ANTITRUST CLASS PROCEEDINGS – THEN AND NOW

Michael D. Hausfeld, Gordon C. Rausser, and Gareth J. Macartney, with Michael P. Lehmann and Sathya S. Gosselin

ABSTRACT

In class action antitrust litigation, the standards for acceptable economic analysis at class certification have continued to evolve. The most recent event in this evolution is the United States Supreme Court's decision in Comcast Corp. v. Behrend*, 133 S. Ct. 1435 (2013). The evolution of pre-*Comcast *law on this topic is presented, the* Comcast *decision is thoroughly assessed, as are the standards for developing reliable economic analysis. This article explains how economic evidence of both antitrust liability and damages ought to be developed in light of the teachings of* Comcast*, and how liability evidence can be used by economists to support a finding of common impact for certification purposes. In addition, the article addresses how statistical techniques such as averaging, price-dispersion analysis, and multiple regressions have and should be employed to establish common proof of damages.*

TABLE OF CONTENTS

INTRODUCTION

In the wake of the Supreme Court's recent decision in *Wal-Mart Stores, Inc. v. Dukes*[1] and *Comcast, Inc. v. Behrend*,[2] scholars, judges, and attorneys are revisiting the requirements of Rule 23 and seeking to identify the precise effects of *Wal-Mart* and *Comcast* on future class-action litigation. The legal community can, however, agree on one central proposition: class certification has, in recent decades, become increasingly complex − whether as an intellectual project, an expenditure of human and financial resources, or an evidence-gathering and demonstrating task − and this trend is all the more evident in the antitrust field. This was not always the case, of course. Federal rule of Civil Procedure 23 was once a relatively simple procedural mechanism, and the class-certification determination typically occurred at the outset of any litigation, well in advance of significant discovery. With the advent of *Wal-Mart* and *Comcast*, however, and their expositions of the "rigorous analysis" required of courts, litigants can expect that the recent trend of deferred class-certification decisions (in favor of substantial precertification discovery) will continue.

It is now clear more than ever before that the economic experts must carefully address each step in class-certification analysis − liability, common impact, and measurement of damages − based on reliable record evidence and data. Otherwise, the expert runs the risk of being discounted or ruled inadmissible. There are several practices that economics experts can adopt in order to ensure that their analysis both addresses the increased complexity of class certification and maintains professionally accepted standards. These practices are discussed in the Section "Post-*Comcast* Economic Testimony and Class Certification" of this article and include: (i) the rigorous adherence to scientific hypothesis formulation and empirical testing, rather than unacceptable data mining practices; (ii) the identification of causal relations, rather than mere correlations; (iii) a separation of liability, common impact, and damages into three distinct analyses, the results of each one feeding in as foundation for the subsequent analyses; (iv) the proper use of averages and the correct consideration of the importance or otherwise of price dispersion; and (v) the correct assessment of regression model reliability and interpretation of regression results, including when damage regressions are applied to individual class members. Carefully addressing these and related issues make class certification possible in many cases, even with decisions such as *Wal-Mart* and *Comcast*.

As the legal community wrestles with the commands of Rule 23 and the attendant availability of and need for early nonbifurcated discovery, a brief retrospective of the timing of the class determination places this shift in evolutionary context and is useful for keeping in mind the goals of class actions. This retrospective is presented in the Sections "The Early History of Rule 23" through Eisen and Bogosian "The Rise and Fall of Bifurcated Discovery."

THE EARLY HISTORY OF RULE 23

Class actions originated some 800 years ago, in what Prof. Stephen Yeazell has dubbed "medieval group litigation."[3] The earliest published sources record one instance in which a parish rector sued four of his parishioners (as representatives of the entire community) to recover certain parochial fees.[4] Later came the English bill of peace, a procedural device that enabled representative parties to petition the English Courts of Chancery to aggregate multiple claims in a single equity proceeding.[5] In the mid-19th century, the United States Supreme Court, borrowing from principles embodied in the bill of peace, created Federal Equity Rule 48 and with it "group representative litigation."[6] Equity Rule 48 provided, in relevant part:

> Where the parties on either side are very numerous, and cannot, without manifest inconvenience and oppressive delays in the suit, be all brought before it, the court in its discretion may dispense with making all of them parties, and may proceed in the suit, having sufficient parties before it to represent all the adverse interests of the plaintiffs and the defendants in the suit properly before it. But in such cases the decree shall be without prejudice to the rights and claims of all the absent parties.[7]

That rule proved too complicated to be of much utility, however, and it was seldom used.[8] In 1912, the Supreme Court scrapped its earlier effort and rewrote the rule (renumbered Equity Rule 38), striving for simplicity with a single sentence: "when the question is one of common or general interest to many persons constituting a class so numerous as to make it impracticable to bring them all before the court, one or more may sue or defend for the whole."[9]

In 1937, the Supreme Court promulgated the Federal Rules of Civil Procedure.[10] Included was Rule 23, which was the first procedural device to permit class action suits for monetary damages in the United States.[11] Rule 23, the advisory committee noted, was a "substantial restatement of [former] Equity Rule 38 (Representatives of Class)," although the new

rule "applie[d] to all actions, whether formerly denominated legal or equitable."[12] And the criteria remained the same: class treatment[13] was appropriate if the litigation posed a question of "common or general interest to many persons constituting a class so numerous as to make it impracticable to bring them all before the court."[14]

Notably, however, the first Rule 23 did not "pa[y] any attention to the details of the procedural management of class actions."[15] Nor was there a "routine certification procedure for the representative suit."[16] As Prof. Richard Marcus notes, "it was expected that judges would scrutinize the propriety of class treatment [at some unspecified time] before entering judgment. Indeed, it seems that the resolution of the question whether a case was a proper class action was enmeshed in the evaluation of the merits of the case and emerged from the resolution of the merits."[17]

Other features of Rule 23 caused confusion as well. The three categories of class actions − "true" class actions, which concerned "joint, common, or secondary rights" in which all plaintiffs had substantially identical interests; "hybrid" class actions, which described plaintiffs with individual causes of action tied to a common fund or property and united by at least one common question; and "spurious" class actions, which involved distinct rights but at least one common question concerning common relief − "proved obscure and uncertain."[18] Further compounding the problem, Rule 23 did not require notice (at least for "hybrid" and "spurious" classes) or provide an opportunity for class members to opt out of the litigation.[19] What is more, there was considerable uncertainty about the binding effect of a judgment on absent class members.[20] Absent class members were bound by any judgment in "true" and "hybrid" class actions, but not with respect to "spurious" class actions.[21] It was an open question, for example, whether absent "spurious" class members who were exempt from an unfavorable decision could nevertheless gain the benefit of a favorable decision after the fact.[22]

Recognizing these flaws, the rules drafters substantially revised Rule 23 in 1966. The 1966 amendments included the addition of the four foundational requirements required of all class actions today: numerosity, commonality, typicality, and adequacy.[23] Additionally, the rule now clarified that a class action judgment binds all absent class members.[24] Another noteworthy feature concerned timing: "In order to give clear definition to the action," Rule 23(c)(1) required a court to determine − "as soon as practicable" − whether a class action was the appropriate procedural classification.[25] That determination could be conditional, however, enabling a court to revisit its decision at some later point.[26]

EISEN AND BOGOSIAN

The "as soon as practicable" admonition prompted further questions about the procedural management of class actions. What was the precise decision sequence called for by the rule? What, if any, discovery should be permitted before a class-certification determination? And did Rule 23 authorize any consideration of the merits at this early stage? In essence, what could courts do with the facts − and the merits − at certification? What is more, any economic analysis, though potentially relevant to some class-certification questions, also seemed premature in light of the timing language embedded in the rule.

Many judges found at least a partial answer in *Eisen v. Carlisle & Jacquelin*.[27] *Eisen*, a price-fixing case against two "odd-lot" dealers for stock-exchange trades, chiefly concerned manageability and notice. The trial court judge, Judge Tyler, initially denied class status, reasoning that common questions of law or fact did not predominate over individual questions and plaintiffs' publication notice plan was sorely inadequate for a class of nearly 4 million people.[28] The Second Circuit overturned that decision, however, emphasizing the need for "a liberal rather than a restrictive interpretation" of the new rule.[29] On remand, Judge Tyler allowed extensive discovery in order to probe various questions relevant to the class determination. After six months of evidence gathering, Judge Tyler concluded that class status was appropriate under Rule 23(a) and 23(b), leaving only the question of which side would bear the substantial costs of notice. Following a hearing and additional submissions, the court held that the defendants should bear 90% of the notice costs given the likelihood that plaintiffs would ultimately prevail on the merits.[30] That prompted another appeal, culminating in the Supreme Court's rejection of Judge Tyler's novel notice-cost solution:

> We find nothing in either the language or history of Rule 23 that gives a court any authority to conduct a preliminary inquiry into the merits of a suit in order to determine whether it may be maintained as a class action. Indeed, such a procedure contravenes the Rule by allowing a representative plaintiff to secure the benefits of a class action without first satisfying the requirements for it. He is thereby allowed to obtain a determination on the merits of the claims advanced on behalf of the class without any assurance that a class action may be maintained. This procedure is directly contrary to the command of subdivision (c)(1) that the court determine whether a suit denominated a class action may be maintained as such "(a)s soon as practicable after the commencement of (the) action ...."[31]

Because of its seeming breadth, the Supreme Court's pronouncement convinced many that class certification and merits analysis were mutually exclusive.[32] That ambiguity lingered until *Wal-Mart*, where Justice Scalia explained that in *Eisen*, "the judge had conducted a preliminary inquiry into the merits of a suit, *not in order to determine the propriety of certification* under Rules 23(a) and (b) (he had already done that …), but in order to shift the cost of notice required by Rule 23(c)(2) from the plaintiff to the defendants. To the extent the … statement goes beyond the permissibility of a merits inquiry for any other pretrial purpose, it is the purest dictum and is contradicted by our other cases."[33] Without the benefit of such explicit guidance, though, courts maintained a fairly strict division between class-certification analysis and merits considerations for nearly forty years, from *Eisen* until the first signs of erosion in the circuit courts.[34]

That division became known as the "*Eisen* Rule" and was, for a long time, a pillar of class-action practice.[35] The strongest form of the *Eisen* Rule was simply to assume the validity of plaintiffs' allegations, with judges typically invoking this strong form as a shortcut to class certification.[36] Another historical standard relevant for class certification is known as the "*Bogosian* Shortcut," which follows the Third Circuit's 1977 decision in *Bogosian v. Gulf Oil Corp*.[37] The pertinent passage of *Bogosian* essentially states that if plaintiffs can prove that the prices in an industry exhibit a "price structure" such that the conspiratorially affected prices, even though they differ across regions or class members, were all higher than those that would have existed under competitive conditions, it is possible to infer that all class members suffered some economic harm.[38]

In the past, a number of district courts have seemingly relied on the *Eisen* Rule in conjunction with the *Bogosian* Shortcut to simplify their class-certification evaluation.[39] Plaintiffs' experts would argue that the products purchased by class members are homogenous and part of the same product market and the same geographic market. Under such circumstances, economics predicts that the Law of One Price holds, with the prices of different products differing only by fixed transaction characteristics (determined by well-specified physical characteristics and other observable transaction characteristics) and transportation costs. Under the Law of One Price, the prices of the products contained in the proposed class then exhibit "price structure" in that they rise and fall together. Plaintiffs would then invoke the *Eisen* Rule and assume that the defendants did agree to collectively raise prices (in the case of a monopolistic price-fixing conspiracy) as alleged. Under this assumption, and armed with the price structure

opinion, plaintiffs contended that the defendants' actions necessarily increased the prices paid by all class members, and therefore all class members suffered economic harm.

THE RISE AND FALL OF BIFURCATED DISCOVERY

Mindful of the twin commands to determine class status "as soon as practicable" and to avoid any examination of the merits (while nevertheless conducting a "rigorous analysis"[40]), courts questioned the boundaries and permissibility of precertification discovery. As of 1977, the *Manual for Complex Litigation* "recommended that no discovery on the merits be permitted during the discovery of the class action issue, except as is relevant to the class determination. Only in exceptional circumstances, such as obvious lack of merit in the claim for relief, should a decision on the merits be made before scheduling discovery on the class action issue."[41] By 1985, however, the *Manual* reflected the challenges courts faced in making this artificial division: "Often … bifurcating [between class and merits] discovery … will be counterproductive. Discovery relating to 'class issues' is not always indistinguishable from other discovery. Nor will discovery into matters affecting other members of the putative class necessarily be wasted if a class is not certified, for in many cases this information will be valuable as circumstantial evidence."[42] That position did not hold, however, with the recognition in 1995 that "[b]ifurcating class and merits discovery can at times be more efficient and economical (particularly when the merits discovery would not be used if certification were denied), but can result in duplication and unnecessary disputes among counsel over the scope of discovery. To avoid this, the court should call for a specific discovery plan from the parties, identifying the depositions and other discovery contemplated and the subject matter to be covered." Other limitations on precertification discovery were local rules in various districts demanding that any class-certification motion be filed within 90 days of commencement of the action.[43]

Not surprisingly, bifurcated discovery was, for a time, typical.[44] Today, however, bifurcated discovery has virtually disappeared as courts acknowledge the difficulty, if not impossibility, of segregating "merits" and "class" evidence under a "rigorous analysis" of the susceptibility and plausibility of claimed facts and economic theories of violation and damage to common classwide proofs at trial.[45]

2003 Amendments

In 2003, Rule 23 was amended in two significant respects. First, Rule 23(c)(1)(A) was altered to require the class determination "at an early practicable time" instead of "as soon as practicable after the commencement of the action."[46] Though subtle, the change was prompted by a recognition that the previous language "neither reflects prevailing practice nor captures the many valid reasons that may justify deferring the initial certification decision."[47]

> *Time may be needed to gather information necessary to make the certification decision.* Although an evaluation of the probable outcome on the merits is not properly part of the certification decision, discovery in aid of the certification decision often includes information required to identify the nature of the issues that actually will be presented at trial. In this sense it is appropriate to conduct controlled discovery into the "merits," limited to those aspects relevant to making the certification decision on an informed basis. Active judicial supervision may be required to achieve the most effective balance that expedites an informed certification determination without forcing an artificial and ultimately wasteful division between "certification discovery" and "merits discovery."[48]

Emphasizing the singular importance of the class-certification determination, the 2003 amendments also eliminated the provision (Rule 23(c)(1)(C)) permitting "conditional" class certification.[49]

The new timing provision had an immediate effect, further swaying courts already inclined to permit combined class/merits precertification discovery.[50] Likewise, the 2003 amendments encouraged plaintiffs to "use this more liberalized standard to argue for adequate time and sufficient breadth of discovery. The notes wisely counsel a pragmatic approach to the never-ending struggle over certification versus merits discovery."[51]

Still, confusion lingered. "As soon as practicable" is not very specific. Defendants, for their part, complained that plaintiffs were obtaining class certification with minimal showings that seemed inconsistent with *Falcon*'s command of "rigorous analysis." Plaintiffs, meanwhile, insisted that any more probing court analysis be accompanied (and preceded) by commensurate full-blown discovery. District courts were left to navigate this tension with little appellate guidance.

