PLUS FACTORS AND AGREEMENT IN ANTITRUST LAW†

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Plus factors are economic actions and outcomes, above and beyond parallel conduct by oligopolistic firms, that are largely inconsistent with unilateral conduct but largely consistent with explicitly coordinated action. Possible plus factors are typically enumerated without any attempt to distinguish them in terms of a meaningful economic categorization or in terms of their probative strength for inferring collusion. In this Article, we provide a taxonomy for plus factors as well as a methodology for ranking plus factors in terms of their strength for inferring explicit collusion, the strongest of which are referred to as “super plus factors.”

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INTRODUCTION

Competition law treats agreements among rival firms to set the terms on which they trade as extremely serious offenses. Most of the world’s approximately 120 systems of competition law assign the prosecution of cartels a high priority. The consequences of detection can be severe. The annual global sum of civil fines and treble damages for cartel participants today routinely exceeds hundreds of millions—indeed, even billions—of dollars, and individuals in a growing number of countries face potent criminal sanctions.

Central to the operation of laws that aggressively punish collusion are the definition and proof of concerted action. Powerful consequences flow from whether price increases observed in the marketplace emerge from individual or collective initiative. A firm acting alone ordinarily can set its prices as high as it likes. If the same firm cooperates with its competitors to

1. See Organization for Economic Cooperation and Development, Cartels: Sanctions Against Individuals, 9 J. COMPETITION L. & POL’Y 7, 36–46 (2007) (reviewing modern enforcement trends); David E. Vann Jr. & Ellen L. Frye, Overview, in CARTEL REGULATION 3 (William Rowley & Martin Low eds., Jan. 2009) (“In the past decade, nearly every jurisdiction with general competition legislation has either enacted specific anti-cartel statutes, significantly enhanced the civil penalties for cartel violations or added criminal sanctions for corporate executives who commit cartel violations. Indeed, in recent years regulators have been enforcing anti-cartel legislation with increased vigour, and have grown more sophisticated and savvier in their investigative and analytical techniques.”).


3. If implemented by a single firm, high prices have been said to be a sign of a healthy competitive process. Justice Scalia’s opinion for the Court in Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP, 540 U.S. 398, 407 (2004), states, “The mere possession of monopoly power, and the concomitant charging of monopoly prices, is not only not unlawful; it is an important element of the free-market system.”
achieve price increases, however, its executives may go to prison. Despite the crucial role of the concept of concerted action to this framework, few elements of modern antitrust analysis in the United States and in other jurisdictions are more perplexing than the design of evidentiary standards to determine whether parallel conduct stems from collective or from unilateral decisionmaking.

In the case of oligopolies, authorities have struggled to develop suitable evidentiary standards for identifying agreements. Firms in an oligopolistic industry recognize their mutual interdependence, understand that they are players in a repeated game, and act accordingly. In antitrust decisions about allegations of collusive pricing, this pattern of interaction—which courts and commentators describe as “conscious parallelism”—is viewed as insufficient to establish that firms are engaged in concerted action. This is because such pricing can emerge from firms acting noncollusively where they understand their role as players in the repeated oligopoly game. In antitrust cases, courts permit the fact of agreement to be established by circumstantial evidence, but they have required that economic circumstantial evidence go beyond parallel movement in price to reach a finding that the conduct of firms potentially violates section 1 of the Sherman Act.


additional economic circumstantial evidence is collectively referred to as “plus factors.”

The interpretation of plus factors in the decision to prosecute and in the resolution of litigated cases has proved to be a vexing task for enforcement officials and judges. Many commentators have catalogued plus factors and discussed the critical mass of circumstances that ought to justify an inference that observed behavior is the product of concerted action. Numerous judicial decisions have wrestled with the evaluation of plus factors in cases dealing with questions of agreement. For all this effort, there is persistent dissatisfaction with the analytical methods commonly used in antitrust enforcement and litigation to distinguish plus factors in terms of their probative value.

The frailties of the existing analytical tests for assessing plus factors have at least two implications. First, they impede the economically sensible resolution of many high-stakes antitrust cases where decisions made on the issue of conspiracy are decisive. Second, the inadequacies of the existing analytical framework may well be magnified in the future. The expanded use of powerful means of detection—including amnesty programs that give certain informants full dispensation from criminal penalties—and ever stronger remedies will encourage firms to achieve consensus through more subtle techniques that fall short of an express exchange of assurances in a covert meeting. If would-be cartel members take this path, then government prosecutors and private plaintiffs may often find themselves relying more extensively on circumstantial proof to establish the fact of coordination. Such a development would place still heavier weight on a proper understanding of plus factors in the treatment of conspiracy questions.

This Article offers a way to increase understanding of plus factors and to improve the manner in which enforcement agencies and courts interpret them in individual cases. We advocate the use of basic probability theory to rank individual plus factors, and groups of plus factors, in terms of their probative value. We refer to plus factors, or groups of plus factors, that

11. See Antitrust Law Developments, supra note 9, at 11–16 (collecting authorities); ABA Section of Antitrust Law, Proof of Conspiracy Under Federal Antitrust Laws 69–92 (2010).
lead to a strong inference of explicit collusion as “super plus factors.” The taxonomy as well as the framework we provide for assessing the probability of explicit collusion given a plus factor, or given a group of plus factors, provides an improved foundation from which enforcement authorities and courts can analyze potentially collusive conduct.

In this Article, we provide a foundation for courts and agencies to adjust the framework they now use to determine the existence of an agreement when the plaintiff lacks direct testimony or documents that prove concerted action but instead relies on circumstantial evidence that the defendants conspired to fix prices or restrict output. Such an approach focuses on modern economic understandings of what cartel participants do to coordinate their behavior.

A key issue in assessing whether firm conduct is rooted in an agreement to suppress interfirm rivalry is the reaction of buyers to the actions of sellers in a marketplace. Each product/industry/market that is the subject of scrutiny for a potential violation of section 1 of the Sherman Act involves a distinct set of participants, actions, and payoffs. The role of buyers, and their potential resistance to actions by sellers that increase seller payoffs at the expense of buyers, appears to be significant in the implicit thinking of many policymakers and courts that consider whether an observed conduct or outcome in the marketplace is the consequence of explicit collusion. Yet this underpinning for assessing plus factors has not been explicitly recognized. We believe that every producer selling a product in an industry conditions its

14. We use the term “explicit collusion” to mean an agreement among competitors that relies on explicit communication, transfers, or both to suppress rivalry.

15. Direct evidence would include a record of meetings or communication to discuss and agree on the components of cartel activity, which may include any of the following: pricing, allocations of the collusive gain, monitoring, or enforcement of the agreements.

16. 15 U.S.C. § 1 (2006) (“Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations, is declared to be illegal.”).

17. Courts often implicitly assume a rational buyer response. For example, the Eleventh Circuit evaluated plus factors as follows:

Oligopolists behaving in a legal, consciously parallel fashion could achieve high and rising prices, even as costs remained stable, by engaging in price leadership. The odds that they could achieve a price and profit increase and maintain incredibly high incumbency rates—that is, maintain the very same distribution of municipal contracts year after year—are miniscule, however, unless the oligopolists were communicating with one another.

City of Tuscaloosa v. Harcros Chems., Inc., 158 F.3d 548, 572 (11th Cir. 1998) (emphasis omitted) (citation omitted). The clear presumption of the court in this case was that buyers, the municipalities in Alabama, would conduct competitive procurements and push back against price increases by the sellers to the effect that incumbency rates would be volatile. Id. at 572–73. The court did not presume that the buyers were passive. Id. Rather, the court presumed that the buyers were players in the game. This active buyer response differs substantially from the passive view advanced in the well-known gas station example. See Dennis W. Carlton et al., Communication Among Competitors: Game Theory and Antitrust, 5 Geo. Mason L. Rev. 423, 428–30 (1997).
attempts to raise prices on the extent and nature of buyer reactions, whether
the actions of sellers are part of coordinated cartel conduct or not.18

The Article proceeds as follows. Part I describes the existing legal stand-
ards that courts and antitrust enforcement agencies use to define concerted
action and reviews the existing literature regarding plus factors. Part II dis-
cusses seller agreements as well as buyer responses to actions of
oligopolistic sellers and the implications of each for plus factors. Part III
presents a taxonomy for plus factors and identifies several super plus fac-
tors. Part IV offers a methodology, grounded in basic probability theory, for
ranking plus factors in terms of their probative value.

I. Definition of Concerted Action in Antitrust Law

Modern competition law makes the detection, prosecution, and punish-
ment of concerted horizontal price and output restraints the chief priority of
antitrust policymaking.19 Commentators generally regard the enforcement of
stringent rules against such agreements as antitrust’s most important positive
contribution to economic performance.20 With increasing intensity, antitrust
authorities around the world prosecute bid-rigging, price-fixing, and market
allocation schemes.21 Since the mid-1990s, a growing number of other juris-

18. As described in Robert C. Marshall et al., Cartel Price Announcements: The Vita-
mins Industry, 26 Int’l J. Indus. Org. 762, 766–67 (2008), the notion of price acceptance and
resistance has received attention in European Commission (“EC”) decisions in cartel cases. In the
EC decision in Vitamins, resistance to price increases was described as follows: “When BASF’s
customers resisted the increase, Roche supported the rise by also announcing an increase to
DEM 46/kg . . . . According to Daiichi, the concerted increase was unsuccessful because of
customer resistance and the huge differential between D-calpan and the equivalent in DL-
calpan.” Commission Decision of 21 November 2001 Relating to a Proceeding Pursuant to
Article 81 of the EC Treaty and Article 53 of the EEA Agreement, 2003 O.J. (L 6) 1, para. 325. In the EC decision in
Cartonboard, cartonboard producers sometimes faced re-
sistance from converters to whom they sold their products:

There is on the other hand an upper limit in practical terms on the amount of any price
increase that could be imposed unilaterally by the cartonboard producers on the convert-
ers. The converters have on some occasions resisted a proposed price increase for
cartonboard on the ground that their own customers would in their turn refuse to accept a
price increase for packaging . . . .

Commission Decision of 13 July 1994 Relating to a Proceeding Under Article 85 of the EC
Treaty, 1994 O.J. (L 243) 1, para. 19. The notion of acceptance of price increases by buyers
appears in the EC decision in Amino Acids: “The five companies . . . exchanged information
on the acceptance of the price increases in the different regions.” Commission Decision of 7
June 2000 Relating to a Proceeding Pursuant to Article 81 of the EC Treaty and Article 53 of
the EEA Agreement, 2001 O.J. (L 152) 24, para. 81.

19. William E. Kovacic, An Integrated Competition Policy To Deter and Defeat Cartels,
11 (describing U.S. and international experiences).

the per se ban against horizontal price fixing and market divisions and concluding that “[i]ts
contributions to consumer welfare over the decades have been enormous”).

21. See Int’l Competition Policy Advisory Comm. to the Attorney Gen. and
dictions have amended their laws to permit the prosecution of cartel offenses as criminal offenses. Private suits in U.S. courts to recover damages on behalf of cartel victims have generated substantial recoveries, and a number of jurisdictions outside the United States are contemplating an expansion of private rights to facilitate the compensation of victims of cartel offenses.

The litigation of agreement issues has inspired judicial complaints about conceptual uncertainty and doctrinal confusion concerning the boundary that separates lawful unilateral conduct from illegal collective behavior. Despite extensive judicial experience with the issue and major contributions by economists and lawyers concerning possible adjustments in the existing analytical framework, the definition and proof of concerted action remain litigated issues in horizontal restraints cases under section 1 of the Sherman Act. Courts continue to struggle to develop a satisfactory calculus for determining whether, without direct proof of agreement, the plaintiff has shown that the defendants conspired to restrain trade.

A. Doctrine Governing the Use of Circumstantial Evidence to Prove an Agreement

Antitrust litigants devote much effort to determining whether conduct stems from an agreement and therefore implicates section 1’s ban against collective trade restraints. A law whose reach hinges on the existence of an agreement requires courts to decide when challenged conduct constitutes an agreement and how such an agreement may be proved in a trial.

Modern judicial efforts in the United States to define concerted action originate in four Supreme Court decisions, beginning with Interstate

successes appear to be occurring amidst a heightened degree of international consensus among enforcers that cartels should be detected and prosecuted."; Harry First, The Vitamins Case: Cartel Prosecutions and the Coming of International Competition Law, 68 ANTITRUST L.J. 711, 733–34 (2001) (suggesting that the prosecution of the vitamins cartel illustrates a broader international acceptance of an anticartel norm).

23. First, supra note 21, at 720 (describing remedies obtained in private cases challenging the vitamins cartel).
Circuit, Inc. v. United States\textsuperscript{27} in 1939 and ending with Theatre Enterprises v. Paramount Film Distributing Corp.\textsuperscript{28} in 1954. In sustaining the conviction of movie exhibitors for fixing the prices to be charged for first-run films, the Interstate Circuit Court defined the concerted action requirement in these terms:

While the District Court’s finding of an agreement of the distributors among themselves is supported by the evidence, we think that in the circumstances of this case such agreement for the imposition of the restrictions upon subsequent-run exhibitors was not a prerequisite to an unlawful conspiracy. It was enough that, knowing that concerted action was contemplated or invited, the distributors gave their adherence to the scheme and participated in it.\textsuperscript{29}

The Court explained that “[a]cceptance by competitors, without previous agreement, of an invitation to participate in a plan, the necessary consequence of which, if carried out, is restraint of interstate commerce, is sufficient to establish an unlawful conspiracy under the Sherman Act.”\textsuperscript{30}

Seven years later, in American Tobacco Co. v. United States,\textsuperscript{31} the Court addressed the agreement issue in reviewing conspiracy to monopolize charges under section 2 of the Sherman Act. The Court stated that “[n]o formal agreement is necessary to constitute an unlawful conspiracy.”\textsuperscript{32} The Court explained that a finding of conspiracy is justified “[w]here the circumstances are such as to warrant a jury in finding that the conspirators had a unity of purpose or a common design and understanding, or a meeting of minds in an unlawful arrangement.”\textsuperscript{33}

In the 1948 case United States v. Paramount Pictures, Inc.,\textsuperscript{34} the Court reiterated Interstate Circuit’s agreement formula. With regard to section 1 and section 2 conspiracy claims, the Court said that “[i]t is not necessary to find an express agreement in order to find a conspiracy. It is enough that a concert of action is contemplated and that the defendants conformed to the arrangement.”\textsuperscript{35}

This formative period of agreement decisions ended in 1954 with Theatre Enterprises.\textsuperscript{36} There the Court said that “[c]ircumstantial evidence of consciously parallel behavior may have made heavy inroads into the tradi-
tional judicial attitude toward conspiracy; but ‘conscious parallelism’ has
not read conspiracy out of the Sherman Act entirely.”37

As a group, the four cases established three conceptual points of refer-
ence. First, courts would characterize as concerted action interfirm
coordination realized by means other than a direct exchange of assurances.
Second, courts would allow agreements to be inferred by circumstantial
proof suggesting that the challenged conduct more likely than not resulted
from concerted action. Third, courts would not find an agreement where the
plaintiff showed only that the defendants recognized their interdependence
and simply mimicked their rivals’ pricing moves.