Hydrogen Peroxide

The 2003 amendments roughly coincided with the first of many circuit court opinions insisting on examination of the merits at class certification

insofar as they bear on the requirements of Rule 23, a position that bucked the longstanding conventional wisdom concerning *Eisen*.[52] The most detailed and influential of these decisions is undoubtedly *In re Hydrogen Peroxide Antitrust Litigation*.[53] In *Hydrogen Peroxide*, a case involving certification under Rule 23(b)(3) of a class of chemical purchasers alleging price fixing, the Third Circuit clarified the standards a district court must use when determining compliance with Rule 23.[54] Noting that the trial court enjoys "broad discretion to control proceedings and frame issues for consideration," the Third Circuit nevertheless reasoned that "proper discretion does not soften the rule: a class may not be certified without a finding that each Rule 23 requirement is met."[55] At issue on appeal was whether plaintiffs had satisfied Rule 23(b)(3)'s predominance requirement, which ensures that "questions of law or fact common to class members predominate over any questions affecting only individual members."[56] Defendants contended that the district court had erred in applying a lax standard of proof for class certification; dismissing defendants' expert testimony without thorough examination; and incorrectly presuming antitrust injury.[57]

Taking up the first aspect, the Third Circuit explained that Rule 23 is dissimilar to a pleading standard; courts are free to probe beyond the pleadings in determining whether class certification is appropriate.[58] "An overlap between a class certification requirement and the merits of a claim," the court noted, "is no reason to decline to resolve relevant disputes when necessary to determine whether a class certification requirement is met."[59] The court added, "*Eisen* is best understood to preclude only a merits inquiry that is not necessary to determine a Rule 23 requirement," a conclusion with which numerous circuit courts now agreed.[60] A truly rigorous analysis, the court continued, cannot rely on "[a] party's reassurance to the court that it intends or plans to meet the requirements."[61] In addition to the support of sister circuits, the court also cited the 2003 amendments to Rule 23(c)(1)(A), which "reflect[] the need for a thorough evaluation of the Rule 23 factors."[62] This alteration, when coupled with the elimination of conditional certification, "guide[s] the trial court in its proper task − to consider carefully all relevant evidence and make a definite determination that the requirements of Rule 23 have been met before certifying a class."[63] The Third Circuit summarized its conclusions:

> First, the decision to certify a class calls for findings by the court, not merely a "threshold showing" by a party, that each requirement of Rule 23 is met. Factual determinations supporting Rule 23 findings must be made by a preponderance of the evidence. Second, the court must resolve all factual or legal disputes relevant to class certification, even if they overlap with the merits-including disputes touching on elements of the

cause of action. Third, the court's obligation to consider all relevant evidence and arguments extends to expert testimony, whether offered by a party seeking class certification or by a party opposing it.[64]

Some suggested that *Hydrogen Peroxide* would radically reshape class-certification analysis, at least in antitrust class actions. But that prediction was not entirely accurate, as subsequent cases have demonstrated. For example, in *In re Ethylene Propylene Diene Monomer (EPDM) Antitrust Litigation*,[65] the court noted the boundaries of its inquiry − observing that its task is *not* to choose between competing economic views of pricing that would have existed absent a conspiracy. Rather, the court "need[s] only determine whether the plaintiffs have demonstrated that the issue of antitrust impact is susceptible to proof applicable to the whole class."[66] Cases like *Hydrogen Peroxide* and *In re Initial Public Offerings Securities Litigation*[67] do not, the court continued, "require plaintiffs to prove the merits of their case-in-chief at the class certification stage."

> They need not demonstrate that their multiple regression analysis captures all the proper variables and thus reaches the "right" answer, as the defendants would require them to do. The defendants have failed to convince me that it is methodologically impossible to use a single formula to estimate class-wide damages.[68]

Similarly, in *In re TFT-LCD (Flat Panel) Antitrust Litigation*,[69] the court probed whether plaintiffs had demonstrated a "plausible methodology" to prove classwide impact and damages, insisting that it need not declare a victor in the battle among competing experts.[70]

Wal-Mart

Three years after *Hydrogen Peroxide*, in *Wal-Mart*, the Supreme Court effectively endorsed the Third Circuit's interpretation of Rule 23. *Wal-Mart* took up the certification of a nationwide class of 1.5 million current and former female Wal-Mart employees − "one of the most expansive class actions ever."[71] The *Wal-Mart* plaintiffs had alleged that Wal-Mart managers routinely abused their discretion over pay and promotions in favor of male employees, thereby violating Title VII of the Civil Rights Act of 1964. And according to the plaintiffs, a class action − under Rule 23(b)(2) − was the appropriate vehicle for their claims because Wal-Mart's discrimination affected *all* of its female employees. As the Court explained, "[t]he basic theory of their case is that a strong and uniform 'corporate culture' permits bias against women to infect, perhaps subconsciously the discretionary

decision making of each one of Wal-Mart's thousands of managers −
thereby making every woman at the company the victim of one common
discriminatory practice."[72]

The Supreme Court considered two questions − whether the *Wal-Mart*
plaintiffs satisfied Rule 23(a)(2)'s commonality requirement and whether
Rule 23(b)(2) permits monetary relief.[73] Beginning with commonality, the
Court observed that Rule 23(a)(2) requires more than a shared violation of
the same provision of law; plaintiffs' claims "must depend upon a common
contention … capable of class-wide resolution − which means that determi-
nation of its truth or falsity will resolve an issue that is central to the valid-
ity of each one of the claims in one stroke."[74] Significant dissimilarities
within a proposed class, meanwhile, merit attention because they reduce
the likelihood of common answers.[75] Nevertheless, "even a *single* common
question" will suffice to establish commonality.[76]

The Court also clarified the burden at class certification, explaining that
"a party seeking class certification must affirmatively demonstrate his com-
pliance with the Rule − i.e., he must be prepared to prove that there are *in
fact* sufficiently numerous parties, common questions of law or fact, etc."[77]
Echoing language from *General Telephone*, the Court affirmed that the
"rigorous analysis" called for by the rule may necessitate some examination
of the merits of the underlying claim, but only to the extent necessary to
conclude that Rule 23 has been satisfied.[78] The Court emphasized as well
that *Eisen* does not bar a preliminary inquiry into the merits to determine
compliance with Rule 23, as some had mistakenly believed.[79]

Elsewhere, the Court hinted, in dicta, that *Daubert v. Merrell Dow
Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), may have some application at
the class-certification stage: "The District Court concluded that *Daubert*
did not apply to expert testimony at the certification stage of class-action
proceedings … We doubt that is so …."[80]

Finally, the dissent, led by Justice Ginsburg, expressed its concern that
"[t]he Court blends Rule 23(a)(2)'s threshold criterion with the more
demanding criteria of Rule 23(b)(3), and thereby elevates the (a)(2) inquiry
so that it is no longer 'easily satisfied'."[81] The "emphasis on differences
between class members," Justice Ginsburg continued, "mimics the Rule
23(b)(3) inquiry into whether common questions 'predominate' over indivi-
dual issues. And by asking whether the individual differences 'impede' com-
mon adjudication … the Court duplicates 23(b)(3)'s question whether 'a
class action is superior' to other modes of adjudication."[82] Ultimately, this
"'dissimilarities' approach leads the Court to train its attention on what

distinguishes individual class members, rather than on what unites them."[83] Justice Scalia explained, however, that "for purposes of Rule 23(a)(2) … [w]e consider dissimilarities not in order to determine (as Rule 23(b)(3) requires) whether common questions *predominate*, but in order to determine (as Rule 23(a)(2) requires) whether there *is* '[e]ven a single [common] question'."[84]

Wal-Mart was not an antitrust case. Most antitrust class actions raise damage claims, thus involving both the commonality requirement of Rule 23(a)(2) and the predominance requirement of Rule 23(b)(3). The inquiry in such cases is thus more extensive than in cases involving solely injunctive relief. Since *Wal-Mart* was decided classes involving direct purchasers of a price-fixed product or service continue to be certified.[85]

Comcast

Third Circuit

Less than two months after *Wal-Mart* issued, the Third Circuit had an opportunity, in *Behrend v. Comcast Corp.*, 655 F.3d 182 (3d Cir., 2011) to synthesize the teachings of *Wal-Mart* and *Hydrogen Peroxide*. *Comcast* provides a helpful analytical roadmap for antitrust class-certification determinations under Rule 23(b)(3), even after its subsequent reversal.[86]

Preliminary Inquiry into the Merits. The first guideline of *Comcast* − extrapolated from *Wal-Mart* and *Hydrogen Peroxide* − is that, in performing its rigorous analysis, a court may consider the underlying merits of plaintiffs' claim to the extent necessary to determine whether class certification is appropriate.[87] According to the Third Circuit, however, these limited forays cannot supplant the ultimate fact finder; any factual determination is nonbinding at trial, and courts must be vigilant against the possibility that "class certification hearings … become actual trials in which factual disputes are to be resolved."[88] "Nothing in *Hydrogen Peroxide* requires plaintiffs to *prove* their case at the class certification stage," the Third Circuit reasoned.[89] "To require more contravenes *Eisen* and runs dangerously close to stepping on the toes of the Seventh Amendment by preempting the jury's factual findings with our own."[90]

Impact. The Third Circuit also articulated the test for evaluating antitrust impact under Rule 23(b)(3), explaining that the court's task is to determine

whether impact is "plausible in theory" and "capable of" or "susceptible to" common proof at trial.[91] Determining whether an expert's opinion of impact is capable of common proof at trial by means of a regression analysis or other common evidence is not necessarily capable of resolution by the application of a preponderance of the evidence. Although "plausible" falls below a requirement of perfection, it is above a "threshold" or a "not fatally flawed" standard. The application of plausibility should evaluate whether the plaintiff's economist had persuasively established "through mathematical models or further data or other means − the key logical steps behind [the impact] theory" and its rational fit to the facts and theory of the alleged conspiracy. *In re New Motor Vehicles Canadian Exp. Antitrust Litig.*, 522 F.3d 6, 25−26 (1st Cir. 2008).

Daubert. Additionally, *Comcast* clarified the trial court's duties − and plaintiffs' obligations − at class certification with respect to *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).[92] The Third Circuit reasoned that, after *Wal-Mart*, the Supreme Court "require[s] a district court to evaluate whether an expert is presenting a model which *could evolve*[93] to become admissible evidence, and [does] not require[e] a district court to determine if a model is perfect at the certification stage. This is consistent with our jurisprudence which requires that at the class-certification stage, expert models are evaluated to determine whether the theory of proof is *plausible*."[94] *Daubert* considerations should be satisfied upon presentation of expert models that show common evidence demonstrating impact of the conspiracy; based on data and record evidence. Corroborative government agency or law enforcement findings[95] should, in fact, strengthen the reliability of such models. This type of presentation should end the district court's *Daubert* inquiry: "When plaintiffs present multiple models created by expert witnesses that can show common evidence and those models are based on the appropriate transactional record data, a district court should not have to determine which model should be used in support of certification."[96]

Damages. The Third Circuit also reaffirmed the burden on antitrust plaintiffs to show, under Rule 23(b)(3), that "the alleged damages are *capable* of measurement on a class-wide basis using common proof."[97] Even at trial, plaintiffs' burden is to establish that the harm suffered from the antitrust violation is measurable, not absolutely certain.[98] For purposes of class certification, antitrust plaintiffs should show, by a preponderance of evidence, that they will be able to ascertain damages across the class using common

proof.[99] That some class members' damages will exceed others' does not prevent certification.[100]

Supreme Court

The Supreme Court accepted certiorari in *Comcast* and rendered its opinion, and on March 27, 2013, reversed the Third Circuit's decision. The majority opinion noted that class plaintiffs presented four theories of impact, one of which was an "overbuilder" theory: "Comcast's activities reduced the level of competition from "overbuilders," companies that build competing cable networks in areas where an incumbent cable company already operates."[101] Three of plaintiff's theories were not deemed suitable for certification. Only the "overbuilder" theory survived motion practice. Plaintiffs' economist ("PE") "designed a regression model comparing actual cable prices in the Philadelphia DMA with hypothetical prices that would have prevailed but for petitioners' allegedly anticompetitive activities. The model calculated damages of $875,576,662 for the entire class. … As the PE acknowledged, however, the model did not isolate damages resulting from any one theory of antitrust impact."[102]

The majority noted that "We start with an unremarkable premise. If respondents prevail on their claims, they would be entitled only to damages resulting from reduced overbuilder competition, since that is the only theory of antitrust impact accepted for class action treatment by the District Court. It follows that a model purporting to serve as evidence of damages in this class action must measure only those damages attributable to that theory. If the model does not even attempt to do that, it cannot possibly establish that damages are susceptible of measurement across the entire class for purposes of Rule 23(b)(3)."[103] This purported certainty of the opinion in *Comcast*, however, was critically questioned by the dissent. Justices Ginsburg, Breyer, Sotomayor, and Kagan said: "[t]he oddity of this case, in which the need to prove damages on a class-wide basis through a common methodology was never challenged by respondents … is a further reason to dismiss the writ as improvidently granted. The Court's ruling is good for this day and case only. In the mine run of cases, it remains the 'black letter rule' that a class may obtain certification under Rule 23(b)(3) when liability questions common to the class predominate over damages questions unique to class members."[104]

As the dissent explained, any language in the majority opinion that might suggest that plaintiffs must show that all putative class members suffered injury and damages is *dicta* at best.

As one district court recently stated,

> The Supreme Court recently reversed a grant of class certification where "[q]uestions of individual damage calculations will in-evitably overwhelm questions common to the class. *Comcast Corp. v. Behrend*, No. 11-864, 2013 U.S. LEXIS 2544, 2013 WL 1222646 (U.S. Mar. 27, 2013). The Supreme Court's holding came from its assumption, uncontested by the parties, that Rule 23(b)(3) requires that damages must be measurable based on a common methodology applicable to the entire class in antitrust cases. That assumption, even assuming it is applicable to privacy class actions in some way, is merely dicta and does not bind this court. See 2013 U.S. LEXIS 2544, [WL] at *9 (Ginsburg and Breyer, JJ., dissenting) ([T]the decision should not be read to require, as a prerequisite to certification, that damages attributable to a class-wide injury be measurable on a class-wide basis. (citation and quotation marks omitted))."[105]

Other post-*Comcast* decisions similarly followed pre-*Comcast* precedent and have held that even if not all class members were impacted by defendants' practices, that was not a disabling factor so long as all or virtually all of the putative class members can be shown to have been impacted by common evidence.[106]

Although raised in *Comcast*, the majority did not resolve the issue of the extent to which any *Daubert* analysis applies at the class-certification stage or the format of any such inquiry. The oral argument, however, reflected the opinions of several of the Justices with regard to their understanding of the proper interpretation of such a *Daubert* analysis or inquiry. It seems as though the Court accepted the petitioners' characterization that a *Daubert* analysis encompassed "three distinct prongs": (1) expert qualifications, (2) reliable methodology, and (3) fit of the facts and economic theories to the facts of the market in the litigation, i.e., is there a qualified expert that utilized a methodology that sufficiently fits the facts and is reliably based on a scientific method enabling proof of a plausible classwide theory of impact and damage at trial.[107] The Justices seemed to have expressed a no "… magic words approach" to *Daubert*. As stated by Justice Sotomayor, district courts had to simply "come to the conclusion that the expert's testimony is persuasive … reliable and probative[.]"[108]

POST-*COMCAST* ECONOMIC TESTIMONY AND CLASS CERTIFICATION

After *Comcast*, plaintiffs in antitrust litigation moving for class certification will likely need to present expert testimony by a PE in most instances. The PE should still be able to use standard methodologies − yardstick

comparisons, "before and after" analysis, regression models, and pricing analysis − to analyze classwide impact. Damage calculations still need not be exact.[109] However, in determining whether impact and damages are amenable to proof on a classwide basis, it is less likely that the PE can merely assert that he or she can come up with an "admissible" analysis *after* the certification decision. Courts are more likely to want to see a sample analysis at the time of certification, ideally based on at least a representative portrayal of the defendants' transaction data. This likelihood is intensified when merits and class-related discovery are not bifurcated and where the class-certification determination is made at a juncture where significant discovery has already occurred and a substantial, if not completed, evidentiary record has been created. In such circumstances, the plaintiff can reasonably expect that defendants will insist on, and courts may apply, a more exacting scrutiny of the expert evidence on certification and, in doing so, will consider evidence concerning the merits to the extent it impinges upon the Rule 23 determination. Accordingly, the following sections present a view of the post-*Comcast* role of economics in antitrust class certification.

The Role of Economic Analysis in Class Certification

In determining whether the standards for class certification have been met, courts handling antitrust cases must typically depend upon the testimony of expert witnesses − including economists and statisticians. In an antitrust case, the assignment for the PE is typically to show that impact and the resulting damages can be proven on a classwide basis. Specifically, the PE must conduct common analysis that supports the proposition that the defendants acted in a manner consistent with the stated or demonstrated allegations ("liability" or "merits"), that these actions adversely affected all, or virtually all,[110] class members ("common impact"), and that there is a method common to the proposed class that can be used to quantify the economic harm to the class in the aggregate ("damages").[111] The PE's proposed analysis may draw on evidence from discovery documents and transaction data, as well as the academic literature and information in the public domain. Both discovery documents and transaction data provide *economic* evidence, with contemporaneous documents evidencing actual recorded market behavior supported by the data on transaction pricing. Further, the use of discovery documents and industry studies to corroborate and support transaction data analysis enables the PE to ensure that his analysis

and results are consistent with the facts of the industry and the alleged actions by the defendants. This corroborating evidence serves an important function of providing a "reality check" for the PE's proposed model and analysis. Similarly, the defendants' economist ("DE") should ensure that any data analysis he offers in opposition to the PE is consistent with the facts reflected in discovery documents and elsewhere.

Armed with the available discovery, the PE's task will be to investigate whether there is a predominant commonality in the economic circumstances faced by proposed class members — a commonality that will facilitate the proof of liability, impact, and damages through common evidence at trial. In contrast, the DE will investigate whether the conclusions of the PE are reliable, credible, or flawed, often by attempting to show that proof of impact or damages is plagued by noncommon issues and/or inconsistent with industry practice and procedure, or contradicted by contemporaneous evidence.

The standards for class certification emerging from *Comcast*, *Hydrogen Peroxide*, and *Wal-Mart* have seemingly created a new paradigm for both plaintiff and defendant experts. Whereas before, the merits of the case could be assumed to hold true, the PE will now in many instances be expected or challenged to investigate the merits to the extent that they are relevant or challenged for issues of commonality and predominance. For example, if the plaintiffs allege that the defendants adopted a universal policy that would necessarily impact all class members, it should now be within the scope of the PE's assignment to examine whether such a policy was in fact implemented commonly across the class. In addition, the "rigorous analysis" standard requires that the PE not only propose common models and analysis to investigate the elements of the case, but also respond to criticisms of his factual premises, economic theories, and models, and if he has proposed them, his econometric and statistical methodologies. Expansion of precertification discovery now means that the class-certification experts are likely to have shared access to a large body of data, including historical transaction records. Inevitably, experts for the two sides are likely to draw conflicting inferences about commonality from their analysis of this shared evidence. Resolving disputes as to such differing opinions, which will require weighing the credibility of the inferences drawn and the quality of their underlying empirical support, may well be an additional obligation of the court.

With this background, we proceed to analyze some of the factors — including scientific reliability; reliable hypothesis formulation and the identification of causality; appropriate data treatments, such as the use of

averages; and the assessment of whether a damage model is workable – that may inform the evaluation of the sufficiency of an expert analysis on classwide proof of impact and damages in antitrust class actions. These are not immutable guidelines. The factors may vary from case to case, but in general, they provide a framework on some of the main areas of expert testimony that would be encountered in antitrust class certifications after the *Wal-Mart*, *Hydrogen Peroxide*, and *Comcast* decisions.

Scientific Reliability

When applying scientific principles to class-certification analysis, it is important to keep in mind "the nature of economic data." As emphasized by econometrician Jeffrey Wooldridge, "rarely can we run a controlled experiment" to uncover a causal relationship between one economic variable and another.[112] Instead, economic data that is generated and recorded as part of real-world interactions, rather than laboratory experiments, consists of two basic components: a systematic signal component that represents a causal relationship between measureable economic variables (for instance, the effect of increased income levels on price, through increased demand) and a random noise component. The random noise component can be due to measurement error or it can be due to idiosyncratic variations that are not readily explained by any economic model, yet are not relevant to the expert analysis. It is accepted in the profession that "[n]ot all possible variables that might influence the dependent variable [say, price] can be included … some cannot be measured, and others may make little difference."[113] As a result, "[n]o model could hope to encompass the myriad essentially random aspects of economic life."[114]

The fact that there is random variation present in the detailed transaction data available to experts in a class action means that the PE should exercise caution in the identification of *causal* relationships (when his inferences would be potentially affected by random variation) and the development of hypotheses based on such relationships. Loose inference based on casual, anecdotal observations of random data patterns and correlations can lead to material errors, so caution must be exercised. As we describe in this section, the typical ordering in class-action litigation of liability, common impact, and damages lends itself well to the application of these principles. Scientific reliability may, for example, be demonstrated by formulating hypotheses and applying them to the record evidence.

The process of formulating hypotheses has been formalized in science and economics over the centuries. The 18th century philosopher David Hume gave structure to the scientific process in *An Enquiry Concerning Human Understanding*, which argued the necessity of reasoning, rather than merely observation.[115] Karl Popper over 100 years later wrote that "[a] scientist, whether theorist or experimenter, puts forward statements, or systems of statements, and tests them step by step. In the field of the empirical sciences, more particularly, he constructs hypotheses, or systems of theories, and tests them against experience by observation and experiment."[116] It may be tempting for experts engaged in certification analyses to comb through the available data, looking for information that appears to be supportive of their position. This approach, however, should be viewed with skepticism, since it is not necessarily consistent with sound scientific practice, which requires the investigator first to specify a theory with testable predictions and then to test those predictions with empirical observation. Popper writes that "a hypothesis can only be empirically *tested* − and only *after* it has been advanced."[117] As the economist Earl Swanson writes, one starts with a theory and goes from it to "observations instead of vice versa."[118] This sentiment has been echoed elsewhere in the literature, "We are never justified in inferring theories from empirical observations."[119] Patterns are readily observed in the real world, and paying casual attention to them, rather than following a formal process of logical theory, model specification, and estimation, may lead to spurious inferences.[120]

The process of searching data (which can include running multiple diverse regression models) to find a hypothesis (rather than forming one first) is often referred to as "data mining." In one study on the dangers of data mining, the authors investigate the supposedly substantial evidence that stock market returns are higher on certain days of the week, weeks of the month, months of the year, and so on.[121] Although these patterns are found to be statistically significant using standard statistical tests, the authors demonstrate through 100 years of daily data that this statistical significance disappears once the distortions due to data mining are accounted for. The authors conclude that the traditional statistical tests do not take into account the relentless searching that has gone into finding patterns in stock market returns that are merely the product of chance. Tests of statistical significance involve a margin of error, often reported as a "confidence level." This confidence level records the probability that the test result is found purely because of random variation in the data, and is not evidence of a real relationship between two variables. With relentless testing on the

same dataset, it is inevitable that results will be found that fall into this error margin and, although reported as statistically significant, such results are, in fact, due merely to random variation in the data.[122] Therefore, caution should be exercised by the courts in the certification process to avoid attributing any unwarranted significance to economic conclusions based on data mining tactics.

Scientifically reliable analysis in class certification should avoid data mining and instead apply hypothesis formulation to each of the three elements of liability, impact, and damages. An expert's analysis at each element may test a relevant *testable* hypothesis. The result of that test may then serve as the foundation of the subsequent element as what is known in economics and statistics as a *maintained hypothesis*.[123] For instance, PE may start by testing the liability hypothesis − i.e., did the defendants engage in the alleged actions? If the liability hypothesis is supported by the evidence, it becomes a *maintained hypothesis* in the impact analysis because it has been supported by sufficient evidence. The PE can then test the common impact hypothesis that the defendants' behavior *caused* injury to the class, taking the maintained hypothesis as a fact. If such causation is also demonstrated, the PE will then have, consistent with the rigorous application of scientific principles, constructed *maintained* hypotheses of both liability and common impact. With these as foundation, the expert can proceed to assess the damages hypothesis − i.e., the quantum of damages suffered by the class. At the class-certification stage, the PE should not need to do more than plausibly demonstrate that this investigation can viably be performed using admissible evidence common to the proposed class.

One complication in practice is that there is not a legal consensus about to what degree, or even whether, the class-certification expert needs to test the hypothesis of liability.[124] So as an alternative, the PE may be asked to assume liability, in the form of accepting as true the conspiracy as alleged and pled by the plaintiffs, and then proceed to test causation in the context of the assumed conspiracy.

Causality and Common Impact

Attempting to capture causal relationships is at the heart of economics. In antitrust class actions, economic and econometric evidence can be used by experts to investigate if events in the real world are consistent or inconsistent with having been caused by the alleged wrongful act. However, if such

statistical evidence is to be presented in support or opposition of class certi-
fication, care must be taken. It is universally recognized by economists and
statisticians that correlation does not imply causality; yet in class-
certification analyses, this critical distinction is often overlooked. The most
obvious example is the extensive use of univariate analysis (where pricing is
investigated along only one dimension), rather than multivariate analysis
(which attempts to control for each of the observable characteristics that
would be expected materially to influence price). *Univariate* analysis such
as a simple graph that presents price movements over time as evidence that
proposed class members did (or did not) suffer injury establishes no causal
relationship without further analysis. In order to identify the *reasons* for
those observed price movements, the economic expert should, at a mini-
mum, use *multivariate* analysis. Instead of investigating only how prices
change as *one* price determining variable changes (univariate analysis), mul-
tivariate analysis seeks to explain how price changes as a *multitude* of deter-
mining variables change. So, instead of looking solely at price points
graphed over time, a multivariate analysis can look at how various eco-
nomic and transaction characteristics (product strength, distance shipped,
fuel costs, and so on) cause prices to change − both over time and across
different transactions. The preferred method to implement multivariate
analysis is to use a multiple regression model, which can "back out" the
influence of a multitude of economic and transaction characteristics on
price.[125] However, an expert could at the very least perform data analysis
and use summary statistics that measure variation (such as the standard
deviation and the coefficient of variation) to investigate if price variation
decreases as the transaction dataset is compartmentalized into isolated
groups of transactions with the same economic and transaction characteris-
tics. Such multivariate approaches can be used to demonstrate that factors
that cause prices to vary can be controlled for, as they might otherwise con-
found isolation of any wrongful price manipulation.

   Similarly, most industries exhibit some price bargaining and discounting,
but this alone does not necessarily preclude collusive − and effective −
price manipulation from taking place across all members of a proposed
class.[126] Indeed, in industries with extensive price negotiation, the publica-
tion of collusively set price schedules may merely adjust the point at which
those negotiations begin, artificially moving the entire schedule up or down
while preserving the individual price differences that would otherwise
exist.[127] It is also possible to manipulate a particular component of price
without manipulating, or triggering offsetting adjustments in, the other
components. For example, in an industry where there has always been

negotiation over the base prices paid by customers, the imposition of a uniform tax or supplemental fee on top of those base prices may be an effective means for horizontal competitors to collusively implement across-the-board price increases. The mere fact that some class members experienced declining base prices during the class period does not justify an inference that they succeeded in countering the tax or supplemental fee that was pasted on top; indeed, their base prices might well have declined identically had the tax never been imposed.[128] In order to establish this connection, it is necessary, empirically, to establish a causal link between the imposition of the tax and the downward adjustment in these particular customers' base prices. This approach is consistent with the academic literature. As Wooldridge emphasizes: "[t]he notion of *ceteris paribus* — i.e., holding all other (relevant) factors fixed — is at the crux of establishing a *causal relationship*. Simply finding that two variables are correlated is rarely enough to conclude that a change in one variable causes a change in another."[129] Often economic variables are correlated because they are simultaneously determined by some other factor. As a result, we should "use econometric methods to effectively hold other factors fixed."[130] This is a basic focus of econometrics: "[a] first course in econometrics teaches students how to apply … [multivariate] regression analysis to estimate ceteris paribus effects."[131]

However, even the utility of multivariate regression analysis can be limited because in some instances not all of the factors that influence price can be observed in the available data. For example, an individual customer might manage to achieve greater base price discounts for any number of reasons not reported in the data, such as his acquisition of an interest in a related business that would add to volume purchases, his election to leadership in an influential trade association, or his credible threats to leave for another supplier. These facts could, however, have been the same in the absence of the collusively imposed tax and do not mean that the customer had the ability to escape the effects of that tax. Therefore, reliance on anecdotal examples of unexplained price changes would constitute a professionally unsound and unreliable method.

The approach adopted by econometricians to "identify" a causal relationship in the presence of unexplained price variation is referred to in the profession as an "identification strategy." Ideally, an identification strategy involves a "natural experiment"[132] in which a "treated" group is compared to an otherwise identical or near identical "untreated" group, in order to identify the effect of the treatment. In the context of our earlier example, suppose the conspiratorial tax was sequentially implemented and

administered to different segments of the class at different times. If so, the expert could seek to compare in each period the base prices paid by certain proposed class members subjected to the tax, with the base prices for proposed class members to whom the tax had not yet been applied. With sufficient controls for any differences between the two groups, a decrease in base prices for certain class members who suffered the tax, relative to those who at the same time did not (supported by sound economic theory as to why certain proposed class members may have negotiated discounts), could provide evidence that some discounting was being implemented to offset the tax.

In this fashion, a PE should investigate if common evidence can be used to establish a dual maintained hypothesis of liability and common impact, which will serve as foundation for a quantification of damages. Both the PE's investigation and the DE's challenges should adhere to reliable hypothesis formulation and the identification of causal relationships. The next section describes more formally the relationship between the three branches of the analysis − liability, common impact, and damages − and suggests certain nonexclusive factors that can be helpful in evaluating expert testimony concerning them.

Relationship between Liability, Common Impact, and Damage Analyses

Although the three branches of analysis − liability, common impact, and damages − are factually and logically connected, they are also distinct and subject to different forms of proof. If they were entirely separable, the results for any one of the three branches would have no implications for the other two. However, this may not be the case. The common impact and damage analyses can depend upon either a presumption or some investigation of liability, while the damage analysis must measure the type of injury posited to have occurred given the common impact analysis.

The ongoing evolution in legal standards (and particularly some courts' clarification of the *Eisen* Rule) appears to recognize the implications that one may have for the others. From an economic perspective, there is a natural and common sense ordering. Liability must be evaluated first because identifying the wrongful conduct is a necessary precursor to analyzing how that conduct may, or may not, have affected putative class members. Impact analysis follows to test whether, as a result of the identified wrongful conduct, all or most of the class would actually have suffered economic harm, regardless of its quantum. The classwide damages that result from

that common impact can then be quantified using a professionally accepted regression model or other methodologies.[133]

At each of the three stages, the economic expert operates within the boundaries of accepted paradigms, such as the assumption that agents on average act rationally, and that the laws of supply and demand apply. Thomas Kuhn had originally proposed the notion of a paradigm for the natural sciences, but it has now been fashionable in economics for several decades.[134] A paradigm in economics, as in the natural sciences, "defines the type of relationships to be investigated and the methods and abstractions which are regarded as legitimate within a particular problem area."[135] As discussed above, the paradigm helps to define a set of possible *maintained hypotheses* from which those most consistent with economic logic will be selected.[136] Not all hypotheses are, in fact, testable, given the limitations of real-world data; from the selected maintained hypotheses, it is therefore necessary to identify one or more *testable hypotheses*.[137]

Economic experts engaged in a class-certification analysis generally apply the accepted paradigm of neoclassical economics. Under this paradigm, most agents are rational and act in their self-interest in order to maximize their utility.[138] In this setting, the PE may either test or assume the liability hypothesis that the defendants acted as alleged and in a fashion that would be expected to cause injury to the putative class. This then establishes a *maintained hypothesis* (a hypothesis that is plausibly determined or assumed to be true) of liability, which can serve as the foundation for the expert to assess the hypothesis that such behavior had a common impact on the putative class. If the results of the inquiry support that second hypothesis, then the expert can approach the damage analysis and quantify classwide damages armed with the demonstrated *maintained hypothesis* of common impact.