Subsequent Supreme Court decisions have tried to capture these princi-
ples in a new formula. In 1984, while addressing minimum resale price
maintenance (“RPM”) conspiracy allegations in Monsanto Co. v. Spray-Rite
Service Corp.,38 the Court observed as follows:

The correct standard is that there must be evidence that tends to exclude
the possibility of independent action by the [parties]. That is, there must be
direct or circumstantial evidence that reasonably tends to prove that [the
parties] had a conscious commitment to a common scheme designed to
achieve an unlawful objective.39

Neither Monsanto nor any earlier case provides a useful basis for identi-
fying concerted action.40 These tests show that the concept of agreement
encompasses more than a direct exchange of assurances, yet they offer no
useful operational means for determining when the defendants have engaged
in something more than consciously parallel conduct.

For example, under the Monsanto formula, one could deem interde-
pendent conscious parallelism to be a “conscious commitment to a common
scheme.”41 Each firm in an oligopoly knows that the effect of its acts de-
pends on the reactions of its rivals. All producers perceive that price
increases will be accepted only if all firms raise prices. Realizing their inter-
dependence, each firm decides, without consulting its rivals, to match
competitors’ price increases. Repeated efforts to match rivals’ price moves
arguably indicate the firm’s conscious commitment to achieve higher prices.
The sole interfirm “communication” consists of each firm’s observation of
its rivals’ price changes. By calibrating its own moves to conform to the
decisions of its rivals, each firm can be said to have “consciously commit-
ted” itself to participate in a “common scheme.” As we discuss below, it is
possible to improve on this formula by focusing more precisely on the forms
of behavior that firms use to communicate their intentions and to execute the
tasks needed to achieve coordination on pricing, output, and other dimen-
sions of effective collusion.

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37. Theatre Enters., 346 U.S. at 541.
40. See generally Page, supra note 4, at 410–23.
41. Monsanto, 465 U.S. at 768.
B. Plaintiff’s Burden of Proof

Plaintiffs in section 1 cases bear the burden of establishing the fact of an agreement. The “conscious commitment to a common scheme” can be shown with direct or circumstantial evidence. As elaborated in later decisions, Monsanto’s articulation of the burden of proof has considerable importance where the defendant files a motion to dismiss or a motion for summary judgment on conspiracy issues.

The fear that mistaken inferences from ambiguous evidence might deter procompetitive or benign conduct led the Supreme Court in Matsushita Electrical Industrial Co. v. Zenith Radio Corp. to extend and apply Monsanto’s conspiracy standards to horizontal agreements. Where the plaintiff relies on circumstantial evidence to establish concerted action, Matsushita said that “antitrust law limits the range of permissible inferences from ambiguous evidence in a § 1 case” and emphasized that “conduct as consistent with permissible competition as with illegal conspiracy does not, standing alone, support an inference of antitrust conspiracy.”

Quoting Monsanto, the Matsushita Court then specified the plaintiff’s burden of proof when the defendant seeks summary judgment or a directed verdict when only circumstantial evidence is introduced to establish collective action:

To survive a motion for summary judgment or for a directed verdict, a plaintiff seeking damages for a violation of § 1 must present evidence “that tends to exclude the possibility” that the alleged conspirators acted independently. . . . [Plaintiffs] in this case, in other words, must show that the inference of conspiracy is reasonable in light of the competing inferences of independent action or collusive action that could not have harmed [plaintiffs].

As in Monsanto, the Court in Matsushita sought to reduce error costs associated with the excessively broad application of liability standards. In Matsushita, Japanese suppliers of electronics equipment allegedly conspired to price below cost in the United States, drive American firms from the market, and later raise prices to monopoly levels. In such a case, the Court

42. See, e.g., ES Dev., Inc. v. RWM Enters., 939 F.2d 547, 554 (8th Cir. 1991) (holding that an antitrust plaintiff may prove existence of combination or conspiracy “by providing either direct or circumstantial evidence sufficient to ‘warrant a . . . finding that the conspirators had a unity of purpose or common design and understanding, or a meeting of the minds in an unlawful arrangement’” (quoting Am. Tobacco Co. v. United States, 328 U.S. 781, 810 (1946))).

43. 475 U.S. 574 (1986).

44. Matsushita, 475 U.S. at 588.

45. Id.

46. Id. (citation omitted) (quoting Monsanto, 465 U.S. at 764).

47. Id. Monsanto emphasized the dangers of discouraging legitimate discussions between producers and their dealers. 465 U.S. 752, 763 (1984).
emphasized that mistaken inferences of conspiracy could injure consumers by deterring firms from offering low prices.\textsuperscript{48}

\textit{Matsushita} had a strong effect on the litigation of cases in which the plaintiff relied on circumstantial evidence to prove the fact of concerted action. Among other effects, \textit{Matsushita} expanded the ability of defendants to obtain summary judgment by inviting lower courts to scrutinize the economic plausibility of the plaintiff’s evidence of conspiracy.\textsuperscript{49} As it had done in \textit{Monsanto},\textsuperscript{50} the Court in \textit{Matsushita} emphasized the costs that could flow from a failure to apply the agreement standard with sufficient rigor.\textsuperscript{51} \textit{Monsanto} mentioned the availability of treble damages in private cases and suggested that resale price maintenance arrangements—like all other conduct forbidden by the Sherman Act—could be prosecuted as a crime.\textsuperscript{52} As noted above, \textit{Matsushita} warned that careful examination of the economic plausibility of the plaintiff’s evidence was necessary to ensure that mistaken inferences of agreement did not lead to treble damage awards, which would deter firms from offering low prices.

In 2007, the Supreme Court extended \textit{Matsushita}’s plausibility screen to the pleading stage of antitrust litigation. In \textit{Bell Atlantic Corp. v. Twombly},\textsuperscript{53} the Court considered allegations that Bell Atlantic and other incumbent local exchange carriers (“ILECs”) had conspired to impede entry by competitive local exchange carriers (“CLECs”) and had agreed among themselves not to enter each other’s traditional service territories. The Court reiterated the principle that proof of conscious parallelism alone is inadequate to establish conspiracy and endorsed the application of the \textit{Matsushita} plausibility standard to evaluate motions to dismiss.\textsuperscript{54} In that context, “an allegation of

\begin{itemize}
\item \textsuperscript{48} *Matsushita*, 475 U.S. at 593–94. \textit{Matsushita}’s policy rationale should have less significance for horizontal conspiracy cases that do not involve claims of collective below-cost pricing. Horizontal agreements to raise prices or cut output pose greater competitive dangers than the concerted low pricing challenged in \textit{Matsushita} and therefore might be subject to more liberal standards of proof.
\item \textsuperscript{49} See GAVIL ET AL., supra note 6, at 279–80 (discussing the application of \textit{Matsushita} to grant summary judgment where court concluded that a plaintiff’s claim lacked economic plausibility). For two important modern illustrations of the application of \textit{Matsushita} to grant summary judgment against a plaintiff’s conspiracy claims, see Williamsohn Oil Co. v. Philip Morris USA, 346 F.3d 1287 (11th Cir. 2003), and Blomkest Fertilizer, Inc. v. Potash Corp. of Saskatchewan, Inc., 203 F.3d 1028 (8th Cir. 2000).
\item \textsuperscript{50} *Monsanto*, 465 U.S. at 762–64.
\item \textsuperscript{51} \textit{Matsushita}, 475 U.S. at 593–97.
\item \textsuperscript{52} *Monsanto*, 465 U.S. at 763. The Department of Justice (“DOJ”) seldom prosecutes resale price maintenance as a crime. Yet, when the Supreme Court issued the \textit{Monsanto} decision in 1984, it had been barely three years since the DOJ’s most recent use of criminal process to challenge an RPM agreement. See United States v. Cuisinarts, Inc., No. H80-559, 1981 WL 2062 (D. Conn. Mar. 27, 1981) (accepting the proposed consent decree).
\item \textsuperscript{53} 550 U.S. 544 (2007).
\item \textsuperscript{54} \textit{Twombly}, 550 U.S. at 554, 560–61 & n.7. On \textit{Twombly}’s significance as an extension of the principle of \textit{Matsushita} to the assessment of pleading requirements in the context of a motion to dismiss, see GAVIL ET AL., supra note 6, at 279–83.
\end{itemize}
parallel conduct and a bare assertion of conspiracy will not suffice."\(^{55}\) For purposes of pleading an antitrust claim, the plaintiff must present "enough facts to state a claim to relief that is plausible on its face."\(^{56}\) The Court observed that a more rigorous examination of the plaintiff’s pleadings was necessary to limit the plaintiff (and classes of plaintiffs) from setting in motion the costly process of civil discovery and extracting unjustified settlements from defendants.\(^{57}\)

As a group, the Court’s antitrust conspiracy cases highlight the interdependence among the six key elements of a competition law system: the substantive scope of the legal command, the volume and quality of evidence required to prove a violation, the means for detecting violations, the prosecution of violations, the adjudication process that determines innocence or guilt, and the sanctions imposed for infringements. The Court’s decisions about the evidentiary standard—here, the circumstantial evidence needed to establish an agreement for Sherman Act purposes—are influenced by other elements of the system. Perceived excesses with private rights of action (the prosecution element) and the mandatory trebling of damages for victorious plaintiffs (the remedy element) have caused the Court to engage in "equilibration"\(^{58}\)—the adjustment of one element of the antitrust system (namely, the evidentiary standard) to offset imperfections in other elements. The inclination to demand a more powerful evidentiary showing—to increase confidence that observed behavior truly results from concerted action—is reinforced by the Justice Department’s routine application of criminal sanctions to cartels and the availability of a per se rule of condemnation for cartels, in which the only issue is whether an illicit agreement was formed and in which considerations of actual effects are irrelevant.

Examination of the links among liability rules, evidentiary standards, identity of the prosecutorial agent, and remedies reveals several possible paths for future adjustments to the treatment of conspiracy issues. One approach is to adjust the evidentiary standards to account for the institutional context in which the litigation of antitrust claims takes place. Specifically, one might lighten the evidentiary demands that the plaintiff must bear when the institutional setting suggests that the case does not pose severe error costs. For example, the concern for overdeterrence should diminish when the plaintiff is a public prosecutor proceeding in a civil suit in which the remedy sought consists entirely of forward-looking injunctive relief. Given the crucial role that institutional factors play in shaping the evidentiary test, there should be a difference in the proof required when the Federal Trade Commission uses its administrative adjudication process and seeks injunct-

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55. Twombly, 550 U.S. at 556.
56. Id. at 570.
57. Id. at 559–60.
58. This concept originated in Stephen Calkins, Summary Judgment, Motions To Dismiss, and Other Examples of Equilibrating Tendencies in the Antitrust System, 74 Geo. L.J. 1065 (1986).
tive relief compared with a private class action that will be tried before a jury and will result in an automatic trebling of any damages awarded.

Another path, discussed in more detail below, is to develop a better analytical approach to evaluating the probative value of various plus factors and, as this Article suggests, to apply economic theory and past enforcement experience to identify factors or clusters of factors whose presence typically reveals the existence of concerted action. If enforcement agencies, courts, and juries have more confidence in the probative value of certain factors, then presumably there will be less hesitation to impose severe sanctions (e.g., treble damages or criminal punishment) when those factors suggest that the defendants have engaged in pernicious misconduct.

C. Interdependence and the Role of Plus Factors

As the Introduction to this Article noted, in markets characterized by interdependence, each firm realizes that the effect of its actions depends on the responses of its rivals. In highly concentrated markets, the recognition of interdependence can lead firms to coordinate their conduct simply by observing and reacting to their competitors’ moves. In some instances, such oligopolistic coordination yields parallel behavior (e.g., parallel price movements) that approaches the results that one might associate with a traditional agreement to set prices, output levels, or other conditions of trade.

The line that distinguishes tacit agreements (which are subject to section 1 scrutiny) from mere tacit coordination stemming from oligopolistic interdependence (which eludes section 1’s reach) is indistinct. The size of the safe harbor that Theatre Enterprises recognized depends on what conduct courts regard as the “extra ingredient of centralized orchestration of policy which will carry parallel action over the line into the forbidden zone of implied contract and combination.” Courts enjoy broad discretion to establish the reach of section 1 by defining this “extra ingredient” broadly or narrowly.

Legal scholars have recognized that certain industry structures, firm histories, and market environments are conducive to and/or facilitate collusion. However, courts have relied on operational criteria known as plus factors to determine whether a pattern of parallel conduct results from an agreement. The chief plus factors have included:

- Actions contrary to each defendant’s self-interest unless pursued as part of a collective plan.
- Phenomena that can be explained rationally only as the result of concerted action.
- Evidence that the defendants created the opportunity for regular communication.

60. See, e.g., Posner, supra note 10, at 69–79.
Industry performance data, such as extraordinary profits, that suggest successful coordination.

The absence of a plausible, legitimate business rationale for suspicious conduct (such as certain communications with rivals) or the presentation of contrived rationales for certain conduct.\textsuperscript{61}

Two basic problems have attended judicial efforts to identify and evaluate plus factors. One problem involves the absence of a methodology for ranking plus factors according to their likely probative value. The second problem arises from the suggestion in the economics literature regarding repeated games that market outcomes associated with collusive schemes can result from interdependent, consciously parallel conduct in some industries. We look at each of these in turn.

First, courts have failed to present a hierarchy of such factors and to establish an analytical framework that explains why specific plus factors have stronger or weaker evidentiary value. Antitrust agreement decisions rarely rank plus factors according to their probative merit or specify the minimum critical mass of plus factors that must be established to sustain an inference that conduct resulted from concerted acts rather than from conscious parallelism.\textsuperscript{62} A relatively small number of judicial opinions have extensively and skillfully evaluated the economic significance of each factor.\textsuperscript{63} These opinions stand in contrast to decisions that either forego a careful discussion of the economic meaning of individual plus factors or attempt such an inquiry without a sure grasp of the economic concepts in question.\textsuperscript{64} Such tendencies make judgments about the resolution of future cases problematic and give an impressionistic quality to judicial decisionmaking on agreement-related issues.