This type of analytical progression is generally widely accepted in economics and most other fields of scientific inquiry. For example, performing a damage analysis without the maintained hypothesis of common impact may mean the damage regression model is applied to a group of products or regions different than those for which prices could plausibly have been manipulated. As a further example, the most commonly used methods for computing classwide antitrust damages rely on the quantification of a price "delta," computed as the difference between prices actually paid for the class products and those paid for competitive benchmarks understood to be unaffected by the alleged misconduct.[139] Typically, these benchmarks are based upon: (1) the same product and time period but in geographic regions unaffected by the alleged manipulation, or (2) the same product and region

but in prior or subsequent time periods unaffected by the alleged manipula-
tion, or (3) a comparable product in regions and time periods as similar to
the class products as possible. Differences in economic conditions between
the class transactions and the benchmark transactions are accounted for by
control variables, and the resulting "delta" by which class transactions are
priced differently than the benchmark transactions may be attributed to the
defendants' alleged misconduct and used to quantify the resulting classwide
harm.[140] To make this critical attribution of the price "delta" to the alleged
actions, the PE should either first assume or provide evidence to support the
maintained hypotheses of liability and common impact.

Attempting to work backward up the logical chain and test the main-
tained hypothesis of common impact by using the damage model may also
lead to spurious inference. Most damage models, such as pricing regressions,
rely on economic data. As discussed in subsection Demonstrating Damages
through Common Evidence, it is important to keep in mind the "nature of
economic data."[141] Such data is generated in the real world, and not in a
laboratory. For this reason, it can exhibit substantial random variation, not
all of which can be explained by any economic model.[142] This unexplained
variation may be unimportant for accurately quantifying classwide
damages. As discussed below, it may be simply random variation, unrelated
to the effect of the alleged acts and will not, therefore, bias an estimate of
damages either up or down.

Investigating Liability through Common Evidence

When a PE addresses the issue of liability, she should do so based on the
existence of common economic and noneconomic factors that describe the
defendants' alleged behavior. The PE may choose to determine an eco-
nomic model that establishes hypotheses regarding the alleged behavior of
the defendants. These hypotheses can then be evaluated against the evi-
dence, to demonstrate if the evidence is common to the class and how that
evidence will be used to prove that the defendants acted in a manner con-
sidered by economists to be consistent with the allegations against them.
The expert should be able to draw from both documentary evidence and
actual transaction data. Both are *economic* evidence, with contempora-
neous documents evidencing actual recorded market behavior, supported
by the data on transaction pricing. Both PE and DE should use documen-
tary evidence to perform "reality checks" on their statistical analysis and
results.[143] Are the models used consistent with the reality of the industry

and the alleged behavior of the defendants? Do the results of those models and statistical analyses *fit the facts* of the industry and the case? Any inconsistency with undisputed facts, or facts as found by the court, serves to undermine the reliability of an expert's analyses.

The DE may choose to criticize the PE's liability model as being inconsistent with accepted economics. There may, for example, be implications of the model that would require some agents to act in an economically irrational manner, which would serve to undermine its credibility. The discovery record may contain evidence of differential behavior by the defendants across the class or evidence of behavior before or after the class period about the contended commonality of behavior during that period. Such evidence would need to be evaluated by the court in assessing whether, based on a preponderance of the evidence, plaintiffs' model is either incomplete or belies common evidence of liability.

The exact analysis required to investigate whether liability can be demonstrated through common evidence will depend on the facts of the industry and the nature of the allegations or record evidence against the defendants. Among a nonexhaustive list of factors a court could consider in assessing common evidence of liability are the following:

1. Can common evidence on industry characteristics be used to support the factual foundations of the PE's model and hypothesis? For instance, industry characteristics such as high barriers to entry and a lack of competing products would serve to support that the defendants would have expected to succeed in an alleged price manipulation.
2. Is it economically rational that the defendants acted in a fashion that was common across the proposed class, so that plaintiffs' model can be appropriately applied on a common basis? Rationality could be demonstrated through an analysis of the costs and benefits of a common classwide manipulation, relative to one aimed at only certain proposed class members.
3. Can a common economic model or other acceptable methodology be constructed or used that explains how the alleged behavior by the defendants was rational? For example, do the potential benefits to the defendants of their alleged actions in terms of profitability outweigh the cost of losing customers to nondefendant suppliers of similar products?
4. Are there any implications of such a model that are inconsistent with the accepted economic principles of rational agents acting to serve their own best interest? Such implications would undermine the validity of the model.

5. Does an analysis of the documentary record and the transaction data support the allegation that the defendants acted in a common fashion across the putative class that is consistent with the PE's model and hypotheses? For instance, if the plaintiffs allege a classwide imposition of a conspiratorial tax, was that tax assessed on all (or virtually all) proposed class members, where possible.
6. Does the economic model account for all (or at least the predominant) common influences on price or output? If academic studies or testimony by market participants suggest that, say, strength, color, and distance shipped predominantly determine prices, are these factors included in the model?
7. Does the economic model account for material factors or peculiarities of the market and transactions?

Investigating Impact through Common Evidence

In per se cases under Section 1 of the Sherman Act (e.g., horizontal price fixing), direct evidence of anticompetitive conduct and injury is more relevant than indirect evidence concerning the defendants' intentions or their market power. In contrast, in *rule of reason* cases, whether or not there is indirect evidence that the defendants had market power typically becomes one of the more contentious issues and may prove dispositive at the class-certification stage. For both types of violations, the current standards for class certification are leaning toward proving common impact through a fuller assessment of the appropriate facts of the case necessary to respond to the requirements of class certification. The expert's assessment may encompass relevant documents, data and possibly testimony produced in the litigation, as well as publicly available information such as academic, governmental, and industry studies or findings.

Where available, data specifically enumerating the transactions alleged to have been affected should be subjected by the experts to rigorous hypothesis formulation and empirical analysis separately from the quantification of classwide damages − the objectives and necessary form of the two exercises differ. The resulting body of evidence may support or disprove common impact through a sequence of steps, from identification of the product and geographic scope of the enquiry, through the characteristics of the industry that may or may not make it conducive to collusion, to an evaluation of any evidence from the discovery record that defendants implemented a scheme across the entire class. If available, both sides could

also examine the transaction data to determine whether pricing was reasonably uniform across the proposed class period, but only after accounting for the set of observable pricing determinants common to the class transactions ("common factors"), and only after considering that all transaction datasets exhibit some amount of random variation that cannot be readily explained.

In common impact analysis in antitrust cases, there are two issues that almost always arise in an analysis of transaction data, which we now examine: (1) the appropriate use of averages and (2) the importance of price dispersion in the industry.

Proper and Improper Uses for Averages

Often, as with many statistical analyses using large transaction datasets, class-certification analysis will require the use of averages. Occasionally average price movements have been used as evidence that different products are substitutes and/or that their prices are subject to the same forces of supply and demand. Averages can be revealing, but if misused can distort data and mask important differences. The case that brought the use of averages under the spotlight in recent years was *Hydrogen Peroxide*. The court in *Hydrogen Peroxide* criticized the use of averages by the PE, on the basis that they masked differences between the distinct types of hydrogen peroxide, which had fundamentally different uses, customer bases, demand drivers, and pricing. Post-*Hydrogen Peroxide*, "average" became something of a dirty word in class actions. However, the criticism of the use of averages in *Hydrogen Peroxide* should be understood in the context of that case's unique facts and not read as erecting a taboo against all uses of averages.

Averages are an essential tool for understanding large volumes of complex transaction data. Such tools are at the heart of econometrics. The founding of the Econometric Society in 1930 was in response "to an unprecedented accumulation of statistical information … [and] a need to establish a body of principles that could organize what would otherwise become a bewildering mass of data."[144] The purpose of an average in econometric analysis is, specifically, to "average out" individual differences that are not relevant to the matter being investigated. In determining whether a particular average runs the risk of masking important differences or instead provides a useful tool, it is important to keep in mind the purpose of the analysis. Where the analytical objective is to evaluate common impact, individual variation takes on a special importance and averages should be cautiously employed. However, where common impact has already been

satisfactorily established, averages may be an appropriate − even essential − tool in quantifying classwide damages.[145] Because this third branch of inquiry is specifically intended to estimate *aggregate* classwide damages (which normally requires applying an average overcharge to class-wide unit sales), averages are often helpful in generating a concrete and reliable result.

Accurate inferences generally require assessment of summary statistics from individual transaction data such as the probability distribution, mean, variance, higher moments, and coefficient of variation, each of which depends upon an average. These standard statistical tools provide a sound basis for investigating differences in the data and it is neither necessary nor possible to explain all variation on an individual basis; attempting to do so can produce misleading results. For instance, it is not possible to determine whether the differences in prices paid by one type of customer and those paid by another type of customer are *statistically significant* without using the full sample of pricing data to capture the magnitude of total variation in pricing, both systematic and random. Similarly, it is not possible to determine whether such price differences are *economically significant* without comparing them to the average prices paid in the industry and the variation in those prices. Without recourse to averages, the analysis can become anecdotal and unreliable.

Given that there is always variation in prices in real-world data and that simply averaging over that variation can be undesirable, a determination of the importance (or otherwise) of such price dispersion for class certification also requires careful analysis.

Price Dispersion and Its Implications for Common Impact
Prices are never entirely standard, and all products − even the most highly commoditized − exhibit unexplained price dispersion.[146] Whether the variation creates an impediment to price manipulation or refutes the hypotheses of liability and common impact depends upon its magnitude and the likelihood that it is systematically related to the allegedly unlawful conduct. In answering these questions, an economist's first step would be to quantify the observed price dispersion. The second step would be an attempt to determine how much of that dispersion can be explained using a set of common transaction characteristics, as well as exogenous factors which economic logic suggests would affect supply or demand for the product. A DE may choose to present price dispersion in the form of a scatter plot and then argue that prices are so substantially different for different transactions that an individual analysis is necessary. The DE's inference from such

a scatter plot would be that the scatter is in and of itself evidence that some proposed class members may have managed to negotiate their way out of the effects of the conspiracy, and this possibility would have to be investigated on a customer-by-customer basis. However, a presentation of price dispersion in the form of a scatter plot can be misleading, if not supplemented with some form of objective quantification. Such quantification can be performed using objective, summary statistics, rather than relying solely on the subjective visual inspection of graphics.

One professionally accepted summary statistic is the coefficient of variation (the standard deviation divided by the average). This statistic, like the standard deviation, is a representation of the probability distribution of individual data points arrayed around the average, but it offers the advantage that it is normalized by the average. The resulting statistic appears as a percentage which can be compared to price dispersion in other industries. These comparisons can shed light on whether the degree of price dispersion present in the industry under study is evidence of intra-class heterogeneity that may be problematic for class treatment, because some proposed class members may be successfully negotiating out of the effect of the conspiracy, or whether the dispersion is merely the highly typical and random price variation found in all markets, even those with homogenous and interchangeable goods.

Even when price variation may be large, this would not necessarily foreclose class treatment if it can be systematically controlled using causal factors unrelated to the alleged misconduct, such as transaction characteristics, economic conditions, and seasonality.[147] A multivariate regression analysis would enable the expert to adjust for these systematic price differences in order to investigate the impact on class members of the alleged wrongful acts. This type of regression utilizes a hedonic approach proposed by some authors for use in class-certification analysis, so named because it measures how attributes or "hedonic" characteristics of products are commonly valued.[148] These control variables may more simply be referred to as "common factors" because, even though they may take on different values, their application is common to all transactions.[149] Examples include delivery distance, product strength, size of delivery, and transaction date. The analysis of price which controls for these shared characteristics may be referred to as the "common factors regression." The need to control for multiple transaction characteristics does not turn a common one-model method into an individual analysis, as long as the characteristics are shared across transactions and there is sufficient data so that the parameters associated with each can be estimated reliably.

Often the success of a common factors regression is focused on its explanatory power, measured by the *R*-squared. Whereas economists are comfortable with a wide range of *R*-squared values as long as other elements of the regression model perform well, courts are sometimes uncomfortable with the inability to perfectly explain all price variation. As noted by Franklin Fisher, statisticians are used to the idea that regression models do not perfectly fit the available data; relatively minor and random influences on prices are left to the error term. He states that "[l]awyers may understand this in principle, but they do not like it."[150] As the court ruled in *Reed*,[151] discussing a regression model with an *R*-squared that ranged between 51% and 97% (depending on the specification) of individual nurse wage variation, this rate "may be sufficient for the economics literature but it falls far short of satisfying plaintiffs' legal burden to establish a means of demonstrating by common proof that the members of the putative class were injured and, if so, by how much."[152] The ruling that a regression model with an *R*-squared as high as 97% does not satisfy the court is difficult for an economist with sound statistical training to accept.[153] However, there are no bright lines to determine what constitutes a sufficiently high *R*-squared. What matters is the significance − statistical and economic − of the included explanatory variables and the properties of the residual unexplained variation. If all of the systematic variation can be explained, with only unexplained random variation left over, the level of the *R*-squared is not determinative.

There are many reasons why markets for even undeniably homogenous products exhibit price dispersion that cannot be accounted for by an economic model. One such reason may be that not every market participant has the same information at the same time. At any given moment, not all buyers may know each of the prices on offer from all sellers and vice versa. As a result, even given perfect rationality, different parties will agree to different prices for the same transaction at the same point in time. This is reflected in the economics literature, which includes a wide range of studies on price dispersion in homogenous goods. These studies investigate transactions involving highly similar or identical products, occurring at around the same time (in some cases on the very same day), in the same geographic region.[154] Even purchases of identically branded products in the same size and packaging involve a certain amount of price dispersion,[155] and even purchases of products reasonably well accepted to be homogenous, such as gasoline.[156]

The challenge for economic experts involved in class certification is to determine which consequences of unexplained variation are important and

which are not. A factor which is missing from a model because it cannot be observed and thus contributes to the error term (the unexplained residual) is often referred to as an omitted variable. In econometrics, it is well understood that the important consideration is whether any omitted explanatory variable is correlated with the *variable of interest*. "[I]n a discrimination case, the variable of interest may be the race or sex of the individual. In an antitrust case, it may be a variable that takes on the value 1 to reflect the presence of the alleged anticompetitive behavior and the value 0 otherwise."[157] No regression model applied to a real-world industry can explain 100% of the variation in pricing; some portion may always be left unexplained.[158] It is accepted in the profession that "[n]ot all possible [explanatory] variables that might influence the dependent variable can be included if the analysis is to be successful; some cannot be measured, and others may make little difference."[159] What matters is whether any omitted explanatory variables are correlated with the variable of interest:[160]

> Failure to include a major explanatory variable that is correlated with the variable of interest in a regression model may cause an included variable to be credited with an effect that actually is caused by the excluded variable … Other things being equal, the greater the correlation between the omitted variable and the variable of interest, the greater the bias caused by the omission.

As a result, what is important for class certification is not whether unexplained price variation may exist (which may often be the case), but whether it is *related* to the alleged illegal conduct. If so, it may confound the ability to determine impact and quantify classwide damages.[161]

In order to assist in an evaluation of whether or not antitrust impact may be proven through common evidence, the court may consider another set of nonexhaustive factors, as listed here. Again, the exact analysis that the PE will perform will depend on the facts of the industry, the alleged actions by the defendants and the available discovery.

1. Are class members generally in a similar situation regarding economically viable alternatives to escape the defendants' alleged harmful actions?
2. Are there pretextual or other reasons that defendants proffered to explain their action in a uniform manner across the class?
3. Are there business practices in the industry, such as the linking of prices of different products or the tying of prices to an underlying index, that would have ensured that the defendants' alleged actions would have had a common impact across class members?

4. Can a common regression model or other generally accepted methodology be used to explain pricing variation using a set of common factors?
5. Is there a convincing economic theory that the remaining unexplained pricing variation is relevant to proving impact and quantifying damages? That is, is the unexplained variation related to the conspiracy and the alleged actions by the defendants, or is it merely random and/or anomalous?
6. Has the PE appropriately used averages in his analysis of common impact? In a pricing comparison, it may be inappropriate to average prices over different product strengths thereby masking important variation, but it can be appropriate to present average prices for each of those product strengths (averaging over small random variations across customers) to investigate if the prices for different products generally move together.
7. Has DE offered more than scatter plots that simply record that there exists variation in prices, which he merely speculates will confound a common impact analysis? Has the DE demonstrated that the lack of common impact professed is not the result of mere speculation and is consistent with accepted principles of *ceteris paribus* and identification?

Demonstrating Damages through Common Evidence

The final step in the analysis offered by the PE at the class-certification stage, and inevitably destined to be challenged by the DE, is generally to demonstrate that damages can be quantified on a classwide basis. *Comcast* makes certain that a PE must quantify classwide damages in a manner that is consistent with the theory of liability. Merely promising later to come up with a workable damage methodology can be insufficient to support certification after *Hydrogen Peroxide*. However, it is equally clear that the actual or probable amount of such damages need not be established at the certification stage, nor need the expert commit to the precise model specification that will be presented at trial. The emergent standards focus heavily (and appropriately) on the soundness of the PE's proposed damage model. Critical questions include the professional standards applied to the model, availability of necessary data, the acceptable margin of error, and the reliable interpretation of regression results. All of these questions bear on the "workability" of the proposed damage model.

Determining whether a Proposed Damage Methodology Is "Workable"
The "reduced form" pricing model is a workhorse of antitrust litigation
and represents the most commonly used, but not the only, damage metho-
dology in such cases.[162] The model investigates the effect a set of transac-
tion characteristics and economic factors have on market equilibrium
prices. The included transaction characteristics are usually the same set of
"common factors" identified as important price determinants in the com-
mon impact analysis. The reduced form model investigates the market equi-
librium price, which reflects both demand and supply forces.[163] The
damage model quantifies the common classwide impact by estimating the
"delta" between prices for class transactions and prices for transactions in
a benchmark (whether a different time period, geographic region, or pro-
duct), which is unaffected by the allegations against defendants. The mod-
el's variables control for differences between the class transactions and the
benchmark transactions. After these nonconspiratorial factors have been
adjusted for, the price delta between the class transactions and the bench-
mark transactions is usually captured by a dummy variable that distin-
guishes the two groups of transactions.[164] To be reliable, this comparison
requires that there are a sufficient number of data points in both the class
period and the benchmark period.[165]

   Three common misapprehensions about such models involve the role of
economic intuition, the acceptability of unexplained price variation, and
the treatment of measurement error in the underlying data. Economic the-
ory and intuition are indispensable tools in evaluating model specification
and regression results.[166] In this context, "theory" and "intuition" are not
synonyms for speculation, but instead reflect the application of a body of
economic knowledge to evaluate whether those variables likely to be impor-
tant are present in the model, and whether the resulting coefficients for
each variable are consistent with economic logic, the facts of the industry,
and the alleged actions by the defendants. If important variables are miss-
ing or the coefficients behave contrary to economic logic, the facts of the
industry, or the alleged behavior of the defendants, these may be signs that
the model has been mis-specified or is unreliable.

   As previously noted, regressions are never "exact," and cannot be
expected to explain all of the variation in the dependent variable (e.g.,
price); there may be some random variation left unexplained. Similarly,
there is typically measurement error in the underlying data. Such errors
most commonly arise because of mistakes in initially recording or inputting
the data, such as the failure to include the correct number of digits which

can easily convert an entry of 1,000 into an entry of 10.[167] Statisticians and economists routinely deal with this problem through establishing a protocol to identify and exclude "outliers" in the data, which are random, unsystematic values outside the normal range otherwise represented in the data, or which violate economic logic.[168] This is a generally accepted practice; the question is not whether it should be undertaken by each side, but instead whether the outlier exclusions have been too strictly or too leniently set and what is the effect on the regression estimates from outlier removal.[169]

With these observations in mind and considering that the exact form of the PE's analysis will depend on the case and the available discovery, the court may assess whether a proposed damage model is theoretically plausible and practically workable by considering the following nonexclusive factors:

1. Is there an appropriate benchmark of transactions that could reasonably be expected to have been unaffected by the defendants' alleged actions?[170]
2. Does the model have sufficient explanatory power given the purposes for which it is specified, such that the independent "right-hand side" variables are jointly significant and explain a reasonable amount of variation in the dependent variable (e.g., price)?
3. Is the model applied to data of sufficient quality and quantity in order to both estimate and account for the effect of nonconspiratorial economic factors on prices *and* estimate the effect of the defendants' actions on prices?
4. Are the coefficients on each of the important transaction characteristics and economic factors both statistically and economically significant, and do they have signs (positive or negative) that are consistent with economic theory, the facts of the industry and the alleged actions by the defendants?
5. Does the model include as controls all variables that are: (i) expected to have significant explanatory power over the variable used to measure effects of the alleged antitrust violation (e.g., price) and (ii) expected to be different between the benchmark transactions and the class transactions? Failure to include such factors may lead to omitted variable bias in the estimated damages. Variables claimed by a DE to be omitted should be corroborated by transactional data and industry facts, and not merely reflect hypothetical speculation.[171]
6. Is the model free from problems of "endogeneity"? This problem arises when explanatory variables are themselves affected by the dependent

variable, which can result in biased and inaccurate estimates of the effect of each independent variable on the dependent variable.[172] Endogenous variables should not be included unless instrumentation is used to filter out the endogenous relationship and identify the causal effect of the explanatory variable on the dependent variable.

7. Is any residual unexplained variation (i.e., the error term) random or anomalous? If nonrandom unexplained variations exists, then estimates of the impact of an illegal act can be biased and unreliable. Have appropriate steps been taken to control for any nonrandomness such as heteroscedasticity or serial correlation, which can often make tests of statistical significance unreliable?[173]

Unreliable Decomposition of Regression Model Data Samples

Plaintiffs' damage models are sometimes rerun by DEs on an individual customer basis, estimating all the model parameters and the delta for each one, as a means of attempting to disprove common impact. Such an approach may be extremely misleading and may often be unreliable, due in large part to the small amount of data that is available for each individual customer. For example, the DE may find widely varying and erratic coefficients on supply and demand variables in his individual customer regression runs, with rising demand increasing prices for some customers (as one would expect), but decreasing it for others. He may claim that each run finds differing coefficients, because each customer's demand is different and the results are simply reflecting this.

In *Plastic Additives*, the DE reran the PE's damage regression one class member at a time. The court noted that of the "115 [class members that he did this for] 81 show[ed] no evidence of a statistically significant increase in prices as a result of the alleged conduct."[174] The PE replied that the regressions were not appropriately specified for this individual use, as evidenced by the fact that the coefficients on supply and demand variables changed with each regression run, and were at times statistically insignificant or had a sign inconsistent with economic theory (with prices going down as demand increased, for example). The PE further noted that there was insufficient data to allow an application of the model for individual customers, leading to the erroneous regression coefficients that changed sign or statistical significance between each customer-specific regression. DE disagreed, arguing that the coefficients on supply and demand variables differed across the customer-specific regressions because each customer may react to supply and demand factors differently.[175] The court ruled in favor of the defendants.[176]

Such claims that a regression model applied to individual customers finds widely different coefficients on supply and demand variables, because the model is merely reflecting customer-specific supply and demand dynamics can be highly misleading. The reduced form regression models routinely used in class actions are predicated on the underlying structural market supply and demand equations.[177] As is well known, the reduced form models the market equilibrium price, which is determined by the intersection of these supply and demand equations. Thus, the coefficients on the supply and demand factors utilized by PE's reduced form regression model are correctly interpreted as measuring the relationship between *market* supply and demand factors and the *market* equilibrium price. They do not measure the supply and demand relationships for *individual* buyers/sellers in the market.[178] This is because the market equilibrium price − which determines the market equilibrium that prices will tend toward and therefore determines the prices that will be observed in the data − is not determined solely by any individual consumer's demand function or any individual firm's supply function. Rather, it is determined by a horizontal *aggregation* of those individual demand and supply functions.[179]

That the reduced form model cannot (and need not) estimate individual customer demand dynamics is relatively easy to understand for the simple reason that in a market customers do not necessarily pay the maximum amount they are willing to pay for a good; instead, they pay the market price. A customer may value a good at $1,000 (determined by his individual demand for that good), but he will pay the market price of $500. Market demand may increase (say, people become richer due to good fortune) and the market price increases to $600. Our customer in question will then pay $600. At no point need he pay his true value of the good, which is $1,000. Therefore, there is no information in the available pricing data on that individual consumer's demand. The reduced form model will reliably estimate how the shift in demand caused prices to move from $500 to $600, but even if applied to an individual customer's prices in isolation, will not be able to estimate anything about that customer's individual demand. Indeed, the model does not need to, because it is marketwide demand and supply that determine that the individual customer paid $500 and then $600 for the product. Simply, the underlying structural demand and supply equations do not identify a consumer's individual demand function and therefore the reduced form regression does not either, even if it is run for that individual consumer.

Such small subset data analyses for individual customers are often used by DEs in an attempt to show that impact varied widely across the

proposed class members, perhaps with many supposedly suffering no impact or even experiencing a benefit of an alleged price manipulation. Often in such decomposition exercises, the coefficients on supply and demand variables change substantially with each individual customer regression run. Any claim by an expert that this is because his individual customer regressions are detecting individual customer supply and demand dynamics is likely unreliable, given our preceding discussion. It is much more likely that any unintuitive coefficients found are due to the small data samples that are available for each customer, making the analysis and the inferences regarding the lack of common impact unreliable. Simply, an expert's interpretation of the coefficients on individual customer regression runs must be considered, as with empirical results in general, in light of generally accepted economic theory and econometric practices.

CONCLUSION AND RECOMMENDATIONS

What do these cases and assessments mean for class certification?

From the inception of Rule 23 until the present, the process for certification has undergone a number of transformations. The timing to move for certification is no longer mandated at a fixed point early in the litigation; discovery of class issues and merits are integrated; and the court must conduct a rigorous analysis of the facts, merits, and economics to the extent they bear on class-certification requirements. The court is also expected to resolve, by a preponderance of the evidence, all factual and economic disputes and to be persuaded as to the reliability, plausibility, and workability of all economic opinions and methodologies in so far as they respond to the elements of Rule 23. All in all, the process has evolved from one which encompassed briefs based on complaint allegations alone and a possible truncated oral argument, to an extensive development of record evidence supported by corroborating and complementary expert evaluation and analysis, culminating in increasingly detailed hearings, potentially including presentation of live witness testimony. The shift has many implications for both the nature of the proceedings and the responsibilities of the parties and the court.

The application of a rigorous analysis to the three essential elements of antitrust liability (conspiracy, impact, and damage) involves a sequential resolution of disputed issues as to each. The findings and conclusions in one segment cannot be disregarded in determinations needed to be made in

subsequent segments. Theories of liability, impact, and damages combined with supporting economics must reflect the facts of the conspiracy. Reliability and credibility of the parties' representation and expert opinions must be judged in the context of the strength or weakness of the factual record confirming or undermining contradictory positions.[180]

As a whole, class certification has taken on characteristics of a summary judgment framework.[181] Rule 23 is designed to concentrate on the ability of the plaintiff class to demonstrate that there is evidence susceptible to common proof at trial that defendants engaged in a conspiracy that impacted and caused damage to all or virtually all members of the class. It is neither a function of Rule 23 nor an obligation of the court to allow the process to be used or to use the process as a forum to decide the ultimate merits of the parties' differences circumventing the right to a jury trial. Rule 23 must not become a surrogate for summary judgment or replacement for a jury trial.[182]

The facts, as bounded by the record, are now the touchstone or benchmark of certification. They must be tested equally by the court on all positions relied upon by either party. Both plaintiff's claims and defendant's contentions must be judged as to how well or reliably they explain or "fit" the findings of the court.

Although certification findings or conclusions are not binding in future pretrial proceedings, they should materially influence decisions within the class proceeding. Findings by the court concerning the existence, nature, and scope of a conspiracy, for example, should be the significant factors in any analysis of the conspiracy's purported class impact and damage. Similar to the Supreme Court holding in *Comcast* that the economic measurement of conspiracy damage must match the claimed theory of conspiracy, findings related to class impact and damage should be consistent with a court's findings of fact defining the conspiracy.

In the sequential approach to class antitrust liability elements, findings as to the challenged conspiracy may be established with or without corroborating economic opinion. These findings may be achieved through common factual evidence of the agreement as disclosed in contemporaneous writings, communications, electronic exchanges, declarations, depositions, industry customs, practice, usage, transaction documents, regulatory proceedings, if any, and other available public information. Proof or refutation of this issue will not vary among class members since the essence of the challenged violation is the joint behavior of the defendants to the market as a whole as opposed to any singular market participant. Although economic opinion concerning the predominance of the issue of conspiracy to

the class in some instances may not be necessary, it may assist the court by either corroborating or challenging the economic significance of the underlying factual evidence, consistent with economic theory and principles. Economic analysis, for example, of industry structure and concentration, product or service homogeneity, and behavior inconsistent with independent self-interest are factors that may aid the court in determining the existence, nature, scope, or duration of the alleged agreement.

However, agreements to manipulate market prices in the absence of countervailing market factors will most likely have some impact on all market participants. In such situations, courts may consider imposing a presumption based upon record evidence of class impact.[183]

In the approach being taken by European authorities in follow-on actions, a finding of regulatory accountability in price-fixing market infringements seems to be advocated as rebuttably presumptive evidence of market damage causation. The presumption appears to apply whether the collective action mechanism is opt-out[184] or opt-in[185]. The function of such follow-on civil proceedings is to focus the claimant's proof on demonstrating the amount of the claimant's damage and not to require the claimant to comment on the fact or absence of damage to others that may have been collectively harmed. In class proceedings in the United States, a court's findings of fact and resolution of disputes regarding conspiracy in many ways resemble the European approach in that the analysis of common impact and damage can "follow on" any findings regarding the conspiracy.

The element of injury in fact requires the establishment of a causal link[186] between the violation and an injury to business or property. A court need not find that a conspiracy was the sole cause of injury, only that it was "a material cause" and evidence of that causation is capable of common proof. When, for example, a conspiracy is found to be based on an agreement among competitors to uniformly and universally manipulate prices or price levels in a market; defendants behaved accordingly; economics confirms that such pricing changes occurred and there are no material nonconspiratorial explanations for the pricing movements, then it would appear reasonable to shift the burden of proof to the defendant to disprove common proof causation.[187]

As to the final element of antitrust class certification, the court's obligation is to analyze whether there are economically reliable[188] and plausible formulaic methods for estimating damage tied to the conspiracy. This inquiry is largely in the province of economic theory and methodology.

After *Comcast*, courts have reached different conclusions as to its import on the analysis of antirust class economics, both as to form and

substance.[189] Defendants seem to be of the almost unanimous opinion that *Comcast* alone has fundamentally altered the landscape of antitrust certification by not only requiring a full-blown *Daubert* analysis and mini-trial, but by also obligating the court to resolve all differences in economic opinion, whether or not they reflect on scientific reliability.