The failure in modern cases to provide a hierarchy of plus factors and to explain the competitive significance of each might be attributed to one of the least discussed but most important Supreme Court decisions of the 1960s. In \textit{Continental Ore Co. v. Union Carbide & Carbon Co.}, the Court stated that "plaintiffs should be given the full benefit of their proof without tightly

\textsuperscript{61} \textit{See Gavil et al., supra} note 6, at 310–11.
\textsuperscript{62} Page, supra note 4, at 416 (observing that courts use the term "plus factor" as "a conclusory label to describe evidence that actually satisfies the plaintiff's burden of production").
\textsuperscript{63} The most sophisticated analysis of the probative value of various forms of evidence, direct and circumstantial, offered to establish the existence of concerted action appears in various opinions of Judge Richard Posner for the U.S. Court of Appeals for the Seventh Circuit. These include Judge Posner's opinion in \textit{In re High Fructose Corn Syrup Antitrust Litig.}, 295 F.3d 651 (7th Cir. 2002), and his opinions in three decisions involving alleged collusion among drug manufacturers and their wholesalers. \textit{In re Brand Name Prescription Drugs Antitrust Litig.}, 288 F.3d 1028 (7th Cir. 2002); \textit{In re Brand Name Prescription Drugs Antitrust Litig.}, 186 F.3d 781 (7th Cir. 1999); \textit{In re Brand Name Prescription Drugs Antitrust Litig.}, 123 F.3d 599 (7th Cir. 1997).
\textsuperscript{64} This category includes decisions such as \textit{Blomkest Fertilizer, Inc. v. Potash Corp. of Saskatchewan, Inc.}, 203 F.3d 1028 (8th Cir. 2000). See \textit{Herbert Hovenkamp, The Antitrust Enterprise} 134–35 (2005) (criticizing \textit{Blomkest}).
compartamentalizing the various factual components and wiping the slate clean after scrutiny of each. . . . [T]he duty of the jury was to look at the whole picture and not merely at the individual figures in it.”  At first glance, this passage might be criticized as an invitation to relax what should be a rigorous examination of evidence—a suggestion that lower courts are free to dispense with a careful assessment of the importance of each element of proof and fulfill their responsibilities by dropping difficult conceptual issues into the lap of the jury. There is another, more sympathetic interpretation. The holding in *Continental Ore* is consistent with the possibility, which we discuss below, that certain clusters of factors warrant especially close attention, and that some constellations of factors have competitive significance that cannot be understood by looking at each factor in isolation.

The variation in judicial analyses of plus factors also suggests that the outcome in many agreement cases depends on the Court’s unarticulated intuition about the likely cause of observed parallel behavior. Our interpretation is that judges vary in their acceptance of the proposition in *Theatre Enterprises* that conscious parallelism, standing alone, does not demonstrate concerted behavior. Some judges may regard pricing uniformity as a sign of likely collaboration. After considering *Theatre Enterprises*, these judges will expand the range and reduce the quantum of conduct that, when added to parallel behavior, can support a finding of agreement. Other judges may view parallelism as a desirable, natural manifestation of rivalry. They will be more reluctant to give weight to asserted plus factors and will be more sympathetic to the defendants’ explanations about why such plus factors implicate conduct that is either procompetitive or essentially benign.

The second problem results from the development of new arguments, rooted in the modern economics literature dealing with repeated games, that market performance associated with collusive schemes can result from interdependent, consciously parallel conduct in some industry settings. Firms in a number of industry settings may be able to achieve collusive outcomes without resorting to conduct that might be characterized as an agreement. Under *Matsushita*, defendants might argue successfully that observed parallelism is just as consistent with what agreement doctrine recognizes as independent action—namely, the recognition and response to interdependence—as with an inference of collusive behavior. Moreover, under *Matsushita*'s implausibility test, firms could assert that it makes no economic sense for them to use tactics that violate section 1 of the Sherman Act when the recognition of interdependence can yield the same market results. Where the recognition of interdependence alone accounts for the market outcome, the difficulties in identifying and prescribing avoidable conduct will likely preclude effective antitrust intervention.

The refinement of federal merger enforcement policy in the past twenty years has increasingly relied on economic theories that illuminate the conditions in which consolidation is likely to have net anticompetitive effects.

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65. 370 U.S. 690, 699 (1962) (citation omitted).

66. For the formative treatment of this point, see Baker, supra note 5, at 149–98.
Among other features, the DOJ and FTC Horizontal Merger Guidelines issued in 1992 and in 2010 focus on how a transaction might increase the ability of firms to coordinate their activity. The economic understanding of the process by which firms cooperate successfully guides the analysis of coordinated anticompetitive effects.

A similar, economically oriented reformulation of agreement jurisprudence in circumstantial evidence cases would focus on the components of successful cooperation by rivals. As a general rule, firms that successfully collude (i) reach a consensus on pricing, output, or other terms of trade; (ii) design allocation mechanisms that divide the collusive gain; and (iii) monitor compliance and stand prepared to punish noncontrite deviant behavior.

A reformulated standard in circumstantial evidence cases would seek to fulfill these conditions. Where the evidence of collaboration is wholly circumstantial, the plaintiff’s prima facie case would consist of introducing proof that demonstrates how the defendants achieve consensus, divide the collusive gain, and monitor compliance. To survive a motion for summary judgment or a motion to dismiss, the plaintiff would need to provide a plausible explanation for how defendants executed these tasks. The defendants could rebut this prima facie case by advancing benign or procompetitive rationales for specific challenged acts or by demonstrating that the observed market outcomes resulted from the recognition of interdependence alone.

The most important threshold element of proof in this framework would consist of evidence showing how the defendants communicated their intentions and confirmed their commitment to a proposed course of action. Perhaps the most probative proof of the mechanism for achieving consensus would consist of evidence demonstrating that a pattern of extensive communication among the defendants preceded a complex, parallel adjustment in behavior that could not readily be explained as the product of the defendants’ independent efforts to identify and adhere to focal points for organizing their conduct. The existence of a means for dividing the collusive gain might be revealed by establishing the existence of transactions among the firms at nonmarket prices, swaps, or patent cross-licensing agreements. The existence of a means for monitoring compliance might be


68. This three-step process is a simplification of the larger range of tasks that a cartel must perform in order to succeed. See Randall Heeb et al., Cartels as Two-Stage Mechanisms: Implications for the Analysis of Dominant Firm Conduct, 10 Chi. J. Int’l L. 213, 218–23 (2009).

69. On the usefulness of evidence of negotiation, see GAVIL ET AL., supra note 6, at 335–37.

70. We derive these possibilities from our review of the published records of the vitamins cartel and other producer conspiracies prosecuted in Europe and in the United States. See
uncovered by establishing a pattern of bilateral exchanges of pricing information between competitors or of exchanges of data through trade associations.\textsuperscript{71}

II. AGREEMENTS TO SUPPRESS RIVALRY ASSESSED THROUGH THE REACTIONS OF BUYERS

Firms in oligopolistic industries recognize their mutual interdependence and act on that recognition.\textsuperscript{72} It would be unreasonable to expect firms not to do so. As noted above, court decisions have not clarified what constitutes an agreement when firms are given the right to recognize and act on their mutual interdependence.

Consider the following example of a repeated game. Suppose a duopoly produces a commodity. The product is not differentiated except for the identity of the producing firm, and there are high entry barriers. Each firm can produce as much of the product as it wants for a marginal cost of $10 per unit. Each firm recognizes that the joint-profit-maximizing price for the product is $25. In each and every period, the firms simultaneously and publicly announce prices to all potential customers. There is no other interaction of any form that occurs between the two firms—they interact only as rivals in the marketplace.

If each firm announces a price of $10, then no one who would characterize that pricing as being an agreement—from an economist’s viewpoint, pricing at marginal cost yields zero profits for each of the two firms and maximizes welfare.\textsuperscript{73} However, suppose that in one period, firm A calls out a price of $10, but firm B calls out $25. Firm A gets all the demand that period. In the next period, firm A calls out $15, while firm B calls out $25—now firm A gets all the demand but earns a profit of $5 per unit. Suppose we get to a period where firm A calls out $25 and firm B calls out $25—now each firm splits market demand and earns profit of $15 per unit. Suppose firm B deviates one period and calls out $24.50 and captures all demand. But, in the following period, firm A calls out $10 and continues to call out $10 for a large number of periods until it finally calls out $25 again. Suppose after a large number of periods each firm continues to call out $25, dividing the demand equally, and earning a profit of $15 per unit.

Consider the question whether the price of $25 per unit, which each firm is now charging, has emerged from an agreement. It is clear that the price of $25 emerged from a substantial amount of interfirm communication through a sequence of public price announcements by each firm to potential customers.

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\textsuperscript{71} On the potential importance of these information exchange arrangements as monitoring devices, see GAVIL et al., supra note 6, at 283–301.

\textsuperscript{72} See, e.g., DENNIS W. CARLTON & JEFFREY M. PERLOFF, MODERN INDUSTRIAL ORGANIZATION 153 (3d ed. 2000) ("Thus, oligopoly differs from competition and monopoly in that a firm must consider rival firms’ behavior to determine its own best policy.").

\textsuperscript{73} Id. at 71–72 (discussing welfare maximization at the competitive equilibrium).
But it is also clear that the pricing outcome emerged from their recognized mutual interdependence. Additionally, given the nature of this duopoly industry, it is perfectly reasonable that each firm would learn of the other's pricing for the current period at the end of the period. Yet, the $25 price outcome is highly profitable and highly damaging to consumer surplus. Were courts to decide the issue without regard to remedies, they would likely hold that such conduct is an agreement in violation of section 1 of the Sherman Act. As discussed in Part I, courts and enforcement agencies cannot address the agreement question without awareness of remedial issues that stand in the background. Courts are left with a substantial conundrum because they cannot meaningfully instruct firms not to react to their rivals' pricing.

Staying with our example, there has been an unarticulated assumption that the buyers are passive in this market and will accept prices as called out by the two firms. But consider an alternative scenario in which the buyers are not passive. Rather, suppose that buyers strongly resist price increases. Specifically, when each firm calls out a price of $25, each buyer does whatever it can to get a special deal with one seller or the other. For example, one buyer may offer to contract at $22.50 with a particular seller for many time periods. At the same time, a buyer may falsely represent a secret offer made by one of the sellers as they try to generate a lower price offer from another seller. Or, a buyer may threaten to use a foreign supplier or alternative input if prices are not decreased.

Without any kind of additional interfirm communication between the sellers beyond the calling out of prices or assurances between sellers that any deviant conduct will be rectified through an interfirm transfer, it seems unlikely that the price of $25 can survive as a stable outcome in the market. There is an important implication of this observation—if the buyers are active players in the oligopoly game and if the price of $25 persists, then the firms must be communicating beyond the simple announcement of prices and potentially also transferring resources among one another, since without such seller conduct the price would tumble toward $10 given the strength of the buyer resistance.

In this circumstance, in which there is an expectation of an aggressive buyer reaction, an agreement would violate section 1 of the Sherman Act, but, unlike the earlier scenario, the courts would be more likely to deny the defendants’ motion for summary judgment. Although in each case there would be an agreement, the critical issue for determining whether an agreement violates the antitrust laws is the assumption regarding the reaction of a third party, the buyers, to elevated prices. The same pricing outcome by sellers would be viewed by the courts in completely different ways depending on whether the buyers were passive, as in the first scenario, or aggressive, as in the second scenario.

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74. For example, the well-known “gas station” oligopoly model presumes that buyers are passive. See Carlton et al., supra note 17, at 428–30 (providing an example in which two gas stations in a town both call out the monopoly price).
The two scenarios above presume that the courts have an understanding of the firms’ costs and of the demand for their product. In the absence of such information the court would not know if $10 was a low price, if $25 was a high price, or if some other price, say $100, was the joint-profit-maximizing price. If $100 were conjectured as a possible joint-profit-maximizing price, then $25 might be viewed as the consequence of active buyer resistance. In that scenario, the court may find itself unable to find a section 1 violation.

Overall, firms in an oligopoly are players in a repeated game. The typical game has incomplete information and substantial information asymmetries. The sellers know many things that buyers do not. And each seller has information that other sellers do not have. Courts can attempt to resolve information asymmetries through discovery, but that process is only a partial solution.

When the firms in an industry are players in a repeated game with substantially incomplete and asymmetric information, courts can examine buyer actions to attempt to distinguish between conduct that is an agreement in violation of section 1 of the Sherman Act and conduct that is not. Indeed, the way individual consumers ordinarily buy products and services is not the way industrial buyers typically buy products and services. Individual consumers are accustomed to transacting in a posted-price environment. None of us conducts a competitive procurement for the toothpaste we want this month—we go to a pharmacy or grocery store and purchase toothpaste at the posted price. We are not players in an oligopoly game when we buy toothpaste or bread or gasoline. In such cases, the only active or strategic players are the oligopolistic producers.

In contrast, even relatively small firms have procurement divisions or at least substantial resources devoted to procurement. Such buyers typically use competitive procurement processes under which firms that are qualified potential suppliers are invited to submit bids. Buyers use the competitive bidding as a way to police the market. Because suppliers are aware that others are bidding, they must account for that as they seek the highest expected profit. Expected profit equals the profit in the event a given firm wins times the probability that the firm wins. These two measures are inversely related, and a bidder seeks the optimal balance between them. Buyers rely on competitive bidding processes to police the market through their ability to reveal information that buyers may not have known about the suppliers, their products, or pricing. When buyers are engaged in competitive procurements to buy from suppliers and can undertake a number of actions in that context to enhance their surpluses, they become active players in the oligopoly game.

Suppliers recognize this policing function and, consistent with playing in a repeated game, may attempt to mitigate the policing function of the competition. If the sellers’ bids yield to pressure from buyers, then it may have been the case that the sellers, who are players in a repeated game with substantial incomplete and asymmetric information, had not suppressed competition among themselves other than by recognizing their long-run interaction in a game setting. However, if the sellers do not yield and hold to
their initial bids, which are seemingly at high prices, then each buyer must consider whether the price increase is a legitimate response to some underlying market conditions or the result of an agreement between sellers to suppress competition.

Buyers design the procurement mechanism that they use. Obviously, they are self-interested designers. If the mechanism produces results that are inconsistent with their expectations for surplus, then the buyers will change the procurement design, in real time, in an attempt to secure greater surplus. This redesign can be costly. But, after seeing an initial round of bids, it can become quite clear to a buyer that the expected payoff from resistance more than offsets the increased costs. For example, qualifying a new seller might have such a low ex ante expected return that a buyer does not qualify the seller and thus initially excludes the new entrant. But after seeing an exceptionally high lowest bid from the procurement, a buyer may void the initial bidding and incur the expense of qualifying the new entrant so as to generate an extra bidder at a new procurement.

In a nutshell, buyers can be wholly passive and thus not be players in the oligopoly game; be vigorous in their pursuit of incremental surplus from sellers; or be anything in between, depending on the specific nature of the product/industry/market under consideration. In our view, courts need to understand the oligopoly game of a given product/industry/market before evaluating any economic circumstantial evidence with regard to its probative value. The example proffered by Professor Carlton and his colleagues of two gasoline stations in a small town achieving monopoly price without communication seems quite compelling, but it quickly withers when contrasted with the market for vitamin A500 USP, which was produced by only two firms throughout the 1990s. Despite being repeat cartel offenders (Roche and BASF), the vitamin manufacturers needed an explicit agreement (communication and transfers) to elevate prices to monopoly levels. When duopolistic firms like Roche and BASF need an explicit agreement to move towards a monopoly price, it becomes increasingly clear that the Carlton et

75. For example, concerns regarding agency problems have sometimes led auction designers to emphasize “transparency in bidding,” particularly with respect to federal government procurements. See generally Robert C. Marshall & Leslie M. Marx, The Vulnerability of Auctions to Bidder Collusion, 124 Q.J. Econ. 883 (2009) (discussing how preauction and postauction transparency affects the probability of collusion).

76. Carlton et al., supra note 17, at 428–30. This example fits well within the standard Folk Theorem environment. See Jean Tirole, The Theory of Industrial Organization 246 (1989) (describing the “Folk Theorem” as the statement that in repeated oligopoly games, the set of payoffs that can be achieved in equilibrium generally includes payoffs greater than those associated with single-shot interaction). In the example, two firms compete by setting prices, where those prices are perfectly observable and can be adjusted instantaneously, and the profit of each firm is determined by the two prices and a fixed demand curve. In this environment, one would not be surprised to find that tacit collusion can support the monopoly outcome. See id. (providing one example of such collusion). Any deviations from monopoly pricing would be immediately observed and met by a response from the other firm. The buyers in this environment are not players in the game and thus have no ability to take actions that might disrupt the ability of the two firms to maintain their tacit agreement.
al. example is only a pedagogical device to illustrate the importance of understanding the specifics of the product/industry/market posed by each case and the extent to which the buyers are players in the oligopoly game.

One need only make small changes to the environment of Carlton et al., however, in order to reach an environment in which tacit agreement is insufficient to achieve the monopoly price. For example, if prices are not observable and demand has at least a small random component, then one enters the environment described by Professors Green and Porter. Green and Porter show that in their environment equilibria exist that allow the firms to obtain supracompetitive profits, but they argue that such equilibria would be expected to require an explicit agreement among the firms.

Other changes in the environment reinforce the need for an explicit agreement, including moving away from posted prices to, for example, competitive procurements and allowing buyers to be true players in the game. When buyers are players, they have an incentive to pursue strategies that disrupt equilibria that allow the sellers to capture supracompetitive profits. Buyer resistance limits the ability of firms to maintain collusive prices through only tacit agreement because buyer resistance exploits the lack of communication, monitoring, and enforcement that characterizes a tacit agreement.

### III. Taxonomy of Cartel Conduct

If an effective cartel uses a market share allocation scheme, then we will observe fixed relative market shares among those firms. This statement is not logically equivalent to the statement that “if we observe fixed relative market shares among a subset of firms, then the firms exhibiting relatively fixed shares are effectively colluding through the use a market share allocation scheme.” Since “A implies B” does not logically yield “B implies A,” what then is a plus factor?

One issue with the current characterization of plus factors is that they lack a taxonomy. Relatedly, plus factors are not ranked, even within broad groupings, by their relative probative value. It is common to note that much depends on the nature of a specific product, industry, or marketplace in considering a given plus factor; at the current time, however, all plus factors tend to reside in the same five-gallon bucket, essentially without distinction.

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77. This situation is consistent with Stigler’s assumption that firms do not observe their rivals’ prices but rather infer them imperfectly from their own demand. See George J. Stigler, *A Theory of Oligopoly*, 72 J. Pol. Econ. 44, 48 (1964).


79. Green & Porter, *supra* note 78, at 89 n.5 (“It is logically possible for this agreement to be a tacit one which arises spontaneously. Nevertheless, in view of the relative complexity of the conduct to be specified by this particular equilibrium and of the need for close coordination among its participants, it seems natural to assume here that the equilibrium arises from an explicit agreement.”).
As an example, we can contrast two plus factors. Consider fixed relative market shares among a subset of firms in an industry as one plus factor. There are numerous noncollusive explanations that can exist for fixed relative market shares among firms in an industry. In contrast, consider vertical foreclosure conduct by a subset of firms in an industry, targeted at one or a few small firms in the industry, in which no single firm in the subset has sufficient market power to act unilaterally as a dominant firm. The former plus factor appears quite weak while the latter appears strong and compelling. If ranking two plus factors is that easy, without describing any features of the product, industry, or marketplace, then at least a broad ranking of plus factors is possible. As will become clear from our examples, and as we formally establish below, the strength of any plus factor is crucially determined by the contrast between the likelihood of an action in the presence of an agreement and the likelihood without the presence of an agreement.

Accordingly, consider the following actions, broadly construed, of an explicit cartel.

A. Raise prices above what they would have been without the conspiracy.
B. Reduce total industry-wide quantity below what it would have been without the conspiracy.
C. Change intrafirm incentives so as to inhibit interfirm competition and foster higher prices.
D. Allocate the collusive gains among members.
E. Redistribute gains and losses among members so as to maintain compliance with the agreement.

80. See Joseph E. Harrington, Jr., Detecting Cartels, in HANDBOOK OF ANTITRUST ECONOMICS 213, 245 (Paolo Bucicrossi ed., 2008) (discussing economic models involving fixed market shares and summarizing that “an optimal equilibrium can have firms keeping prices and market shares fixed, so there are indeed stable market shares”).

81. See Stigler, supra note 77, at 46 (emphasizing “pricing structures” as opposed to the more narrow concept of elevating prices). A cartel may find price discrimination to be quite profitable. If so, then some buyers may actually experience price decreases as a consequence of profit-enhancing conduct by the cartel. In practice, however, this would be atypical. Also, this caveat would create an ongoing difficulty for exposition. Therefore, we only discuss price increases by a cartel.

82. It is well known that extensive price discrimination can actually increase quantities brought to the market (while extracting large amounts of consumer surplus). See, e.g., Posner, supra note 10, at 79–80. Again, this would be highly atypical and, in addition, would create ongoing exposition difficulties. Therefore, we only discuss the restriction of quantity by a cartel.


85. See Stigler, supra note 77, at 46 (discussing the need for cartels to have “an appropriate formula for redistribution of gains and losses from departures from quotas”).
F. Monitor compliance with the agreement and communicate regularly regarding all relevant features of the conspiracy that require discipline.  

G. Stand ready to abandon collusive conduct if some cartel members continually engage in substantial noncompliant conduct.  

H. Once interfirm rivalry has been suppressed successfully, seek additional profits through activities such as dominant-firm conduct.

If these are the eight components of cartel conduct, then any plus factor must be consistent with one or more of these components. At a minimum, plus factors can be classified by these eight actions. Consider the list of fourteen plus factors from Posner:

1. Fixed relative market shares  
2. Marketwide price discrimination  
3. Exchanges of price information  
4. Regional price variations  
5. Identical bids for nonstandard products  
6. Price, output, and capacity changes at the formation of the cartel  
7. Industry-wide resale price maintenance  
8. Declining market shares of leaders  
9. Amplitude and fluctuation of price changes  
10. Demand elastic at the market price  
11. Level and pattern of profits  
12. Market price inversely correlated with number of firms or elasticity of demand  
13. Basing-point pricing  
14. Exclusionary practices

Directly or indirectly, nine of these factors concern action A, cartel pricing (factors 2, 4–7, 9–10, 12–13). Only factor 3 concerns action F—interfirm communication and monitoring—which addresses only the exchange of price information. None of these plus factors concern action E—the redistribution of gains and losses among cartel members so as to maintain compliance with the agreement. Only factor 6 is related to action G—the threat of abandoning.

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86. See id. (discussing role of monitoring in cartel enforcement).
87. See Ian Ayres, How Cartels Punish: A Structural Theory of Self-Enforcing Collusion, 87 COLUM. L. REV. 295, 306 (1987) (discussing cartel punishments and the possibility of “reverting to the competitive level of quality will be credible, because if all other firms are behaving competitively, no individual firm will have an incentive to deviate”).
88. See Marshall, Marx & Samkharadze, supra note 84, at 4 (identifying cartel cases in which dominant-firm conduct by the cartel is reported).
89. Id. at 79–93.
collusive conduct if there is substantial noncompliant conduct—and that relation is quite indirect. Only factor 1 concerns action D—the allocation of the collusive gain among members—and factor 1 concerns only one type of allocation mechanism. Factors 7 and 14 address action H—a cartel undertaking dominant-firm conduct—but again in a restrictive sense.

None of the Posner plus factors address action C—changing intrafirm incentives. Nor do they address action B—reducing industry-wide quantity—even though in certain cases, effective cartel management may require these types of agreements.

The strength of an inference of collusion that can be drawn from individual Posner plus factors is a mixed bag. On the one hand, if we observe a subset of firms in an industry engaging in dominant-firm conduct, and none of the firms is large enough on its own to act as a dominant firm, then the inference of collusion is strong. On the other hand, the observation that a subset of firms experiences higher profits is consistent with entry barriers and a positive demand shock (and/or a negative factor price shock), so the inference of collusion is weak. Some of Posner’s plus factors are relatively simple to observe in the marketplace (such as factor 13), whereas others require access to detailed internal records of the cartel members (such as factor 3), and still others require sophisticated econometric analysis (such as factor 12).

It is our contention that the actions of an explicit cartel, and the outcomes of those actions, should illuminate the path to identifying plus factors. Furthermore, any of those actions that almost surely do not result from unilateral conduct should be given special attention, because those lead to a strong inference of collusion. In addition, some individual plus factors do not lead to a strong inference of collusion, but two or more plus factors seen together may lead to a strong inference. Finally, some plus factors are relatively simple to observe and draw strong inferences from, while others are only available after considerable economic analysis.

A cartel must solve a multidimensional problem; the actions it takes will not be one dimensional, as our list of cartel actions above makes clear. We now consider in greater detail each of cartel actions A through H that can act both individually and jointly as plus factors.

A. Price Elevation

Given that a plus factor is defined as something beyond conscious parallelism in conduct, such as parallel pricing, from which a court can infer collusion, it seems a bit odd that nine out of Posner’s fourteen plus factors concern price. In fact, cartels have taken great comfort in the fact that, at the end of the day, courts typically will not rely on economic evidence about price to infer collusion.90

90. See Commission Decision of 13 June 1994 Relating to a Proceeding Under Article 85 of the EC Treaty, 1994 O.J. (L 243) 1, para. 73, which states the following:

Had they been challenged, the producers could as a result of this elaborate scheme of deception have attributed the series of uniform, regular and industry-wide price increases in
Nevertheless, many cartels spend a great deal of energy on coordinating price announcements. For example, international cartels in the vitamins industry coordinated announcements of price increases, including the designation of which company would lead the price increase. And one of the components of the rubber chemicals conspiracy was “issuing price announcements and price quotations in accordance with the agreements reached.”

Similar charges have been made against firms in sorbates, monochloroacetic acid and organic peroxides, polyester staple, high pressure laminates, amino acids, carbonless paper, cartonboard, and graphite electrodes.

Since prices are typically determined by a major industrial buyer through competitive procurements, the direct manipulation of those prices the cartonboard sector to the phenomenon of ‘oligopoly behaviour’. They could argue that it made sense for all the producers to decide of their own volition to copy an increase initiated by one or other of the market leaders as soon as it became publicly known; unlawful collusion as such would not necessarily be indicated. Customers might well suspect and even accuse them of operating a cartel; and given the relatively large number of producers, economic theory would be stretched to its limits and beyond, but unless direct proof of collusion were forthcoming—and they went to some lengths to ensure it was not—the producers must have had hopes of defeating any investigation into their pricing conduct by the competition authorities by invoking the defense of oligopolistic interdependence.


101. See William E. Kovacic, Robert C. Marshall, Leslie M. Marx, & Matthew E. Raiff, Bidding Rings and the Design of Anti-Collusion Measures for Auctions and Procurements, in HANDBOOK OF PROCUREMENT 381, 384 (Nicola Dimitri et al. eds., 2006) (noting that for many industrial cartels “the buyers obtain the commodity from cartel firms through ‘competitive’ procurements where the cartel members have rigged bids”); see also Laura Carpineti et
is a matter of bid-rigging by sellers, and given that many transactions do not occur at announced prices, even after the “effective” date, it is natural to wonder why oligopolistic firms go through such efforts regarding price announcements.

Sellers make price announcements to adjust buyers’ expectations in a publicly observable way and, as a consequence, lower buyer resistance to price increases. To illustrate this, consider two scenarios. In the first scenario, there are no price announcements, but buyers are confronted with surprisingly high prices at their competitive procurements. In the second scenario, the same bids are submitted by sellers, but in the weeks prior to the bidding, the sellers make similar price announcements with similar justifications for the price increase. Buyers will be more apt to resist the higher prices in the first scenario than in the second. In the second scenario, buyers can be more confident that all their competitors confront similar price increases, whereas in the first scenario they have no such assurance. In the first scenario, buyers need to take measures to assure that their firm is not comparatively disadvantaged. This outcome is consistent with the fact that all procurement divisions at major firms have limited budgets and must allocate scarce administrative resources over all of their acquisitions to procure a large number of factors at least cost, both in absolute terms and relative to their competitors. Any product market in which sellers regularly use price announcements is one in which sellers are fully cognizant of the fact that buyers will actively resist price increases if they are too high or unexpected.

Marshall, Marx, and Raiff emphasize the distinction between public price announcements and private notification by sellers to buyers. A buyer that receives private notification of a price increase may resist because of concerns that it is being disadvantaged relative to other buyers. A public announcement mitigates this concern.