In engaging in the appropriate level of class damage inquiry, courts should be guided by whether the dispute among experts involves the application of appropriate methodology, the construction of an appropriate formulaic model, or whether the proffered analysis is consistent with or contradicted by the record evidence, as found by the court in its evaluation of the issues of conspiracy and impact. *Daubert* inquiries should not devolve into resolving disputes concerning the *results* of an expert's methodology as opposed to its feasibility, plausibility, or workability. Resolution of the former is the province of the jury. Similarly, economic opinions cannot be viewed in a vacuum. An economic opinion, no matter how seemingly sound in the abstract, that is contradicted by the record is of diminished credibility.

With respect to *Daubert* challenges, there is no consensus among courts as to the precise type of such a hearing or argument on class certification. Some courts have held extensive proceedings over several days with the admission of documentary and testimonial evidence. Others have held mini-trials, which in addition to argument and the exchange of evidence, included testimony by live witness. Some courts have required a formal proceeding as an integral part of the class process, while others have not. There is no consensus even as to the extent of *Daubert* inquiries.[190] Regardless of the precise form of the "look" used to address *Daubert* challenges, courts must not become referees of academic economic debate.[191]

In the final analysis, the emerging class-certification standards require greater diligence and impose greater obligations on both the parties and the court. Unbundled discovery provides the opportunity and ability to tether class findings and resolution of disputes, noneconomic and economic, to a fully developed fact-based record. The reliability and credibility of all positions of the parties and resolution of all challenges to inferences and opinions should be weighed against their "fit" to the record findings. As well as being scientifically reliable, economic opinion must not be divorced from any class fact findings of the court. Class damage opinions must demonstrate, as opposed to speculate, that there are workable accepted methodologies for estimating aggregate class damage.

Parties and courts will have to work harder. Strong cases of liability will likely succeed. Weak cases should − and will − falter. Rule 23, however,

should survive as an effective procedure affording meaningful access to justice for matters of collective wrongs.

NOTES

1. 131 S. Ct. 2541 (2011).
2. 133 S. Ct. 1426 (2013).
3. Yeazell (1997) 687.
4. *Ibid.*
5. Yeazell (1987) and Pastor (2000) 774.
6. Yeazell, *supra* n. 2, at 221.
7. Fed. R. Eq. 48 (cited in 42 U.S. (1 How.) xIii, Ivi (1843)).
8. *Ibid.*; Pastor, *supra* n. 2, at 785.
9. Equity R. 38, 226 U.S. 659 (1912).
10. *See* Order of December 20, 1937, 302 U.S. 783 (1937).
11. Alba Conte and Newberg (2007).
12. Fed. R. Civ. P. 23 advisory committee's note, Note to Subdivision (a) (1938).
13. "Class certification" is a relatively new term. It first appeared in the text of Rule 23 in 1998, although the Supreme Court had by that time employed the term for some two decades (Marcus, 2011) 324, 330.
14. Fed. R. Civ. P. 23 advisory committee's note (1938).
15. Kaplan (1967) 356, 379.
16. Bone (1990) 213, 284.
17. Richard Marcus, *supra* n. 4, at 330.
18. Fed. R. Civ. P. 23 advisory committee's note (1966); *see* Yeazell (1987) 229 ("Unable to discern the 'jural relationships' asserted to lie behind the rules classifications and reluctant to venture into constitutional thickets that the Court had identified, lawyers and judges trod warily around this procedural device."); *see*, for example, *Shipley v. Pittsburgh & L. E. R. Co.*, 70 F. Supp. 870, 874−876 (W.D. Pa. 1947).
19. *See* Spence (2002) and Rabiej (2003) 323.
20. *See* Rabiej, *supra* n. 10, at 330−333.
21. Bassett (2006) 1415.
22. *See* Rabiej, *supra* n. 10, at 330−333.
23. Fed. R. Civ. P. 23 advisory committee's note (1966).
24. *Ibid.*
25. *Ibid.*
26. *Ibid.*
27. 417 U.S. 156 (1974).
28. *Eisen v. Carlisle & Jacquelin*, 41 F.R.D. 147, 151−152 (S.D.N.Y. 1966).
29. *Eisen v. Carlisle & Jacquelin*, 391 F.2d 555, 563 (2d Cir. 1968).
30. *Eisen v. Carlisle & Jacquelin*, 50 F.R.D. 471, 473−474 (S.D.N.Y. 1970).
31. 417 U.S., at 177−178.
32. For example, *Blackie v. Barrack*, 524 F.2d 891, 901 n. 17 (9th Cir. 1975); *In re Tableware Antitrust Litig.*, 241 F.R.D. 644, 648 (N.D. Cal. 2007); *In re Dynamic*

Random Access Memory Antitrust Litig., No. M 02-1486 PJH, 2006 WL 1530166, at *9 (N.D. Cal. June 5, 2006).

33. *Wal-Mart*, 131 S. Ct., at 2552 & n. 6 (emphasis added).

34. *See infra* [ ]; [string cite]; *Szabo v. Bridgeport Machines, Inc.*, 249 F.3d 672, 676−677 (7th Cir. 2001); *In re Initial Pub. Offerings Sec. Litig.*, 471 F.3d 24 (2d Cir. 2006).

35. Miller (2004), at 2.

36. Miller, at 16.

37. 561 F.2d 434 (3d Cir. 1977).

38. The passage reads: "[i]f, in this case, a nationwide conspiracy is proven, the result of which was to increase prices to a class of plaintiffs beyond the prices which would obtain in a competitive regime, an individual plaintiff could prove fact of damage simply by proving that the free market prices would be lower than the prices paid and that he made some purchases at the higher price. If the price structure in the industry is such that nationwide the conspiratorially affected prices at the wholesale level fluctuated within a range which, though different in different regions, was higher in all regions than the range which would have existed in all regions under competitive conditions, it would be clear that all members of the class suffered some damage, notwithstanding that there would be variations among all dealers as to the extent of their damage." *Ibid.*, at 455.

39. For a discussion, *see* Ripley and Glueck (2009).

40. *See General Tel. Co. of the S.W. v. Falcon*, 457 U.S. 147, 160 (1982).

41. Manual for Complex Litigation § 1.40 (1977).

42. Manual for Complex Litigation § 30.12 (1985).

43. *See* Local Rules § 23-3 (C.D. Cal.); Local Rules § 23.1(b) (D. D.C.).

44. *See* Manual for Complex Litigation § 21.14 (4th ed. 2004) ("Courts often bifurcate discovery between certification issues and those related to the merits …."). *See also Larson v. Burlington Northern & Santa Fe Ry. Co.*, 210 F.R.D. 663, 665−666 (D. Minn. 2002) ("the mandate of Rule 1 … [warrants] completing discovery as to the claims of the four named-Plaintiffs, prior to extensive discovery on the merits"); *Rodriguez v. Banco Central*, 102 F.R.D. 897, 902 (D.P.R. 1984) ("[t]he class determination is preferable before substantial discovery on the merits has been conducted."); *Am. Nurses Ass'n v. Illinois*, No. 84-4451, 1986 WL 10382, at *3 (N.D. Ill. September 12, 1986) ("[i]f class certification is denied, the scope of permissible discovery may be significantly narrowed; if a class is certified, defining that class should help determine the limits of discovery on the merits.").

45. *See*, for example, *In re Rail Freight Fuel Surcharge Antitrust Litig.*, 258 F.R.D. 167, 172−174 (D.D.C. 2009) (noting that permitting defendants to pare their evidence unilaterally would "in effect amend[ ] the Federal Rules of Civil Procedure to create a unique form of discovery for class actions" and observing that class evidence and merits evidence can, at least in price-fixing instances, be "so closely intertwined" that segregating the two would be arbitrary); *See also In re Plastics Additives Antitrust Litig.*, 2004 WL 2743591, at *4 (E.D. Pa. November 29, 2004) ("[t]here will be a substantial overlap between what is needed to prove plaintiffs price-fixing claims, as well as the information needed to establish class-wide defenses, and what is needed to determine whether the elements of class certification are met."); *Bodner v. Banque Paribas*, 202 F.R.D. 370, 373 (E.D.N.Y. 2000) (denying bifurcation request and

noting that "discovery on the merits, reasonably structured, is essential to determining whether class certification is appropriate"); Manual for Complex Litigation (Fourth) § 21.14.

46. Fed. R. Civ. P. 23, advisory committee's note (2003).

47. *Ibid.*

48. *Ibid.* (emphasis added).

49. *Ibid.*

50. *See*, for example, *Weiss v. Regal Collections*, 385 F.3d 337, 347 & n. 17 (3d Cir. 2004) ("[o]f course, the federal rules do not require certification motions to be filed with the class complaint, nor do they require or encourage premature certification determinations. … Allowing time for limited discovery supporting certification motions may also be necessary for sound judicial administration. *See* … 7B Wright and Miller, Fed. Practice and Procedure § 1785, at 107 ("[t]he [certification] determination usually should be predicated on more information than the complaint itself affords.")."); *Gariety v. Grant Thornton, LLP*, 368 F.3d 356, 365−368 (4th Cir. 2004) (overturning class-certification determination that simply accepted plaintiffs' allegations as true for purposes of Rule 23 and urging the district court to consider the fruits of discovery on remand).

51. Larkin and Coukos (2004), at 4.

52. *See*, for example, *Szabo v. Bridgeport Machines, Inc.*, 249 F.3d 672, 675-78 (7th Cir. 2001); *In re Initial Pub. Offering Sec. Litig.*, 471 F.3d 24, 26 (2d Cir. 2006).

53. 552 F.3d 305 (3d Cir. 2008).

54. *Hydrogen Peroxide*, 552 F.3d, at 305.

55. *Ibid.*, at 310.

56. *Ibid.*, at 310−311; Fed. R. Civ. P. 23(b)(3).

57. *Hydrogen Peroxide*, 552 F.3d, at 312.

58. *Ibid.*, at 316.

59. *Ibid.*, at 316−317.

60. *Ibid.*, at 317 & n. 17.

61. *Ibid.*, at 318.

62. *Ibid.*, at 319.

63. *Ibid.*, at 320.

64. *Ibid.*, at 307.

65. 256 F.R.D. 82 (D. Conn. 2009).

66. *Ibid.,* at 95.

67. 471 F.3d 24 (2d Cir. 2006).

68. *Ibid.*, at 101.

69. 267 F.R.D. 291 (N.D. Cal. 2010).

70. *Ibid.*, at 313; *see also In re Southeastern Milk Antitrust Litig.*, No. 2:08-md-1000, 2010 WL 3521747, at *10 (E.D. Tenn. September 7, 2010) ("It appears to the Court that once again the defendants are asking the Court to resolve certain of the issues in this litigation on the merits. A class certification motion is not the appropriate vehicle for accomplishing that. While the Court must rigorously examine the allegations of the plaintiffs in evaluating a class certification motion, the plaintiffs are not required, at this stage of the litigation, to establish that they can succeed on the merits.").

71. 131 S. Ct., at 2547.

72. *Ibid.*, at 2548.

73. As for the second question, the Court held that claims for monetary relief may not be certified under Rule 23(b)(2), at least where, as with the *Dukes* plaintiffs, each class member would be entitled to an individualized award. 131 S. Ct., at 2557−2558 (prohibiting claims for monetary relief under Rule 23(b)(2) if the monetary relief is not incidental to the injunctive or declaratory relief).

74. *Ibid.*, at 2545.

75. *Ibid.*

76. *Ibid.*, at 2556 (emphasis added and quotation marks omitted). A literal application of this expression would virtually render class certification in antitrust conspiracy cases mandatory. Although the issue and evidence of conspiracy will always be predominantly common to a class, it is doubtful that its presence alone would be a sufficient foundation up on which to grant certification. Issues of impact, damage, nexus and methodology would still need to be established.

77. *Ibid.*, at 2551 (emphasis in original).

78. *Ibid.*

79. *Ibid.*, at 2551−2552 & n. 6.

80. *Ibid.*, at 2554. The Court provided no guide as to what type of format or any Daubert gatekeeper inquiry would be appropriate or necessary.

81. *Ibid.*, at 2565 (citation omitted).

82. *Ibid.*, at 2566.

83. *Ibid.*, at 2567.

84. *Ibid.*, at 2556−2557 (quotation marks and citation omitted).

85. *See*, for example, *In re Rail Freight Fuel Surcharge Antitrust Litig.*, 287 F.R.D. 1 (D.D.C. 2012); *In re Titanium Dioxide Antitrust Litig.,* 284 F.R.D. 328 (D. Md. 2012); *In re Vitamin C Antitrust Litig.,* 279 F.R.D. 90 (E.D.N.Y. 2012)*; In re Aftermarket Auto. Lighting Prods. Antitrust Litig.,* 276 F.R.D. 364 (C.D. Cal. 2011); *In re Chocolate Confectionary Antitrust Litig.,* No. 1:08-MDL-1935, 2012 U.S. Dist. LEXIS 174681 (M.D. Pa. December 7, 2012); *Allen v Dairy Farmers of Am. Inc.* Case No. 5:09-cv-230, 2012 U.S. Dist. LEXIS 164718 (D. Vt. November 19, 2012).

86. *See ibid.*, at *5 n. 6 (recognizing that "[t]he Supreme Court confirmed our interpretation of the Rule 23 inquiry in *Wal-Mart*").

87. *Ibid.*, at *5.

88. *Ibid.*, at *14.

89. *Ibid.* (emphasis added).

90. *Ibid.*

91. *Ibid.*, at *6, *7, *12,*19 n. 13, *20.

92. *Ibid.*, at *19 n. 13.

93. Although the Supreme Court in *Comcast*, in accepting certiorari, undertook to hear the issue of what is an "admissible" economic model, it decided the matter on other grounds. There is therefore, no definitive precedent mandating that plaintiffs' expert must, at the certification stage, present a workable damage model as opposed to presenting merely a theoretically acceptable economic model. Despite this uncertainty, it would seem that the preferable practice would be to present a workable model at certification, with the express understanding that it could be modified or revised for trial.

94. *Ibid.* (emphasis added).

95. *Ibid.*, at *10, *13, *19 n. 13.

96. *Ibid.*, at *19 n. 13 (emphasis added); *see ibid.*, at *13 (reasoning that a district court's choice to credit one expert's theory of common impact over another's cannot be clearly erroneous if both experts' views are "permissible" interpretations of the evidence); *See also In re Currency Conversion Fee Antitrust Litig.*, 264 F.R.D. 100, 115 (S.D.N.Y. 2010) (expert dispute over which of two "but for" worlds would have existed absent conspiracy does not preclude certification); *In re Ethylene Propylene Diene Monomer (EPDM) Antitrust Litig.*, 256 F.R.D. 82, 100-02 (D. Conn. 2009) (experts' competing views of market structure and the "but for" world present merits questions).

97. *Ibid.*, at *15 (emphasis added); *see ibid.*, at *18 (characterizing the inquiry as whether plaintiffs' damages presentation is "amenable" to the class action mechanism).

98. *Ibid.*, at *18 ("Given the inherent difficulty of identifying a 'but-for world,' we do not require that damages be measured with certainty, but rather that they be demonstrated as 'a matter of just and reasonable inference'." (citation omitted)).

99. *Ibid.* Not surprisingly, Comcast attempted to compare the damages model proffered by the plaintiffs' expert, Dr. James McClave, with the expert sociologist's model in *Wal-Mart* — asserting that Dr. McClave's work was similarly deficient. The Third Circuit squarely rejected that analogy, though, noting the unique features of *Wal-Mart* and explaining its limited application: "The factual and legal underpinnings of *Wal-Mart* — which involved a massive discrimination class action and different sections of Rule 23 — are clearly distinct from those of this case. *Wal-Mart* therefore neither guides nor governs the dispute before us." *Ibid.*, at *17 n. 12.