Marshall, Marx, and Raiff characterize collusive price announcements in the vitamins industry as (1) made relatively more frequently than noncollusive price announcements; (2) occurring at somewhat regular intervals;
(3) being gradual in the sense of involving relatively modest individual price increases; (4) typically involving “joint announcements,” with one firm leading and others matching soon thereafter; and (5) typically having long lead times before the new price becomes effective.\textsuperscript{105}

The gradualism of price increases as well as the use of joint announcements and lead times before the effective date of the price increase each directly addresses buyer resistance. The value of gradualism is apparent in \textit{Electrical & Mechanical Carbon & Graphite Products},\textsuperscript{106} where cartel members faced buyer resistance because of the size of the price increase they announced.\textsuperscript{107} Joint announcements are valuable because if buyers observe that all the firms in an industry, or at least an important subset of firms in an industry, have announced identical price increases, they will be less likely to expect that aggressive price negotiations with the firms will be worthwhile.\textsuperscript{108} Lead times for the effective dates of public price announcements allow the cartel to monitor acceptance of the price increase and retract an announced increase that is heavily resisted by buyers before incurring disruptions in cartel market shares.\textsuperscript{109}

\begin{itemize}
\item \textsuperscript{105} Marshall et al., \textit{supra} note 18, at 763.
\item \textsuperscript{107} In addition, gradual price increases may reduce the probability that an illegal conspiracy to increase prices is detected. See Joseph E. Harrington, Jr., \textit{How Do Cartels Operate?}, 2 \textit{Found. & Trends Microeconomics} 1, 19 (2006).
\item \textsuperscript{108} See Commission Decision of 21 November 2001 Relating to a Proceeding Pursuant to Article 81 of the EC Treaty and Article 53 of the EEA Agreement, 2003 O.J. (L 6) 1, paras. 203–204. The decision states:
\begin{quote}
The parties normally agreed that one producer should first ‘announce’ the increase, either in a trade journal or in direct communication with major customers. Once the price increase was announced by one cartel member, the others would generally follow suit. In this way the concerted price increases could be passed off, if challenged, as the result of price leadership in an oligopolistic market.
\end{quote}
\textit{Id.}
\item \textsuperscript{109} Approximately 50 percent of the price announcements made by the vitamins cartel were made well prior to the effective dates for the price increases; however, in an earlier benchmark period in which explicit collusion was unlikely, only 5 percent of price announcements were made prior to the effective dates for the price increases. Marshall et al., \textit{supra} note 18, at 783. Because of the role that the preannouncement of price increases can play in supporting a collusive agreement, competition authorities have in certain cases prohibited the announcement of prices prior to their effective date. Such a prohibition was imposed on an association of sugar refiners in 1934 but reversed by the Supreme Court. \textit{See United States v. Sugar Inst., Inc.}, 15 F. Supp. 817, 908 (S.D.N.Y.1934), rev’d, 297 U.S. 553 (1936). More recently, a prohibition on advance price announcements was included in the 1967 consent agreement in \textit{United States v. Pennsalt Chemical Corp.}, 1967 Trade Cas. (CCH) ¶ 71,982 (E.D. Pa. 1967). In addition, in \textit{In re Ethyl Corp.} (1979–1983 Transfer Binder) Trade Reg. Rep. (CCH) ¶ 21,856, \textit{enforcement denied sub nom. E.I. Du Pont de Nemours & Co. v. FTC}, 729 F.2d 128 (2d Cir. 1984), the Federal Trade Commission found that advance announcement of price changes had an anticompetitive effect.
\end{itemize}
Now turn to the actual bidding that occurs at the competitive procurements of the buyers. Identical bids can arise in many noncollusive environments. Further, it is difficult to imagine that participants in an explicit cartel would assemble in a hotel room and determine that the right procurement decision was to submit identical bids. The primary way to determine whether any bids at a procurement, or a set of procurements, came from an explicit cartel requires a benchmark that is considered noncollusive. A benchmark could be a time period, a geographic region, or a related but separate product. The analytic requirements are substantial when evaluating bid data relative to a benchmark. If that analysis is done well, the results can constitute a super plus factor—that is, actions or conduct (in this case, pricing) that are highly unlikely to occur in the absence of a collusive agreement. One way to do this analysis well requires that a reliable predictive econometric model be estimated for a benchmark, usually a time period, where conduct is thought to be noncollusive. The predictive model would account for those demand and cost factors specific to the product market that are not potentially manipulable by a cartel (and only those factors), and it would similarly account for industry characteristics that are not potentially manipulable by a cartel. This model would be used to predict prices during a time period in which there was a suspicion of collusion. If actual prices fall outside the range of prices that would have prevailed under the noncollusive benchmark, with the range determined by a specified high confidence level, then this outcome would constitute a super plus factor.

B. Quantity Restrictions

If we think of an industry-wide demand curve for the product in question, a cartel elevates price and reduces quantity relative to what would be accomplished if the sellers simply act as oligopolists in a repeated game without explicit collusion. A reduction in quantity often does not require even the mention of quantity by cartel members. Commitment to an increase in price along with a commitment to a market share allocation rule is all that a cartel needs to implement a supply restriction—nothing needs to be discussed about supply because the market share allocation accomplishes the supply restriction.

There are industries in which explicit restrictions in supply are needed for the implementation of the cartel agreement. As a well-known example, the Organization of the Petroleum Exporting Countries ("OPEC") cartel operates by establishing petroleum output limits for its member countries. By suppressing output of oil, they increase the market-clearing price for oil above what it would have been without the constraints. Likewise, the role of quantity reductions to increase prices is well understood by governmental agricultural price-support programs that pay farmers not to grow certain

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110. "Super plus factors" are defined more precisely below.
crops or to leave fields fallow. Recently, a produce wholesaler filed a suit claiming that the United Potato Growers of America and others “conspired to manipulate potato prices by controlling and reducing supply, taking coordinated steps including agreeing to limit potato planting acreages, to pay off farmers to destroy potatoes or not grow additional potatoes, and to diminish the overall number of potatoes available to direct purchasers.”\(^\text{112}\)

Reduced supply is often observed at the trough of a business cycle as a natural part of unilateral conduct in response to reduced demand in a recession. Supply restrictions that stem from a cartel agreement provide weaker evidence of collusion at the trough of a business cycle than if the same conduct occurred at the peak of economic activity. Restrictions in supply by subsets of firms when demand is strong, profits are high, and prices are relatively high, however, leads to the strong inference of collusion—namely, it is a super plus factor—for two reasons. First, there are substantial foregone profits from restricting supply when demand is strong. Second, buyers will take measures to resist price increases in such an environment, and it is quite unlikely that unilateral conduct by sellers would not take advantage of the opportunity to sell incremental units at high prices.

C. Internal Incentive Shifts

When a cartel forms, the firms participating in the conspiracy cannot issue a memorandum to all staff about the fact that upper management has opted to suppress interfirm rivalry through an agreement with other sellers. The issue of sales force incentives arose for the cartel in *Amino Acids*:

During this meeting, ADM alluded to the importance of a company controlling its sales force in order to maintain high prices, and explained that its sales people have the general tendency to be very competitive and that, unless the producers had very firm control of their sales people, there would be a price-cutting problem.\(^\text{113}\)

Cartel firms may likely find that they need to change the incentives of their sales force after the inception of the cartel in order to comply with the agreement. In the precartel period, many sales forces have incentives to pursue increases in market share. Such incentives run counter to cartel allocation agreements.

Consider a market share allocation. A sales force that has incentives to pursue increased market share will put upper management in a difficult position with respect to other cartel firms because the sales force will drop prices to secure incremental business, both of which are likely violations of the cartel agreement. To rectify this internal issue, cartel firms will often change the incentives of their sales forces to comply with “price before


This means that the sales force will be rewarded for maintaining prices at relatively high levels and will not be rewarded for gaining market share. In an industry where the product made by different firms is largely homogeneous, this kind of shift in the incentives of a sales force could not be justified as a unilateral noncollusive action. If a firm unilaterally acted in this manner, it would likely find itself losing market share to rivals at a remarkable pace. Buyers who resist price increases would shift away from such a firm to other sellers who were still pursuing increases in market share. In an industry where the product made by different firms is largely homogeneous, a shift in the incentives of sales forces across firms in an industry to “price before volume” leads to the strong inference of explicit collusion—namely, it is a super plus factor.

D. Allocation of Collusive Gains

The allocation of collusive gains can occur through a market share agreement, a customer allocation, a geographic allocation, or some combination of these. As noted above, a market share agreement is used to implement the supply restriction and not just to divide the collusive gain. If a firm sells more than its market share allocation, then it must be that some other firms are below their market share allocations. In this case, the firm selling too much will be required to buy product from a firm selling too little at cartel prices at the end of the year. The underselling firm is thus made whole while the overselling firm incurs a penalty for overselling—buying product at cartel prices that it could produce at much lower cost. Observationally, each of the allocations has an implication—stable market shares for a subset of firms, no customer churn, and certain regions being serviced only by specific firms, respectively. But each of these implications may arise as part of noncollusive conduct by oligopolists in a repeated game setting.

However, strong buyer resistance when firms act without explicit collusion will produce more variability in market shares, the sellers that customers select, and the penetration of geographic regions by sellers, than when firms act with explicit collusion. In the face of relatively high or rising prices, we expect stronger buyer resistance and thus more variability in these three measures when firms act noncollusively. If these measures actually become more stable and have less variability when prices are relatively high or rising, especially when firms have excess capacity,

\begin{quote}
114. See Commission Decision of 21 November 2001 Relating to a Proceeding Pursuant to Article 81 of the EC Treaty and Article 53 of the EEA Agreement, 2003 O.J. (L 6) 1, para. 200 (’In their ’top-level’ meeting in Zurich in September 1989, the divisional chairmen of Roche, BASF and Rhône-Poulenc had agreed to a policy of ’price before volume.’ ’). Furthermore, ’[w]hile Managers are instructed to hold the worldwide market at 48%, they are ordered to put ’price target before quantity/market share target: do not overshoot quantity by not achieving price target’ c.f. the ’price before tonnage’ maxim.” Id. para. 207. This “price before tonnage” policy is not unique. See, e.g., Commission Decision of 13 July 1994 Relating to a Provision Under Article 85 of the EC Treaty, 1994 O.J. (L 243) 1, paras. 51–52 (discussing a similar policy).
\end{quote}
then this is a super plus factor and leads to the inference of explicit collusion.\textsuperscript{115}

E. Redistribution of Gains and Losses

Cartels will often need to redistribute gains and losses to maintain their agreements. In some circumstances, the observation that one seller buys output from another seller at market prices leads to the strong inference of collusion, such as when each seller has excess capacity, the product made by each seller is physically identical, and the value-to-weight ratio of the product is high. These types of transactions are consistent with “true-ups” to comply with the terms of a market share agreement in which one firm has produced more than its share while others have produced less.\textsuperscript{116} In addition, if one seller buys anything from another at nonmarket prices, then a resource transfer is made for which there is no reasonable noncollusive explanation. Other transactions require scrutiny, such as patent licensing, cross-licensing, and patent pools, as well as the settlement of seemingly frivolous lawsuits.\textsuperscript{117} In summary, if firms engage in interfirm transfers of resources that are largely void of productive unilateral motivations for one or both of the parties, then these transactions are super plus factors.

F. Communication and Monitoring

Communication is a central part of the operation of a cartel.\textsuperscript{118} We are concerned with communication that reflects the ongoing nature of the conspiracy. In general, if a seller (receiver) knows something about another seller (sender) an immediate question arises: Was there no legitimate unilateral function for the sender in communicating such information to the receiver? Overall, information is a valuable commodity. For one seller to know information about a rival is to give that seller a competitive advantage. A competitor has no unilateral interest in disadvantaging itself relative to its rivals.

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{115} However, the inference is weaker if the sellers function at full capacity rather than with excess capacity when prices are rising. But collusive sellers who understand that this weakens the inference may be able to manipulate capacity utilization to give the appearance of full capacity.
\item \textsuperscript{116} True-ups are described in the European Commission decision in Vitamins. For example, when Rhône-Poulenc did not meet its market share target, “the other two European, producers would purchase product from it to compensate for the shortfall. Compensating purchases were made by Roche in 1996 and by Roche and BASF in 1997.” Commission Decision of 21 November 2001 Relating to a Proceeding Pursuant to Article 81 of the EC Treaty and Article 53 of the EEA Agreement, 2003 O.J. (L 6) 1, para. 225.
\item \textsuperscript{117} It is a relatively simple matter for firms in an oligopoly to engage in contractual relationships with regard to a broad range of activities, many of which are completely meaningless from a productivity standpoint, and to use allegations of contract breach, and ensuing settlements, to legitimize cartel side payments.
\item \textsuperscript{118} See generally Page, supra note 4; Page, supra note 25.
\end{itemize}
\end{footnotesize}
Suppose one seller knows the customers who purchased from another seller in the past quarter and knows the price and quantity of each transaction with each customer during the past quarter. The receiver will argue that it wants to know these things in a competitive marketplace and that it cannot be expected to ignore such information when it comes to its attention. However, why would the sender convey such information? Sloppiness and incompetence in the management of critical business information are not legitimate reasons. The sender may argue that it did not convey the information, but rather that each buyer gave this information to the receiver. But how would a buyer gain by conveying information to a nonawardee about the terms offered by an awardee? In the absence of direct evidence that such conveyances were made, it is reasonable to assume that the sender transmitted the information to the receiver. But the sender would have no unilateral self-interest in doing so. Thus, the motivation must be explicit collusion, and there must be an expectation of reciprocation.

With regard to firm-specific production information, again there is no reasonable explanation for such a conveyance by a noncollusive seller to another noncollusive seller. Unilateral knowledge of a rival’s capacity utilization, inventory levels, or production costs will increase expected returns in any competitive bidding process. The conveyance of firm-specific production and sales information is important for monitoring compliance with many cartel agreements. For example, market share allocations require knowledge of exactly this kind of information, as well as the ability of cartel members to verify such information. Sometimes cartels will use trade associations, export associations, or outside consultants to convey this information among themselves.

Other information conveyances also yield a strong inference of explicit collusion. One example is knowledge of transactions between two sellers by a third seller. If one seller buys a large amount of product from another seller, there is no reasonable noncollusive reason for a third seller to be aware of such a transaction. From a cartel perspective, however, every member wants assurance that the transactions necessary for the peaceful, stable maintenance of the cartel agreement have occurred between members.

Overall, each of the three information conveyances discussed above lead to a strong inference of collusion among the sender and receiver sellers, and thus each is a super plus factor.

G. Enforcement

Because courts will not enforce cartel agreements, a cartel must devise enforcement mechanisms and threats. A common threat is to hold excess capacity, but excess capacity is often observed in industries without collusion. The economics literature devotes much attention to the threats required to enforce outcomes in repeated games. What distinguishes those threats and enforcement mechanisms from the ones we would observe with explicit collusion? Cartels from the early 1900s often required members to post bond with the central committee of the cartel. A firm would forfeit its bond if it
had been deemed to have violated the cartel agreement. This kind of obvious paper trail appears to be largely absent from modern cartels. Overall, it seems that modern cartels are more focused on monitoring, communication, and redistribution so as to prevent breakdowns in cartel discipline than on some punishment. A cartel’s demise implies a return to a standard oligopoly repeated game. The ensuing drop in the price level is consistent with such a breakdown, but it may be consistent with many noncollusive factors as well.

**H. Dominant-Firm Conduct by Cartels**

Many cartels struggle to suppress interfirm rivalry and remain continually focused on solving that problem. Other cartels reach a peaceful and concordant equilibrium, and essentially act as a single firm in the marketplace. Once a cartel has solved the issues associated with suppression of interfirm rivalry and can act as a single firm, it looks to other ways to increase profits. One of these other ways is to adopt dominant-firm conduct. Relevant conduct may include predation against noncartel producers, exclusive dealing, or other kinds of monopolization activities. This kind of conduct is relatively easy to observe and, if no member of the cartel is large enough to undertake dominant-firm conduct, it is an indication of the presence of a cartel. In other words, dominant-firm conduct by firms in an industry where there is no one dominant firm leads to the inference of collusion. The strength of the inference depends on the conduct as well as the product/industry/market.

A typical section 2 investigation begins with determining whether there is a dominant firm in the industry. If so, then specific dominant-firm conduct is analyzed to determine if it is anticompetitive. In contrast, we begin with the determination that there is no dominant firm in the industry, and then inquire whether there are specific conducts that are typically associated with dominant firms, regardless of whether the conduct is pro- or anticompetitive. We draw the inference of a cartel from the presence of that conduct.

Of course, some conduct that is the focus of section 2 investigations can be undertaken legitimately by smaller firms in an industry. Thus, the observation of dominant-firm conduct, by itself, does not necessarily imply collusion. But there are two general guideposts that can be used to strengthen the inference. First, is the conduct something that would be defeated by competitive forces? Consider an industry with three firms that each have 33

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119. The International Steel Cartel established a “common fund.” George W. Stocking & Myron W. Watkins, Cartels in Action: Case Studies in International Business Diplomacy 183 (1946). The Aluminum Alliance used “guarantee deposits,” which were in proportion to the firms’ sales quotas. Id. at 231–32. The incandescent electric lamp cartel required the deposit of “indemnity funds” established for cartel purposes. Id. at 337.

120. See, e.g., Randal D. Heeb et al., supra note 68 (analyzing dominant firm conduct). New research has shown that once cartels are concordant in that they have suppressed interfirm rivalry, they then act as dominant firms. See Marshall, Marx & Samkharadze, supra note 84.
percent of the market and one firm that has 1 percent of the market. Suppose the three large firms control a critical factor input that the small firm needs for production. If one of the large firms refuses to sell to the small firm, but it is profitable for either of the other two large firms to sell to the small firm, it is unlikely that the refusal will continue in light of the competitive pressure from the other two large firms. Second, if conduct has industry-wide benefits, such as entry deterrence, it may be too costly for a single firm to undertake the conduct. Furthermore, if one firm undertakes the activity on its own, then it is automatically disadvantaged relative to rivals since it bears a cost that rivals did not, yet all share equally in the benefit.

With these guideposts in mind, the strongest inference of collusion comes from joint vertical foreclosure where, again, there is no dominant firm in the market. Bundling, tying, predation, and exclusive dealing can be compelling evidence of collusion depending on the product/industry/market. In general, if a subset of firms have sufficient market power in the aggregate and jointly engage in a dominant-firm conduct where no single firm has the market power to act unilaterally as a dominant firm, then there is a strong inference of a cartel—and thus such conduct is a super plus factor.

I. Cartel Response to Factors Identified as Super Plus

If collusive firms come to understand that super plus factors will be used by courts to infer section 1 violations, then colluding firms will try to avoid conduct that creates super plus factors. But to avoid super plus factors greatly encumbers the profitability and stability of a cartel, perhaps even deterring the conspiratorial conduct. For example, if cartels come to understand that interfirm transfers will be treated as super plus factors, then they will either need to avoid these transfers or further disguise them. The avoidance of such transfers can greatly increase the monitoring burden of a cartel. Specifically, the absence of interfirm transfers requires a market share cartel to have no year-end deviations from the agreed-on shares. Moreover, if the absence of market share variability in the face of relatively high or increasing prices and profits is treated as a super plus factor, then cartel firms will be forced to artificially manufacture market share volatility. This greatly threatens a market share cartel, especially if interfirm transfers are no longer possible. In a homogenous product industry, cartel cohesion could be disrupted if firms had to leave the incentives of the sales force intact so that the sales force could continue to pursue market share gains instead of enforcing higher price levels. Overall, because super plus factors are actions or outcomes that would almost never be observed in the absence of collusion, it is reasonable to presume that the cartel finds these conducts or outcomes important to the implementation and operation of the collusive structures.

IV. Inferences Based on Plus Factors

Detecting a cartel is much like diagnosing whether a disease is present. The plus factors are symptoms that can make the diagnosis more reliable. In
medicine, there are definite rules for arriving at a diagnosis based on the presence or absence of given symptoms. If these rules are useful in medical matters of life and death, they should also be useful in legal matters involving potentially vast sums of money and the health of firms and markets because the underlying principles are the same.

The rules we just alluded to are not rules of thumb, but are embodied in a precise mathematical formula for probabilities set forth almost 250 years ago by Thomas Bayes. In the context of cartels, as in any legal setting, certainty is not always possible. Instead, uncertainty is common. Uncertainty can be measured by probabilities. Probabilities are numbers between 0 and 1, inclusive, that indicate the likelihood of an event.

We are interested in whether a cartel was operating given the evidence. We write the probability of this as

\[ P[\text{collusion} \mid \text{evidence}] \]

or just \[ P[C \mid E] \]. When \[ P[C \mid E] \] is close to 1, the evidence indicates that a cartel was almost certainly operating. When it is close to 0, the evidence indicates a cartel was almost certainly not operating.

Consider how the evidence of plus factors can be used to assess \[ P[C \mid E] \]. Suppose our evidence consists of just one plus factor. As a shorthand, write this as \( F \) (\( F \) is for “factor”). We would like to know the probability that a cartel was operating, given the evidence provided by the plus factor, \( F \)—that is, \( P[C \mid F] \). According to Bayes’ Theorem,

\[ P[C \mid F] = \frac{P[F \mid C] \times P[C]}{P[F \mid C] \times P[C] + P[F \mid \neg C] \times P[\neg C]} \]

where \( \neg C \) denotes the event “no collusion,” so that \( P[F \mid \neg C] \) is the probability of observing plus factor \( F \) given that there is no cartel.

The elements of this formula all have natural interpretations and can be computed more or less accurately from economic knowledge and/or experience. There are four different elements on the right side of the equation. We tackle each in turn.

The simplest element is \( P[C] \). This is the “baseline” probability that a cartel was operating, in the absence of any evidence about firm conducts. \( P[C] \) typically depends on the product/industry/market. For example, for certain chemical products \( P[C] \) might be quite high, while for certain agricultural products it might be quite low. In addition, \( P[C] \) presumes that parallel conduct, often in pricing, has already been observed.


122. Applying the definition of conditional probability gives \[ P[C \mid F] = \frac{P[C \cap F]}{P[F]} = \frac{P[F \mid C] \times P[C]}{P[F]}. \] The law of total probability states that \[ P[F] = P[F \mid C] \times P[C] + P[F \mid \neg C] \times P[\neg C]. \] Substituting this last expression for \( P[F] \) in the denominator of the expression obtained from the definition of conditional probability gives Bayes’ Theorem.

123. It would be more precise to introduce as formal conditioning arguments the structural characteristics of a product/industry/market that predate the cartel or are outside the cartel’s potential control or influence, along with parallel conduct (most likely pricing) but we
of illustration, suppose \( P[C] \) is .25 (baseline odds of three to one against a cartel operating).

The next simplest element is \( P[\text{not } C] \). This is the baseline probability a cartel was not operating.\(^{124}\) We always have \( P[\text{not } C] = 1 - P[C] \), so once we know \( P[C] \), we also know \( P[\text{not } C] \). If the baseline probability that a cartel was operating is .25, then the baseline probability that it was not operating is .75 = 1 – .25.

The next element is \( P[F | C] \). This is where the plus factor is first taken into account. It represents the probability of observing the plus factor given that a cartel was operating. For example, suppose that the plus factor is the evidence that one or more of the alleged conspirators changed intrafirm sales incentives to “price before volume.” We can estimate \( P[F | C] \) as the proportion of the time that a known cartel changed incentives in this way. Suppose we observe this conduct in about 15 percent of relevant cartels. Then \( P[F | C] = .15 \).

The information provided by a plus factor is not determined only by the probability of observing that factor given the cartel. The final and crucial determinant of the plus factor’s worth is whether it distinguishes cartel behavior from noncartel behavior. This is determined by the last element in the formula, \( P[F | \text{not } C] \). This probability represents the probability of observing the plus factor given that a cartel was known not to be operating. Economics can often play a crucial role in assessing this value. Specifically, suppose the behavior is one in which a noncollusive rational competitor would be highly unlikely to engage, such as “price before volume” sales incentives. Then \( P[F | \text{not } C] \) is quite small. Other behaviors with this property, depending on the product/industry/market, can be information conveyance, interfirm purchases at nonmarket prices, and dominant-firm conduct.

These latter examples clearly illustrate the concept of super plus factors: specifically, super plus factors are actions or conduct that could occur in the presence of a collusive agreement but that are highly unlikely to occur in its absence. Super plus factors necessarily have the property that \( P[F | \text{not } C] \) is quite small.

Now put together the pieces. If \( P[F | \text{not } C] = .001 \), then from the formula above, we get

\[
P[C | F] = \frac{(.15 \times .25)}{(.15 \times .25 + .001 \times .75)} = .9804
\]

Because this plus factor is one that would almost never be observed in a noncollusive environment but that can occur in a collusive environment, we have a high degree of certainty (.9804) that a cartel was operating given this plus factor.

\(^{124}\) This probability implicitly conditions on all the same product/industry/market structural elements and parallel conduct (most likely pricing) that are in \( P[C] \).
Now consider a different plus factor, say, stable market shares. Suppose we observe stable market shares in relevant cartels two-thirds of the time, so that $P[F \mid C] = .667$. Suppose we observe stable market shares in noncollusive markets one-fifth of the time, so that $P[F \mid \neg C] = .2$. Using Bayes’ Theorem gives

$$P[C \mid F] = ((.667 \times .25) / (.667 \times .25 + .2 \times .75)) = .5264.$$  

Now the evidence for cartel operation is not nearly as strong. Nevertheless, the evidence of this plus factor shows that it is more likely (.5264) than not (.4736) that a cartel was indeed operating.

As these examples suggest, the strength of a plus factor is governed by the relation between $P[F \mid C]$ and $P[F \mid \neg C]$. We let $S$ represent the “strength” of a plus factor, calculated as the ratio

$$S = P[F \mid C] / P[F \mid \neg C].$$

In our first example (price before volume), we had $S = .15/.001 = 150$. In our second example (stable market shares), we had $S = .667/.2 = 3.33$. This directly shows the contrast between super plus factors (large $S$) and non-super plus factors (moderate $S$).

We can relate $P[C \mid F]$ directly to plus factor strength, $S$, by making use of the baseline odds against a cartel,

$$O = P[\neg C] / P[C].$$

A little math then gives

$$P[C \mid F] = 1 / (1 + O/S).$$

In our example, we have $P[\neg C] = .75$ and $P[C] = .25$, which gives $O = 3$ (baseline odds of three to one against a cartel).

From this relationship between $P[C \mid F]$ and $S$, we see that whenever $S$ increases, so does $P[C \mid F]$, the probability of a cartel given the plus factor. And whenever $S$ decreases, so does $P[C \mid F]$, which justifies calling $S$ a measure of plus factor strength. We can also check that when $S = 1$ (unit strength), then $P[C \mid F] = P[C]$. Accordingly, $F$ is formally defined to be a plus factor if and only if $S > 1$, because this is mathematically equivalent to the condition that taking $F$ into account increases the likelihood of a cartel having operated—that is, $P[C \mid F] > P[C]$ if and only if $S > 1$.\footnote{In fact, there are also “minus” factors. These have $S$ less than one and are associated with behaviors that are more likely to be engaged in by noncolluders than by colluders.}

Plus factors are typically not observed in isolation. Just as there may be multiple symptoms in medicine, there may be multiple plus factors in cartel matters. Given the life-or-death stakes in medicine, multiple symptoms cannot be ignored or their information wasted; the same should be true in law. Thus, whether in medicine or in law, the proper way to treat multiple diagnostic factors is as a constellation, rather than in isolation. To see this, note that a particular constellation of symptoms can confirm or rule out a particular diagnosis that individual symptoms by themselves cannot resolve. The
necessity in law of looking at the entire cluster of factors is precisely the principle articulated in Continental Ore Co. v. Union Carbide & Carbon Co. 126

Mathematically, the information provided by a constellation of plus factors is properly accounted for by treating the joint occurrence of the plus factors as if this were a single plus factor. That is, when \( k \) plus factors, \( F_1, \ldots, F_k \), are observed, we let

\[
F = F_1 \text{ and } F_2 \ldots \text{ and } F_k.
\]

With this convention in place, the remaining formulas remain unchanged. The challenge comes in determining the strength \( S \) of the plus factor constellation.127 The particulars can vary from case to case. Nevertheless, economic experience and knowledge can often be applied to determine that the combination of plus factors increases strength beyond what one might obtain from a single plus factor. In fact, such a group or constellation can be a super plus factor even when none of the individual plus factors that make up the constellation is itself a super plus factor.

A. Plus Factor Categorization

To explore further the implications for this way of thinking about plus factors, assume that a court, in the absence of any direct evidence of a conspiracy, requires that the probability of collusion given the economic circumstantial evidence be greater than 90 percent in order to reach a guilty verdict in a criminal trial.128 Given this hurdle for the probability of collusion, the probability of collusion given the economic circumstantial evidence must be at least

\[
P(C \mid F_1, F_2) = 1 / (1 + O_d / S_1),
\]

where \( O_d = P[\text{not } C \mid F_1] / P[C \mid F_1] \) is the odds against a cartel given plus factor \( F_1 \) and \( S_1 = P[F_2 \mid C, F_1] / P[F_2 \mid \text{not } C, F_1] \) is the strength of plus factor 2 given plus factor 1.

In the general case of \( n \) plus factors, \( F_1, \ldots, F_n \), then

\[
P(C \mid F_1, \ldots, F_n) = 1 / (1 + O_d \cdot S_1 \cdot \ldots \cdot S_{n-1}),
\]

where \( O_{n-1} = P[\text{not } C \mid F_1, \ldots, F_{n-1}] / P[C \mid F_1, \ldots, F_{n-1}] \) is the odds against a cartel given \( n-1 \) plus factors and \( S_{n-1} = P[F_n \mid C, F_1, \ldots, F_{n-1}] / P[F_n \mid \text{not } C, F_1, \ldots, F_{n-1}] \) is the strength of plus factor \( n \) given plus factors 1, \ldots, \( n-1 \).

As a mathematical property, adding plus factor \( n \) increases the inferred probability of collusion, that is, \( P(C \mid F_1, \ldots, F_{n-1}) > P[C \mid F_1, \ldots, F_{n-1}] \) if and only if the strength of plus factor \( n \) given plus factors 1, \ldots, \( n-1 \) is greater than one, \( S_{n-1} > 1 \). The plus factor strengths can be related to one another through the recursive formula, \( S_{n-1} = S_n / S_{n-1} \), where \( S_n = P[F_1, \ldots, F_n \mid C] / P[F_1, \ldots, F_n \mid \text{not } C] \).

126. See supra note 65 and accompanying text.

127. When many plus factors operate together, this can in principle result in the combination being either stronger or weaker than any single factor as an indicator of cartel operation. More specifically, as defined above, \( P[C \mid F_1] = 1 / (1 + O_d / S_1) \), where \( O_d = O = P[\text{not } C] / P[C] \) is the odds against a cartel given zero plus factors, and \( S_1 = P[F_2 \mid C] / P[F_2 \mid \text{not } C] \) is the strength of plus factor 1. With two plus factors, \( F_1 \) and \( F_2 \), then

\[
P(C \mid F_1, F_2) = 1 / (1 + O_d / S_1),
\]

where \( O_d = P[\text{not } C \mid F_1] / P[C \mid F_1] \) is the odds against a cartel given plus factor \( F_1 \) and \( S_1 = P[F_2 \mid C, F_1] / P[F_2 \mid \text{not } C, F_1] \) is the strength of plus factor 2 given plus factor 1.