100. *Ibid.*

101. *Ibid.*, at 1430−1431.

102. *Ibid.*, at 1431.

103. *Ibid.*, at 1433.

104. *Ibid.*, at 1437.

105. *Harris v. comScore*, Inc., No. 11 C 5807, 2013 U.S. Dist. LEXIS 47399, at *27 n. 6 (N.D. Ill. April 2, 2013).

106. *See In re Urethanes Antitrust Litig.*, MDL No. 1616, 2013 U.S. Dist. LEXIS 69784, at *39−*40 (D. Kan. May 15, 2013) (denying decertification despite *Comcast*, saying "Dr. McClave gave his opinion that the conspiracy alleged by plaintiffs — a horizontal price-fixing conspiracy — impacted nearly every class member because prices during the alleged conspiracy period exceeded those that would have prevailed absent that conspiracy, which competitive prices were determined from an analysis of prices during a post-conspiracy benchmark period"); *In re High-Tech Employees Antitrust Litig.*, No.: 11-CV-02509-LHK, 2013 U.S. Dist. LEXIS 49784, at *92 (N.D. Cal. April 4, 2013) (court declined to certify classes because of the concern that the "proposed classes may be defined so broadly as to include large numbers of people who were not necessarily harmed by Defendants' allegedly unlawful conduct"). For pre-*Comcast* cases making a similar point (both in and out of the antitrust context), *see Butler v. Sears, Roebuck & Co.*, 702 F.3d 359, 361 (7th Cir. 2012); *Messner v. Northshore Univ. HealthSystem*, 669 F.3d 802, 823−824 (7th Cir. 2012) *Kohen v. Pac. Inv. Mgmt. Co., LLC*, 571 F.3d 672, 677 (7th

Cir. 2009), *cert. denied,* 130 S. Ct. 1504 (2010); *DG ex rel. Stricklin v. Devaughn*, 594 F.3d 1188, 1198 (10th Cir. 2010); *Mims v. Stewart Title Guar. Co.*, 590 F.3d 298, 308 (5th Cir. 2009); *In re Rail Freight Fuel Surcharge Antitrust Litig.*, 287 F.R.D. 1, 40 (D.D.C. 2012); *Yarger v. ING Bank*, 285 F.R.D. 308, 312 (D. Del. 2012); *Brooks v. GAF Materials Corp.*, 284 F.R.D. 352, 363 (D.S.C. 2012); *Connor B. ex rel. Vigurs v. Patrick*, 272 F.R.D. 288, 295 (D. Mass. 2011); *In re Light Cigarettes Mktg. Sales Practices Litig.*, 271 F.R.D. 402, 419 (D. Me. 2010); *Hamilton v. First American Title Ins. Co.*, 266 F.R.D. 153, 163 (N.D. Tex. 2010); *Sheet Metal Workers Local 441 Health & Welfare Plan v. GlaxoSmithKline, PLC*, No. 04-5898, 2010 WL 3855552, at *93 (E.D. Pa. September 30, 2010).

107. *Comcast Corp. v. Behrend*, No. 11-864, Transcript of Oral Argument, 22 (November 5, 2012) ("Comcast Transcript").

108. As expressed by Justice Alito, the question of probative value in *Comcast* apparently subsumed the *Daubert* question. *Ibid.*, at 25, 26−27. *See*, for example, Justice Scalia's footnote noting that a plaintiff will not have established "the requisite commonality of damages" unless it "plausibly" showed that the theory of damage had either been "the same in all counties or was irrelevant to the effect upon the ability to charge supra-competitive prices." *Comcast Corp. v. Behrend*, 133 S. Ct. 1426, 1435 n. 6 (2013).

109. *Comcast*, 133 S. Ct. at 1433.

110. There is not yet consensus concerning the quantity contemplated by "virtually all." We do not answer that question here.

111. *Supra* Section "The Rise and Fall of Bifurcated Discovery"

112. Wooldridge (2002), at 3.

113. Rubinfeld (2011), at 314.

114. Greene (2012), at 6.

115. Hume (1748).

116. Popper (2005), at 3.

117. Popper, at p. 7 (emphasis in the original).

118. Swanson (1960), at 1484.

119. Christ and Rausser (1973), at 273.

120. Shapiro (1973), at 252.

121. Sullivan, Timmerman, and White (2001).

122. Traditional statistical tests, such as a *t*-test, report a confidence level. An estimated statistical effect of an explanatory variable on a dependent variable is said to be statistically significant at a 95% level of confidence if there is only a 5% probability that the chosen sample exhibits the effect (due to random variation in the data), even though in reality there is no true effect. With many repeated statistical testing of the same dataset (in this case the dataset of stock returns), researchers will eventually find statistical variations that fall into this 5% margin of error, but will be reported by the *t*-test and the researcher as statistically significant (this is known as a Type I error).

123. Hayashi (2000), at 33: "Sometimes the maintained hypothesis is somewhat loosely referred to as 'the model'. We say that the model is correctly specified *if the maintained hypothesis is true*" (emphasis added).

124. It should be noted that in practice, the PEs are often asked to assume the existence of liability and proceed directly to issues of impact and damages. Even in

such cases, however, the analysis of impact often takes into account evidence of defendants' conduct and statements. *See*, for example, *In re Aftermarket Auto. Lighting Prods. Antitrust Litig.,* 276 F.R.D. 364, 371 (C.D. Cal. 2011) (PE considered "the existence of a pricing structure adopted by Defendants" as part of the impact analysis).

125. Greene, at pp. 29−30.

126. Regarding the pricing system of the citric acid price-fixing cartel: "In some industries, like retail stores, the price listed on the item or shelf is the actual price a buyer will pay at check-out. However, in many other industries, like automobiles, most consumers regard the list price as simply the highest price a seller hopes to get for the product, whereas after searching for alternative offer prices most buyers will purchase an automobile at a negotiated discount. List prices for most industrial commodities like citric acid follow the automobile model of pricing." Connor (2007), at 156.

127. A conspiracy that manipulates those list prices by adjusting the starting point for negotiations was recognized in *In re Ethylene Propylene Diene Monomer (EPDM) Antitrust Litigation,* 256 F.R.D. 82, 90 (U.S.D.C. Conn. 2009).

128. In *In re Plastic Additives Antitrust Litigation,* 2010 U.S. Dist. LEXIS 90133, at *24−*26 (U.S.D.C. E.D. Pa. 2010) (at 12), the court ruled against class certification because prices for some individual transactions were observed not to increase after the implementation of supposedly conspiratorial list price announcements.

129. Wooldridge, at p. 3 (emphasis in the original).

130. *Ibid.*

131. *Ibid.,* at p. 4.

132. The term "natural experiment" is used because, of course, econometricians cannot conduct these experiments in the laboratory; rather we exploit instances where they have occurred naturally in the real world. *See*, Coleman and Langenfeld (2008).

133. Not all classwide damage methodologies will necessarily require a regression model. For instance, a case that alleges the imposition of a conspiratorial tax, where the entirety of that tax is alleged to represent the damage to each class member, may require simply the summation of all such taxes in order to calculate classwide damages.

134. Kuhn (1970).

135. Christ and Rausser, at p. 274.

136. Hayashi at 33: "Sometimes the maintained hypothesis is somewhat loosely referred to as 'the model.' We say that the model is correctly specified *if the maintained hypothesis is true*" (emphasis added).

137. Christ and Rausser, at p. 275: "the selected maintained hypotheses … isolate a still smaller set which represents the testable hypotheses."

138. "Neoclassical economics assumes that man, *homo economicus* if you will, has consistent preferences − if he prefers apples to oranges and oranges to nuts, then he prefers apples to nuts − and makes choices that maximize his utility at all times." An alternative paradigm is that of "behavioral economics." Under this paradigm, agents "have only limited or 'bounded' rationality and therefore sometimes make choices that satisfy their preferences but do not maximize their utility. This

idea flows from the observation that humans do not possess the cognitive capacity required to process all the information necessary to maximize utility at all times; instead, they use heuristics or 'shortcuts' to make decisions that sometimes fail to jibe with the predictions of neoclassical economics." However, although its influence in legal scholarship is growing, "behavioral economics has not yet affected judicial decisions in the United States in any substantive area of law," Ginsburg and Moore (2010), at 89.

139. Baker and Rubinfeld (1999), at 391. *See also* Brander and Ross (2006), at 351: "… estimation of reduced-form price equations is the preferred and most commonly applied method for damage estimation by economists in price-fixing cases."

140. *See* ABA Section of Antitrust Law (2010).

141. *Supra*, citing Wooldridge.

142. *Supra*, citing Rubinfeld, at p. 314 and Greene, at p. 6.

143. Kennedy (2002), at 577: "… check that the results make sense. Are the signs of coefficients as expected? Are important variables statistically significant? Are coefficient magnitudes reasonable? Are the implications of the results consistent with theory?"

144. Greene, at p. 1.

145. *See*, for example, *Greenhaw v. Lubbock County Beverage Assocs.*, 721 F.2d 1019, 1028 (5th Cir. 1983) ("it was more reasonable to apply the market average overcharge figure in calculating damages rather than separate figures for each store in which purchases were made"); *LCD II*, 267 F.R.D., at 605 (noting that averaged and aggregated data are used by courts in granting class certification); *In re Static Random Access Memory (SRAM) Antitrust Litig.*, 264 F.R.D. 603, 614 (N.D. Cal. 2009) (same); *In re Nifedipine Antitrust Litig.*, 246 F.R.D. 365, 371 (D.D.C. 2007) ("the Court can find no fault in [plaintiffs' expert's] consideration of aggregate changes in price") (emphasis in original); *Cardizem*, 200 F.R.D., at 345 (use of average prices did not undermine defendants' due process rights); *NASDAQ*, 169 F.R.D., at 523 (proper to show that the price range was affected "generally" by defendants' prices); *In re Pressure Sensitive Labelstock Antitrust Litig.*, 03-MDL-1556, 2007 WL 4150666, at *20 (M.D. Pa. November 19, 2007) ("[d]efendants argue that [plaintiffs' expert's] proposed multiple regression analysis is flawed because it yields an average overcharge. … This will not defeat Plaintiffs' class certification motion because Plaintiffs do not have to present a precise damages formula at this stage"); *In re Scrap Metal Antitrust Litig.*, 02 CV 0844, 2006 WL 2850453, at *16 (N.D. Ohio, September 30, 2006), *aff'd*, 527 F.3d 517 (6th Cir. 2008), *cert. denied*, 129 S. Ct. 673 (2009) (in situation where plaintiffs' expert used average price spreads to compute average undercharges, court upheld jury verdict for plaintiffs; "[r]ecognizing that antitrust cases present damages questions that often are not amendable to concrete mathematical calculations, courts have regularly recognized averaging of overcharges as a valid method"); *Presidio Golf Club of S.F., Inc. v. Nat'l Linen Supply Corp.*, No. C 71-431 SW, 1976 WL 1359, at *5 (N.D. Cal. December 30, 1976) (only an "illustration of generalized injury" is needed for class certification); *Gordon v. Microsoft Corp.*, No. MC 00-5994, 2003 WL 23105550, at *3 (Minn. Dist. Ct. December 15, 2003) (use of average overcharge analysis was permissible in determining what classwide damages would have been in the absence of defendants' conduct).

146. In a seminal article on the economics of information George Stigler notes that "it is important to emphasize immediately the fact that dispersion is ubiquitous even for homogenous goods." Stigler (1961), at 213.

147. Nieberding and Cantor (2007), at 79−80.

148. Hartman and Doane (1987), at 352: "It is so named because it measures how the attributes, or 'hedonic' characteristics, of goods and services are commonly valued in consumption or in production. Its usefulness for class certification procedures lies in its ability to identify and measure the commonality in a group of apparently heterogeneous products, services, or individuals. When such commonalities are identified and measured, the courts can support class certification and can calculate the common effect of illegal actions, correcting for any apparent heterogeneity."

149. In addition, *see* ABA Section of Antitrust Law (2010).

150. Fisher (1986), at 278.

151. *Reed v. Advocate Health Care*, 268 F.R.D. 573 (N.D. Ill. 2009).

152. *Ibid.*, at 593.

153. For example, R-squared statistics of 26% or lower in regressions testing hypotheses on market concentration are cited by Carter (1978); another litigation research article on examining employment discrimination reports a series of regressions with R-squareds lower than 80%, Whiteside and Narayanan (1989), at 405, Table 4; Rubinfeld (at p. 345), presents a regression with an R-squared of 56% as an example, when explaining the utilization of multiple regressions in antitrust analysis.

154. Sorensen (2000), at 833−850; Adams (1997) and Lach (2002).

155. Adams, at p. 801.

156. Barron, Taylor and Umbeck (2004).

157. Rubinfeld, at p. 313.

158. Greene, at p. 6: "No model could hope to encompass the myriad essentially random aspects of economic life."

159. Rubinfeld, at p. 314.

160. Rubinfeld, at p. 314. *See also*, Baker and Rubinfeld, at p. 396.

161. Although, it should be noted that the omission of variables that determine price from the model, even if unrelated to the included variables, will inflate the standard errors on the estimated coefficients on the included variables and therefore decrease the precision of the model's estimates.

162. Baker and Rubinfeld, at p. 391. *See also* Nieberding (2006) and ABA Section of Antitrust Law (2010).

163. This is in contrast to a "structural model" which estimates the supply and demand curves separately. Part of the PE's assignment will be to decide between the appropriateness of a reduced form model versus a structural model − both are used in antitrust. Reduced form models are more commonly used and this section will focus on such models, although the general principles described herein are applicable to structural models, with some technical modifications.

164. A similar method is known as the predictive approach. The predictive approach estimates the model for the benchmark transactions first then uses the estimated coefficients from that model to predict but-for prices for the class

transactions. The difference between actual prices and the estimated but-for prices facilitates the quantification of damages. ABA Section of Antitrust Law (2010).

165. Rubinfeld describes, using the example of a patent infringement case, how it is important to have sufficient data to accurately perform a "but-for" analysis: "For example, if the question at issue in a patent infringement case is what price the plaintiff's product would have been but for the sale of the defendant's infringing product, *sufficient data must be available to allow the expert to account statistically for the important factors that determine the price of the product*," (emphasis added) Rubinfeld, at p. 311. *See also* Brander and Ross, at pp. 353−354: "The investigator will need data from both inside and outside the cartel period …. In addition to needing data of high enough quality, we need it to be of sufficient quantity. Precise estimates require a large number of observations."

166. In *Plastic Additives* 2010 U.S. Dist. LEXIS 90135 at *67, the court rejected criticisms of a model's specification because those criticisms were "based solely on economic theory."

167. Wooldridge (2009), at 325: "From a practical perspective, outlying observations can occur for two reasons. The easiest case to deal with is when a mistake has been made in entering the data. Adding extra zeros to a number or misplacing a decimal point can throw off the [regression] estimates, especially in small sample sizes."

168. Wooldridge (2009), at p. 325: "Outliers can also arise when sampling from a small population if one or several members of the population are very different in some relevant aspect from the rest of the population. The decision to keep or drop such observations in a regression analysis can be a difficult one … [regression] results should probably be reported with and without outlying observations in cases where one or several data points substantially change the results."

169. Wooldridge (2009), at p. 677: "Good papers in the empirical social sciences contain sensitivity analysis … [discussing outliers] If some observations are much different from the bulk of the sample … do your results change much when those observations are excluded from the estimation?"

170. Brander and Roos, at pp. 342−343 and at p. 346.

171. Economist and Nobel laureate, Wassily Leontief, criticizes economic modeling based on "preoccupation with imaginary, hypothetical, rather than with observable reality." (Leontief, 1971), at 3.

172. For example, consider a regression model designed to measure the effect of an alleged conspiracy on prices. In such a model, it is important to control for the effect of demand on prices. However, if one includes the quantity of the product consumed as an attempt to control for demand, this may lead to problems of endogeneity derived from *reverse causality*. Simply, the quantity of a product consumed is itself affected by price (consumers buy more when the product is cheaper), as well as being an indication of how much of the product is inherently demanded by consumers. If not accounted for, this could lead to a biased estimate of the effect of demand on prices (because the coefficient on the quantity variable reflects both the effect of demand on price *and* the effect of price on quantity) and unreliability in the regression model in general. More technically, an explanatory variable is endogenous if it is correlated with the error term in the regression. This can be due to reverse causality from the dependent variable to a specified (endogenous)

explanatory variable, as just discussed, but other sources of endogeneity include omitted variable bias and nonclassical measurement error; Wooldridge, at pp. 50−51. Econometricians use "instrumental variables" as an identification strategy to filter out the endogenous relationship and identify the causal effect of an explanatory variable on the dependent variable.

173. The classical assumptions for an ordinary least squares regression model to produce reliable tests of statistical significance include that the residuals (the variation in price for each data point, unexplained by the model) are random, in that they are not correlated with each other and their variance is not correlated with explanatory variables included in the regression. *Heteroscedasticity* is a potential problem in regression models where the variance of the residuals is not constant across observations, but instead is correlated with the explanatory variables. If not accounted for, heteroscedasticity can lead to inaccurate standard errors and, therefore, an erroneous inference concerning the statistical significance of coefficient estimates, s*ee* Greene, at pp. 268−269. *Serial correlation* (or *autocorrelation*) is a situation common in time-series data where the residuals in a regression are correlated with each other over time − i.e., if the residual is high in one time period, it is more likely to be high in the next period. This can occur if there is an explanatory variable omitted from the regression that varies over time. As with heteroscedasticity, if not corrected for, serial correlation may lead to inaccurate standard errors and unreliable tests of statistical significance, *see* Greene, at pp. 903−906.

174. *Plastic Additives* 2010 U.S. Dist. LEXIS 90135 at *61.

175. *Ibid.*, at *69: "For example, one customer may be a 'very aggressive negotiator,' and so even as costs go up, that customer is able to 'extract lower prices'."

176. *Ibid.*: "in a hypothetical textbook example … [an] increase in cost will increase prices … in the real world … there are many reasons why … the relationship between the two variables is not positive." Defendants' expert argued that the regression could be used to estimate and control for each individual customer's demand responses and the possibility that some aggressive negotiators may be able to extract lower prices as costs increased.

177. Varian (1992), at 202−203, describes how the reduced form model is derived from the "demand and supply system" that defines the "demand and supply for some good … its price … [in terms of] … variables that affect supply and demand …. The reduced-form parameters can be used to predict how the *equilibrium price* will change as the [supply and demand] variables change," (emphasis added). Economists define the *equilibrium price* as the "price at which the quantity of a good supplied [by the market] is equal to the quantity demanded [by the market]" (Black, 2012, at 150).

178. Varian, at p. 219, describes how the equilibrium price, which he previously established is the focus of a reduced form model, is determined by *industry* supply and demand: "The industry supply function measures the total output supplied at any price. The **industry demand function** measures the total output demanded at any price. An **equilibrium price** is a price where the amount demanded equals the amount supplied" (emphasis in the original).

179. Varian, at p. 152 describes how the "aggregate demand for [a] good" is derived from a summation of the individual consumers' demand functions;

Mas-Colell, Whinston and Green (1995), at 105−109, describes how aggregate demand is determined by a sum of consumers' individual demand functions.

180. *See*, for example, *In re High-Tech Employee Antitrust Litig.*, 11-CV-02509-LHK, 2013 WL 5770992, at *40 (N.D. Cal. October 24, 2013) where the court noted: "Before the Court turns to an analysis of the competing methodologies … the Court notes that the importance of these statistical models is diminished in light of the extensive documentary evidence that supports Plaintiffs' theory of impact. In other contexts, courts have long noted that statistical and anecdotal evidence must be considered in tandem. … After all, class certification requires a holistic, qualitative assessment … the class certification analysis is not 'bean counting'."

181. *See*, for example, Judge Weinstein's Opinion in *Tobacco* which combined class certification, summary judgment and *Daubert* determinations in a single proceeding. *Schwab v. Philip Morris USA, Inc.*, 449 F. Supp. 2d 992 (E.D.N.Y. 2006) (later reversed on other grounds). There is also a further potential consequence of merits-type findings in the course of class procedures with respect to separate subsequent summary judgment motions. If a court makes such findings in certifying a class, would it not be inherently inconsistent for defendants to prevail on a motion for summary judgment since the court would have already decided that there are material facts in dispute?

182. For a divergent view as to the elements of class certification, see the opinions of the Supreme Court of Canada in *Pro-Sys Consultants Ltd. v. Microsoft Corp.* [2013] S.C.R. 57 (Can.), *Infineon Tech. AG v. Option Consommateurs* [2013] S.C.R. 59 (Can.), and *Sun-Rype Prods. Ltd. v. Archer Daniels Midland Co.* [2013] S.C.R. 58 (Can.).

183. Although some courts have referenced such a presumption, few have actually applied it. *See*, for example, *In re Chocolate Confectionary Antitrust Litig.,* 289 F.R.D. 200 (M.D. Pa. 2012). In the chronology of class certification, those decisions did not make findings of fact a court is now expected to make in the certification process. This new dynamic may require at least a revisiting of this practice. *See also In re Hydrogen Peroxide Antitrust Litig.*, 552 F.3d 305, 325 (3d Cir. 2008), where the Court held that "the question at [the] class certification stage is whether, if such impact is plausible in theory, it is also susceptible to proof at trial through available [economic] evidence common to the class." Such a "plausible" formulation of class impact, when bonded with the facts specific to the claim and contemporaneous industry information would be consistent with the application of a presumption.

184. Binds all class members unless they specifically exclude themselves from the litigation in an appropriate court approved form.

185. Binds only those entities that specifically agree, in accordance with a court approved procedure, to be included as litigant claimants.

186. *See In re Nexium (Esomeprazole) Antitrust Litig.*, CIV.A. 12-MD-02409, 2013 WL 6019287, at *14 (D. Mass. November 14, 2013) where the court states that "*Comcast* has not changed the rule on what is required for damages models in establishing Rule 23(b)(3) predominance. *Comcast* simply requires the moving party to present a damages model that directly reflects and is linked to an accepted theory of liability under Rule 23(b)(3)" (internal citations omitted).

187. Under such a presumption, the burden of proof would shift to defendants to demonstrate, for example, in situations where it is asserted that pricing was

individually negotiated, the precise identity of the class members who engaged in such negotiations, the transaction price actually negotiated and the total number of class members so affected.

188. *In re High-Tech Employee Antitrust Litig.*, 11-CV-02509-LHK, 2013 WL 5770992, at *19 (N.D. Cal. October 24, 2013) notes, "Ultimately, the Court is not tasked at this phase with determining whether Plaintiffs will prevail on these theories. Rather, the question is narrower: whether Plaintiffs have presented a sufficiently reliable theory to demonstrate that common evidence can be used to demonstrate impact. The Court finds that, based on the extensive documentary evidence, economic theory, data, and expert statistical modeling, Plaintiffs' methodology demonstrates that common issues are likely to predominate over individual issues." *In re U.S. Foodservice Inc. Pricing Litig.*, 729 F.3d 108, 123, n. 8 (2d Cir. 2013) states that "In *Comcast*, the Supreme Court held that courts should examine the proposed damages methodology at the certification stage to ensure that it is consistent with the classwide theory of liability and capable of measurement on a classwide basis. [*Comcast v. Behrend*, 133 S. Ct. 1426, 1433−1435 (2013)] (finding that plaintiffs' damages 'model failed to measure damages from the particular antitrust injury on which petitioners' liability in this action is premised'). As discussed in Part B, infra, the district court carefully examined plaintiffs' damages model, finding it appropriate and feasible to redress the common harms alleged, and therefore did not abuse its discretion in determining that common issues predominate."

189. *Compare In re Rail Freight Fuel Surcharge Antitrust Litig.*, __ F.3d __, 2013 WL 4038561 (D.C. Cir. 2013) (remanding class certification decision in light of *Comcast*, and explaining that *Comcast* requires a "hard look at the soundness of statistical models that purport to show predominance"), *with In re Cathode Ray Tube (CRT) Antitrust Litig.*, MDL No. 1917, at *14 (N.D. Cal. September 24, 2013) (finding that "Defendants' arguments misread Comcast and relevant precedent to require proof of the merits of their damages claim − as opposed its methodology − at the class certification stage").

190. *See* Transcript of Supreme Court Justices' oral comments in *Comcast* cited at subsection "Supreme Court" *supra*.

191. The function of the law in a civil proceeding is to provide a forum in which a fact finder may determine which party's explanation of events is more likely descriptive of what happened. It is not the role of a court to declare the truth on scientific disagreement. *See also*, for example, Appelbaum (2013).

REFERENCES

ABA Section of Antitrust Law. (2010). Econometrics and regression analysis. In *Proving antitrust damages: Legal and economic issues* (2nd ed.), ABA.

Adams, A. (1997). Search costs and price dispersion in a localized, homogeneous product market: Some empirical evidence. *Review of Industrial Organization*, *12*, 801–808.

Alba Conte, A., & Newberg, H. B. (2007). *Newberg on class actions § 1:9* (4th ed.).

Appelbaum, B. (2013). Economist clash on theory, but will still share the Nobel. *New York Times*, October 14.

Baker, J., & Rubinfeld, D. (1999). Empirical methods in antitrust litigation: Review and critique. *American Law and Economics Association*, 391.

Barron, J., Taylor, B., & Umbeck, J. (2004). Number of sellers, average prices, and price dispersion. *International Journal of Industrial Organization*, *22*, 1041–1066.

Bassett, D. L. (2006). Constructing class action reality. *Brigham Young University Law Review*, *2006*, 1434–1436.

Black, J. (2012) *Oxford dictionary of economics*. Oxford: Oxford University Press.

Bone, R. G. (1990). Personal and impersonal litigative forms: Reconceiving the history of adjudicative representation. *Boston University Law Review*, *70*, 213, 284.

Brander, J., & Ross, T. (2006). Estimating damages from price-fixing. In S. Pitel (Ed.), *Litigating conspiracy: An analysis of competition class actions* (p. 351). Toronto: Irwin Law.

Carter, J. (1978). Collusion, efficiency and antitrust. *Journal of Law and Economics*, *21*(2) (October), 435–444.

Christ, C., & Rausser, G. (1973). Discussion on Shapiro and Fromm. *American Journal of Agricultural Economics*, *55*(2) (May), 271–279.

Coleman, M., & Langenfeld, J. (2008). Natural experiments, issues in competition law and policy. *ABA Section of Antitrust Law*, *1*, 743–772.

Connor, J. (2007). *Global price fixing* (2nd ed.). New York, NY: Springer.

Fisher, F. (1986). Statisticians, econometricians, and adversary proceedings. *Journal of the American Statistical Association*, *81*(394) (June), 277–286.

Ginsburg, D., & Moore, D. (2010). The future of behavioral economics in antitrust jurisprudence. *Competition Policy International*, *6*(1) (Spring), 92–93.

Greene, W. (2012). *Econometric analysis* (7th ed.). Prentice Hall.

Hartman, R., & Doane, M. (1987). The use of hedonic analysis for certification and damage calculations in class action complaints. *Journal of Law, Economics and Organization*, *3*(2) (Autumn), 351–372.

Hayashi, F. (2000). *Econometrics*, Princeton University Press.

Hume, D. (1748). *An enquiry concerning human understanding*.

Kaplan, B. (1967). Continuing work of the civil committee: 1966 amendments of the Federal Rules of Civil Procedure (I). *Harvard Law Review*, *81*, 356, 379.

Kennedy, P. (2002). Sinning in the basement: What are the rules? The ten commandments of applied econometrics. *Journal of Economic Surveys*, *16*(4), 570–589.

Kuhn, T. (1970). *The structure of scientific revolutions* (2nd ed.). Chicago, IL: The University of Chicago Press.

Lach, S. (2002). Existence and persistence of price dispersion: An empirical analysis. *The Review of Economics and Statistics*, *84*(3), 433–444.

Larkin, J. D., & Coukos, P. (2004, February). *Rule 23 Revisions: Ten Tips for Plaintiffs' Lawyers*, Retrieved from http://www.impactfund.org/downloads/Resources/Rule23 RevisionTips.pdf

Leontief, W. (1971). Theoretical assumptions and nonobserved facts. *The American Economic Review*, *61*(1) (March), 1–7.

Marcus, R. (2011). Reviving judicial gatekeeping of aggregation: Scrutinizing the merits on class certification. *George Washington Law Review*, *79*, 324, 330.

Mas-Colell, A., Whinston, M., & Green, J. (1995). *Microeconomic theory* (Oxford Student Edition., pp. 105–109). Oxford: Oxford University Press.

Miller, G. P. (2004). Review of the merits in class action certification. *The Berkeley Electronic Legal Series*.

Nieberding, J. (2006). Estimating overcharges in antitrust cases using a reduced-form approach: Methods and issues. *Journal of Applied Economics*, *IX*(2) (November).

Nieberding, J., & Cantor, R. (2007). Price dispersion and class certification in antitrust cases: An economic analysis. *Journal of Legal Economics*, *14*(2), 62–84.

Pastor, N. M. (2000). Equity and settlement class actions: Can there be justice for all in *Ortiz v. Fibreboard*. *American University Law Review*, *49*, 783–784.

Popper, K. (2005/1935). The logic of scientific discovery. In *Routledge classics*. Taylor & Francis e-Library.

Rabiej, J. K. (2003). The making of class action Rule 23 – What were we thinking? *Mississippi College Law Review*, *24*, 330–333.

Ripley, A. R., & Glueck, M. J. (2009). In re Hydrogen Peroxide antitrust litigation bleaches clean the class certification standard. *The Antitrust Source*, *8*(3), (February).

Rubinfeld, D. (2011). Reference guide on multiple regression. In *Reference manual on scientific evidence* (3rd ed.). Federal Judicial Center.

Shapiro, H. (1973). Is verification possible? The evaluation of large econometric models. *American Journal of Agricultural Economics*, *55*(2) (May), 250–258.

Sorensen, A. (2000). Equilibrium price dispersion in retail markets for prescription drugs. *The Journal of Political Economy*, *108*(4), 833–850.

Spence, S. T. (2002). Looking back … in a collective way: A short history of class action law. *Business Law Today*, *11*(6), (July/August). Retrieved from http://apps.americanbar.org/ buslaw/blt/ 2002-07-08/spence.html

Stigler, G. (1961). The economics of information. *The Journal of Political Economy*, *LXIX*(3), 213–225.

Sullivan, R., Timmerman, A., & White, H. (2001). Dangers of data mining: The case of calendar effects in stock return, *Journal of Econometrics*, *105*, 249–286.

Swanson, E. (1960). Are agricultural economists becoming mechanics? *Journal of Farm Economics*, *42*(5), Proceedings of the annual meeting of the American Farm Economic Association, December, 1483–1486.

Varian, H. (1992). *Microeconomic analysis* (pp. 202–203). (3rd ed.). W. W. Norton.

Whiteside, M., & Narayanan, A. (1989). Reverse regression, collinearity, and employment discrimination. *Journal of Business & Economic Statistics*, *7*(3) (July), 403–406.

Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. MIT Press.

Wooldridge, J. M. (2009). *Introductory econometrics: A modern approach* (4th ed.). South-Western.

Yeazell, S. C. (1987). *From medieval group litigation to the modern class action*. Yale University Press ix.

Yeazell, S. C. (1997). The past and future of defendant and settlement classes in collective litigation. *Arizona Law Review*, *39*, 687–688.