128. As a rough approximation, we can translate general legal standards into percentage probabilities. For a finding of guilt in a civil matter, assuming no direct evidence of a conspiracy, the probability of collusion given the economic circumstantial evidence must be at least
sion, we can ask what strength would be required of an individual plus factor in order for the 90 percent threshold to be passed conditional on the observation of that single plus factor. For example, suppose a particular factor $F_1$ has a strength of $S_1 = 10$. This means the factor is ten times more likely conditional on collusion than conditional on no collusion. Suppose we assume a baseline of even odds for collusion so that $O_0 = 1$. (Note the change: in our earlier discussion, we had $O_0 = 3$.) It then follows from Bayes’ Theorem that the probability of collusion given that factor is

$$P[C \mid F_1] = 1 / (1 + O_0/S_1) = 1 / (1 + 1/10) = 91\%.$$ 

Thus, this factor would be sufficient for the inferred probability of collusion to exceed 90 percent.

We can define a somewhat less strong set of plus factors to contain those plus factors such that the observation of two plus factors from this set is sufficient to conclude that the probability of collusion is at least 90 percent, assuming the two plus factors are conditionally independent, that is, their strengths are independent so that $S_{21} = S_2 = P[F_2 \mid C] / P[F_2 \mid not C].$ We refer to these plus factors as level-two plus factors and denote a level-two plus factor by $F^2$. A plus factor would be level two if it has a strength of $S = 4$, so that it is four times more likely conditional on collusion than conditional on no collusion, assuming a baseline of an even chance of collusion. To see this, note that when $O_0 = 1$, two conditionally independent plus factors each with a strength of four deliver a probability of collusion that exceeds 90 percent:

$$P[C \mid F_1, F_2] = 1 / (1 + O_1/S_{21}) = 1 / (1 + (1/4) / 4) = 94\%,$$

where $S_{21} = S_2 = 4$ and $O_1 = P[not C \mid F_1] / P[C \mid F_1] = O_0/S_1 = 1/4$.

Similarly, one can consider how many plus factors one would need to reach the 90 percent threshold if the plus factors were independent and each were three times more likely conditional on collusion than on no collusion. The results are summarized in the table below.
TABLE 1
PLUS FACTOR CATEGORIZATION

Conditions to exceed a 90 percent probability of collusion assuming baseline odds against collusion of $O_0 = 1$ and conditional independence

<table>
<thead>
<tr>
<th>Plus factor strength</th>
<th>Number of plus factors required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super plus factor</td>
<td>$F^1$</td>
</tr>
<tr>
<td>Level-two plus factor</td>
<td>$F^2$</td>
</tr>
<tr>
<td>Level-three plus factor</td>
<td>$F^3$</td>
</tr>
<tr>
<td>Level-four plus factor</td>
<td>$F^4$</td>
</tr>
</tbody>
</table>

Although the analysis based on Bayes’ Theorem can in theory be used to calculate the exact probability of collusion given a particular constellation of plus factors, this table provides a way to categorize plus factors into distinct categories based on the number of times more likely it is to observe the plus factor conditional on collusion than on no collusion.\textsuperscript{130} The different levels of plus factors allow a loose interpretation that a level-$k$ plus factor would require $k$ plus factors in order for the inference of collusion to exceed 90 percent. Given more detailed information about the interactions between plus factors, one could take that information into account using a more sophisticated analysis. But even without such information, this categorization emphasizes the value of considering constellations of plus factors rather than artificially focusing on the implications of plus factors on an individual basis.

We emphasize that this categorization of plus factors applies to a 90 percent threshold, which we assume appropriate for criminal proceedings. For civil cases, presuming a 50.1 percent probability threshold would apply, when the baseline odds of collusion are even, $O_0 = 1$, the plus factor strengths required to reach each given level are close to one.\textsuperscript{131}

B. Estimating Probabilities

The aforementioned probabilities can emerge from economic theory. For example, theory can tell us that the strength $S$ of a plus factor is high if the plus factor is highly unlikely to emerge from noncollusive conduct. Thus, economics alone can provide us with super plus factors. But for many plus factors, it is not the case that theory provides such stark implications for the probabilities in question. For example, if $F$ is “fixed and temporally stable market shares,” then theory does not provide us with a definite statement about the plus factor’s strength independent of the specific product/industry/market. As an example, consider the linerboard

\textsuperscript{130} This table is for the specific value $O_0 = 1$. An analogous table can be constructed for any other specified value of $O_0$.

\textsuperscript{131} In order to meet a threshold probability of 50.1 percent given baseline odds of collusion of $O_0 = 1$, one need only have one plus factor with a strength of at least 1.004.
industry. Linerboard is produced by machines that run at a single speed for twenty-four hours a day, seven days a week. Machines typically are turned off for maintenance for ten days per year. Production market shares will be essentially fixed and stable in such an industry without any collusion, so the strength of the factor “fixed and temporally stable market shares” would be low. Alternatively, in the vitamins industry where production is more variable, relatively fixed and stable production market shares are relatively less likely without explicit collusion. In this case, the strength of the factor is high.

We could enumerate all cartel decisions by the Department of Justice and European Commission in recent years and identify a number of conduct by the cartels for each case. However, this will almost surely not provide useful information about the strength $S$ of various plus factors. First, none of the cases have anything to do with noncollusive conduct; these are apprehended cartels. Second, apprehended cartels are only a subset of the set of cartels $C$. If apprehension is not random, then there is an unknown bias in extrapolating from the apprehended cartels to all cartels. Third, as noted above, the strength $S$ of a plus factor is a function of the specifics of the product in question, including the specifics of the market and the industry that makes the product. Aggregating over different products, different markets, and different industries to construct measures of plus factor strength is not sensible.

If aggregation over products/industries/markets is not sensible, then, except for some super plus factors, we are left assessing plus factor strength for a given product/industry/market. For a given product/industry/market, for example, stable market shares during a period of price increases may be viewed as a strong plus factor if buyers vigorously resist price increases, but it may be viewed as a weak plus factor if buyer resistance is weak or nonexistent.

C. Harms from Decisions and Types of Errors

In the previous Section, we considered specific probability thresholds relevant to findings of criminal, civil, or FTC section 5 liability. Use of such probability thresholds to test liability balances the harms associated with the possible ways that a decision can be wrong. In the contexts where these tests apply, there are two ways a decision can be wrong: (1) a party can be found liable when in fact they are not (a “Type I Error”) or (2) a party can be found nonliable when in fact they are (a “Type II Error”).

To see how this balance works, suppose the harm associated with a Type I Error is some number, $h_1$, whereas the harm associated with a Type II Error is $h_2$. It is convenient and appropriate to think of $h_1$ and $h_2$ as dollar amounts. Suppose also that the probability of collusion, based on all the evidence $E$ is $p = P(C \mid E)$. Then the expected harm of a finding of liability can be shown

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132. Linerboard is the brown, flat outer layer on cardboard boxes and packaging.

133. Note that here we reference production market shares, not sales market shares.
to be the harm, $h_1$, multiplied by the probability that there was no collusion given the evidence, $(1 - p)$—that is, the expected harm of a finding of liability is $(1 - p)h_1$. Similarly, the expected harm of a finding of no liability equals $ph_2$. Applying the principle of choosing the decision that results in the least expected harm, it follows that a finding of liability should be returned when (and only when)

$$(1 - p)h_1 < ph_2.$$ 

After a little algebra to rearrange this inequality, it follows that a finding of liability should be returned when

$$p > 1 / (1 + h_2/h_1).$$

The term on the right represents the probability threshold required for a finding of liability. This means that any probability threshold, such as .9 (criminal), .501 (civil), or .4 (FTC section 5), corresponds to a specific harm ratio, $h_2/h_1$, that balances the harms.

For example, consider the harm ratio corresponding to the criminal liability test, .9. Setting $1 / (1 + h_2/h_1) = .9$ and solving for $h_2/h_1$, we obtain $h_2/h_1 = .111$. This says that the .9 criminal threshold embodies the view that the harm of finding an innocent party criminally liable is nine times greater than the harm of finding a guilty party not criminally liable.

A similar computation shows that the harm ratio corresponding to the civil test (.501) embodies the view that the two harms are about the same ($h_1 = 1.004h_2$). On the other hand, suppose the threshold for an FTC section 5 test is .4. Since .4 is less than .5, this embodies the view that the harm $h_1$ of a liability finding in the absence of a true violation is less than the harm $h_2$ of finding no liability in the presence of a true violation. With a .4 threshold, the harm ratio implies $h_1 = .667h_2$.

A significant implication of this analysis is that real-world applications of fixed probability thresholds may or may not accurately reflect the true underlying relative harms corresponding to the two different decision errors for a given matter. This may lead to decisions that violate the principle of least expected harm; however, such fixed thresholds have the considerable virtue of practicality in situations in which the true harm ratio $h_2/h_1$ may not be easy to determine.

We close this Section by noting that the analysis of harms relates directly to plus factors. Specifically, some algebra shows that a liability finding that results in the least expected harm occurs when (and only when) the plus factor strength, $S$, exceeds the inverse harm ratio, $h_1/h_2$, multiplied by the baseline odds, $O$; that is, when $S > (h_1/h_2)O$.

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134. This follows from elementary rules of probability and the calculation of expected values, assuming, as is standard and appropriate, that the harm associated with a correct decision of liability or no liability is zero.

135. $(1 - p)h_1 < ph_2$ implies $h_1 < p(h_1 + h_2)$. This implies $p > h_1 / (h_1 + h_2)$, which gives the result above.
The resolution of many antitrust cases hinges on the determination of whether observed conduct is the product of unilateral behavior or collective action. In a large number of disputes, the plaintiff seeks to establish the fact of concerted conduct by way of circumstantial evidence. Because antitrust conspiracy doctrine does not recognize proof of parallel price movements by itself to sustain an inference of agreement, plaintiffs seek to introduce plus factors to show that it is more likely than not that parallel conduct resulted from concerted action.

The analysis of plus factors is one of the most unsettled and perplexing doctrinal issues of modern antitrust law. This Article proposes a formal definition of plus factors, a taxonomy for plus factors, and a coherent methodology for ranking them in terms of their probative values. We identify super plus factors, which lead to a strong inference of collusion. Plus factors should be considered in groups or constellations whenever such groups are present, because the probative value of a constellation of plus factors can be far greater than each individual plus factor that comprises the constellation. In fact, a group or constellation can be a super plus factor when none of the individual plus factors that make up the constellation is itself a super plus factor.

In closing, we offer a review of the partial list of super plus factors discussed in Part III:

1. A subset of firms restricts production when prices and profits are relatively high or increasing.
2. Among a subset of producers, market shares, customer incumbency, or geographic dominance is stable when the firms have excess capacity, and prices and profits are relatively high or increasing.
3. A reliable predictive econometric model that accounts for all material noncollusive effects on price, estimated using benchmark data where conduct was presumed noncollusive, produces predictions of prices that do not explain the path of actual prices in the period or region of potential collusion, at a specified high confidence level.
4. A firm or subset of firms has knowledge of the details of another firm’s transactions, production, sales, and/or inventories where the latter firm would be competitively disadvantaged by conveying that information unilaterally.
5. Firms engage in interfirm transactions that are transfers of resources and are largely void of productive noncollusive motivations.
6. In an industry where the product made by different firms is largely homogeneous, there is a discrete change in the interfirm incentives of sales forces, across a subset of firms during a given period, that shifts from the pursuit of market share to maintenance of elevated prices (such as a shift to "price before volume").
7. A subset of firms with an aggregate market share large enough to have dominant-firm market power jointly engage in a dominant-firm conduct when no single firm has the market power to act unilaterally as a dominant firm by engaging in that dominant-firm conduct.
IN RE: URETHANE ANTITRUST LITIGATION.

DOW CHEMICAL COMPANY,

Appellant,

v.

SEEGOTT HOLDINGS, INC.; INDUSTRIAL POLYMERS, INC.; QUABAUG CORPORATION, (Class Plaintiffs),

Appellees,

and

CHAMBER OF COMMERCE OF THE UNITED STATES and AMERICAN INDEPENDENT BUSINESS ALLIANCE,

Amici Curiae.

Appeal from the United States District Court for the District of Kansas (D.C. No. 04-MD-01616-JWL-JPO)

No. 13-3215
Carter G. Phillips, Sidley Austin LLP, Washington, D.C. (Joseph R. Guerra, C. Frederick Beckner III, Kathleen Moriarty Mueller, Jeffrey S. Beelaert, Sidley Austin LLP, Washington, D.C.; and Charles J. Kalil, General Counsel, the Dow Chemical Company, Duncan A. Stuart, Associate General Counsel, the Dow Chemical Company, Midland, MI, on the briefs) for Defendant-Appellant.


Before LUCERO, MURPHY, and BACHARACH, Circuit Judges.

BACHARACH, Circuit Judge.

This antitrust class action stems from an allegation that Dow Chemical Company conspired with competitors to fix prices for polyurethane chemical products. Over
Dow’s objection, the district court certified a plaintiff class including all industrial purchasers of polyurethane products during the alleged conspiracy period. The action went to trial, and the jury returned a verdict against Dow. The district court entered judgment for the plaintiffs, denying Dow’s motions for decertification of the class and judgment as a matter of law.

Dow appeals, raising four arguments:

- First, Dow contends that class certification was improper because common questions did not predominate over individualized questions. We reject this contention. The district court decided that common questions predominated because: (1) the existence of a conspiracy and impact raised common questions, and (2) these common liability-related questions predominated over individualized questions regarding the extent of each class member’s damages. This decision fell within the district court’s discretion. Thus, we reject Dow’s challenge to class certification.

- Second, Dow argues that the district court should have excluded the testimony of the plaintiffs’ expert witness on statistics. According to Dow, the impact and damages models were unreliable because the expert witness inappropriately selected variables and benchmark years based on what would yield the greatest damages. We disagree. The district court acted within its discretion in allowing the testimony, and Dow’s arguments relate to the weight of the expert’s testimony, not admissibility.

- Third, Dow challenges the sufficiency of the evidence regarding liability. Viewing the evidence in the light most favorable to the plaintiffs, as we must, we conclude that the evidence sufficed on liability.

- Fourth, Dow asserts that the damages award lacked an evidentiary basis and that the resulting judgment violated the Seventh Amendment. These arguments are invalid.

The award of $400,049,039 was supported by the evidence. Dr. McClave calculated even greater damages ($496,680,486), and the jury had an evidentiary basis for reducing this figure to $400,049,039.
In allocating this award, the court did not violate the Seventh Amendment; and Dow has no interest in the method of distributing the aggregate damages award among the class members.

I. The Polyurethane Market

This appeal involves four categories of urethane chemical products: (1) polyether polyols; (2) toluene diisocyanate (TDI); (3) methylene diphenyl diisocyanate (MDI); and (4) polyurethane systems.1 These products—collectively, “polyurethanes”—are used in various consumer and industrial components such as mattress foams, insulation, sealants, and footwear.

The polyurethane market comprises a “myriad of products, pricing structures, individualized negotiations, and contracts.” AA 413. Buyers negotiate individually with manufacturers regarding price and other terms, sometimes entering into long-term contracts and other times purchasing on a “spot” basis. The price depends on multiple factors, including supply and demand, the balance of bargaining power between the buyer and manufacturer, and the availability of a substitute product to meet the buyer’s needs. Apart from price, buyers can negotiate on other terms, such as rebates, most-favored-nation clauses, early payment discounts, and protection from future price hikes.

Prices are set in some of the contracts, but not in others. When there is no set price, a contract typically requires the manufacturer to give the buyer advance notice of price increases. Accordingly, price increases are announced by letter 30 to 45 days in

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1 The litigation initially involved another category of urethane products—polyester polyols—but those defendants settled.
advance. But these announcements did not always result in actual price increases. For example, buyers sometimes avoided price hikes by negotiating with the supplier.

II. The Price-Fixing Claim

The plaintiffs are industrial purchasers of polyurethane products who sued under the Sherman Antitrust Act, 15 U.S.C. § 1, and the Clayton Antitrust Act, 15 U.S.C. § 15(a), alleging that a group of polyurethane manufacturers—Bayer AG, Bayer Corporation, Bayer Material Science, BASF Corporation, Huntsman International LLC, Lyondell Chemical Company, and Dow Chemical Company—conspired to fix prices and allocate customers and markets from January 1, 1999, to December 31, 2004. AA 369. As the case progressed, it underwent three significant changes. First, the plaintiffs settled with all defendants except for Dow. Second, the plaintiffs dropped their allocation theory, leaving the price-fixing theory as the sole basis of the lawsuit. Third, the plaintiffs chose to pursue a shorter conspiracy—one lasting from January 1, 1999, to December 31, 2003—than was initially alleged.

The price-fixing claim arises under § 1 of the Sherman Act, which “prohibits contracts and conspiracies that restrain trade.” Smalley & Co. v. Emerson & Cuming, Inc., 13 F.3d 366, 367 (10th Cir. 1993). For a § 1 violation, the class had to prove:

- the existence of an agreement or conspiracy
- among actual competitors
- that had the purpose or effect of raising, depressing, fixing, pegging, or stabilizing prices
in interstate commerce.\(^2\)

_Cayman Exploration Corp. v. United Gas Pipe Line Co_. , 873 F.2d 1357, 1360 (10th Cir. 1989). Because the plaintiffs sought damages under § 4 of the Clayton Act, 15 U.S.C. § 15(a), they also had to prove antitrust injury, or “impact,” which is “an injury of the type the antitrust laws were intended to prevent and that flows from that which makes defendant’s acts unlawful.” _Elliott Indus. Ltd. v. BP Am. Prod. Co_. , 407 F.3d 1091, 1124 (10th Cir. 2005) (quoting _Reazin v. Blue Cross & Blue Shield of Kan., Inc._, 899 F.2d 951, 962 n.15 (10th Cir. 1990)).

III. Certification of the Class

The plaintiffs moved for class certification under Rule 23(b)(3) of the Federal Rules of Civil Procedure. Dow opposed the motion, arguing that certification was improper because common questions did not predominate over individualized questions. The district court disagreed, holding that common questions predominated because the key elements of the price-fixing claim—the existence of a conspiracy and impact—involved common questions that were capable of class-wide proof.

The court rejected Dow’s argument that the impact element caused individualized questions to predominate, relying in part on a report prepared by the plaintiffs’ expert, Dr. John Beyer. Dr. Beyer examined the polyurethane industry and concluded that a price-fixing conspiracy for polyurethane products would affect all buyers. Crediting Dr.

\(^2\) Dow stipulated to the interstate commerce element; accordingly, that issue was not submitted to the jury.
Beyer’s report and his supporting models, the court determined that impact involved a common question susceptible to class-wide proof.

This determination was unaffected by the fact that prices were individually negotiated. The court reasoned that the industry’s standardized pricing structure—reflected in product price lists and parallel price-increase announcements—“presumably establishe[d] an artificially inflated baseline” for negotiations. AA 410. Consequently, any impact resulting from a price-fixing conspiracy would have permeated all polyurethane transactions, causing market-wide impact despite individualized negotiations.

The court acknowledged that the determination of damages might be individualized. But the court concluded that:

- class certification was appropriate for resolution of “the more difficult, threshold liability issues,” and

- if individualized questions were to overwhelm the damages issue, “the more appropriate course of action would be to bifurcate a damages phase and/or decertify the class as to individualized damages determinations.”

_Id. at 413-14 (quoting In re Urethane Antitrust Litig., 237 F.R.D. 440, 452 (D. Kan. 2006)).

IV. Dow’s Motion to Exclude Expert Testimony

Before trial, Dow moved to exclude the testimony of Dr. James McClave, the plaintiffs’ statistical expert. Dr. McClave used a multiple-regression analysis to develop models predicting prices that would have existed in a competitive market. He then
compared these prices to the actual prices during the conspiracy period, estimating overcharges of 15.6% for MDI, 14% for TDI, and 14.9% for polyether polyols. SA 6297. Using these overcharge estimates and sample data from roughly 50% of class sales, Dr. McClave extrapolated damages for the entire class and distilled the calculations into a damages model.³

Dr. McClave proposed to testify about these models, and Dow objected on grounds that he picked variables and the time period to get the result that he wanted.

First, Dow accused Dr. McClave of selecting variables based on whether they would produce supra-competitive prices for the conspiracy period. The district court rejected this argument, holding that Dr. McClave had “a basis, beyond statistical fit, rooted in general economic theory and particular documents” for selecting the variables that he did. AA 504. Thus, the court concluded that Dow’s argument affected the weight of the testimony rather than its admissibility. Id.

Dow’s second challenge involved Dr. McClave’s decision to move 2004 from the conspiracy period to the competitive/benchmark period. According to Dow, Dr. McClave manipulated the benchmark to generate supra-competitive prices for the conspiracy period. The district court was unpersuaded, reasoning that: (1) Dr. McClave did not create a regression model for systems. Instead, he assumed that prices for systems increased proportionately with increases in the price of MDI, the basic chemical comprising the system. AA 1036, 2087-88. Estimating that MDI constituted approximately 74% of a system, Dr. McClave assumed that all systems were subject to an overcharge equal to 74% of the average overcharge for MDI, resulting in a 7.2% average overcharge for systems. Id. at 1036-40.

³ Dr. McClave did not create a regression model for systems. Instead, he assumed that prices for systems increased proportionately with increases in the price of MDI, the basic chemical comprising the system. AA 1036, 2087-88. Estimating that MDI constituted approximately 74% of a system, Dr. McClave assumed that all systems were subject to an overcharge equal to 74% of the average overcharge for MDI, resulting in a 7.2% average overcharge for systems. Id. at 1036-40.
could have had legitimate reasons to modify the benchmark, and (2) Dow’s argument was untimely.

V. The Trial, the Verdict, & the Post-Trial Rulings

At trial, the plaintiffs attempted to prove that Dow had conspired with competitors to fix prices for polyurethane products. The plaintiffs’ theory was that the conspiracy had begun in January 1999, when the polyurethane market was depressed. In an effort to turn the industry around, executives allegedly coordinated “lockstep” price-increase announcements and agreed to try to make the price increases stick in individual contract negotiations.

The plaintiffs supported their theory with testimony from industry insiders, evidence that the defendants behaved collusively, evidence that the industry was susceptible to collusion, and evidence that prices exceeded a competitive level.

On the day before the trial was to begin, Dow moved to decertify the class. Nonetheless, the trial proceeded, and the jury ultimately found that: (1) Dow had participated in a price-fixing conspiracy, (2) the conspiracy caused the plaintiffs to pay more for polyurethane products than they would have paid in a competitive market, (3) the injury did not precede November 24, 2000, and (4) the plaintiffs suffered damages of

\[ \text{4 Dow did not include its motion in the appendix. Because the appeal involves the denial of the motion to decertify the class, Dow had an obligation to include the motion in the appendix. See 10th Cir. R. 10.3(D)(2), 30.1(A)(1). But we exercise our discretion to take judicial notice of the motion. See Guttman v. Khalsa, 669 F.3d 1101, 1127 n.5 (10th Cir. 2012).} \]
$400,049,039. After trebling the damages and deducting the amounts paid by the settling defendants, the court entered judgment against Dow for $1,060,847,117.

The court then granted the plaintiffs’ request to permit allocation of the award according to Dr. McClave’s damages model, with a pro rata reduction to reflect the jury’s award of a lesser amount. With this ruling, the court rejected the Seventh Amendment challenge, adding that Dow had no interest in the way damages were distributed among the class members.

Over a month after the trial ended, Dow renewed its motion to decertify the class. In its reply brief, Dow relied for the first time on the Supreme Court’s then-recent opinion in Comcast Corp. v. Behrend, __ U.S. __, 133 S. Ct. 1426 (2013). Invoking Comcast, Dow argued that Dr. McClave’s models had failed to supply a nexus between:

- the liability theory and
- the impact on class members.\(^5\)

The court held that Comcast did not apply and declined to decertify the class.

VI. Dow’s Arguments

Dow raises four challenges on appeal, which involve: (1) the certification of a class and refusal to order decertification, (2) the admission of Dr. McClave’s testimony, (3) the sufficiency of the evidence, and (4) the damages award.

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\(^5\) Dow raised this argument for the first time in a post-trial brief. The court characterized the argument as “arguably untimely,” but addressed the merits “in light of the intervening Supreme Court decision and the fact that plaintiffs were given an opportunity to file a sur-reply addressing the Comcast opinion.” AA 528.
VII. Certification & the Motion for Decertification

Dow challenges the orders certifying a class and declining to decertify the class. In evaluating these challenges, we review de novo whether the district court applied the correct legal standard. Carpenter v. Boeing Co., 456 F.3d 1183, 1187 (10th Cir. 2006). If the proper standard was applied, we will reverse only for abuse of discretion. Id. An abuse of discretion occurs “when the district court bases its decision on either a clearly erroneous finding of fact or conclusion of law or by manifesting a clear error of judgment.” DG ex rel. Stricklin v. Devaughn, 594 F.3d 1188, 1194 (10th Cir. 2010).

The class was certified under Rule 23(b)(3) of the Federal Rules of Civil Procedure, which requires “that the questions of law or fact common to class members predominate over any questions affecting only individual members.” Fed. R. Civ. P. 23(b)(3). Dow maintains that common questions did not predominate and that the district court’s contrary rulings run afoul of Wal-Mart Stores, Inc. v. Dukes, ___ U.S. ___, 131 S. Ct. 2541 (2011), and Comcast Corp. v. Behrend, ___ U.S. ___, 133 S. Ct. 1426 (2013).

A. Dow’s Wal-Mart Arguments

Wal-Mart involved a gender-discrimination claim under Title VII. The plaintiffs, who were female employees, alleged that their supervisors had discriminated in decisions on pay and promotions. For the gender-discrimination claims, the district court certified a class of female employees. See Wal-Mart, 131 S. Ct. at 2549. The Ninth Circuit Court of Appeals upheld certification, reasoning that the evidence had raised a common question involving the reason for gender-based disparities on pay and promotion. See id.
The Supreme Court disagreed, concluding that the evidence did not show a company-wide policy of discrimination or “a common mode of exercising discretion that pervade[d] the entire company.” *Id.* at 2553-55. Thus, there was no “glue” holding together the reasons for the alleged injury, and the district court could not resolve the individual claims “in one stroke.” *Id.* at 2551-52. The Court emphasized that “[w]hat matters to class certification . . . is not the raising of common ‘questions’—even in droves—but, rather the capacity of a classwide proceeding to generate common answers apt to drive the resolution of the litigation.” *Id.* at 2551 (quoting Nagareda, *Class Certification in the Age of Aggregate Proof*, 84 N.Y.U. L. Rev. 97, 132 (2009)). The problem for the plaintiffs was that the common question (the reason for the pay and promotion disparities) was incapable of yielding a common answer. Therefore, individual trials were needed to resolve the claims.

The district court held that class-wide liability could be decided based on a sample of class members. *See id.* at 2560-61. This procedure was invalidated by the Supreme Court. *Id.* at 2561. Calling the procedure a “trial by formula,” the Supreme Court reasoned that the determination of liability would violate Wal-Mart’s right “to litigate its statutory defenses to individual claims.” *Id.*

Dow contends that the certification here violated *Wal-Mart* in two ways: (1) by denying Dow the right to show in individualized proceedings that certain class members suffered no injury, and (2) by allowing the class to proceed on the basis of extrapolated impact and damages. We reject both contentions.
1. The Need for Individualized Proceedings

Dow argues that it was entitled to show in individualized proceedings that certain class members could not have been injured by the alleged conspiracy. To support this argument, Dow points to ways that the plaintiffs could have avoided the announced price increases, such as negotiating for a lower price or switching to a substitute product.

It is true that some of the plaintiffs may have successfully avoided damages. But Dow has not shown that the district court abused its discretion in finding that class-wide issues predominated over individualized issues.

The district court determined that common questions predominated because the key elements of the price-fixing claim—the existence of a conspiracy and impact—raised common questions that were capable of class-wide proof. Dow disagrees, contending that impact involved individualized questions because the class members experienced varying degrees of injury, with some avoiding injury altogether.

The district court did not abuse its discretion in determining that impact involved a common question that would override other individualized issues. Under the prevailing view, price-fixing affects all market participants, creating an inference of class-wide impact even when prices are individually negotiated. E.g., In re Linerboard Antitrust Litig., 305 F.3d 145, 151-52 (3d Cir. 2002); In re Foundry Resins Antitrust Litig., 242

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6 In In re Linerboard Antitrust Litigation, the Third Circuit Court of Appeals upheld class certification based in part on expert testimony by John Beyer, Ph.D. 305 F.3d at 153-54. There, Dr. Beyer testified that antitrust impact could be proven on a class-wide basis despite variations for particular products or customers. See id. This testimony was
The inference of class-wide impact is especially strong where, as here, there is evidence that the conspiracy artificially inflated the baseline for price negotiations. See In re Rail Freight Fuel Surcharge Antitrust Litig., 287 F.R.D. 1, 61 (D.D.C. 2012) (holding that common proof could be used to prove injury by raising the starting point for negotiations), vacated in part on other grounds, 725 F.3d 244 (D.C. Cir. 2013); In re Cardizem CD Antitrust Litig., 200 F.R.D. 326, 345-47 (E.D. Mich. 2001) (holding that injury was provable through class-wide evidence involving inflation of the baseline for individual negotiations); In re Commercial Tissue Prods., 183 F.R.D. 589, 595 (N.D. Fla. 1998) (holding that impact of price-fixing was provable through class-wide evidence notwithstanding individualized negotiations for every distributor); see also In re Scrap Metal Antitrust Litig., 527 F.3d 517, 535 (6th Cir. 2008) (“[E]ven where there are individual variations in damages, the requirements of Rule 23(b)(3) are satisfied if the plaintiffs can establish that the defendants conspired to interfere with the free-market pricing structure.”).

The district judge certified a class based on the plaintiffs’ evidence of an artificially inflated baseline, including parallel issuance of similar product price lists and among the evidence relied on by the district court and the appeals court. Id. Here, the district court relied on similar testimony by Dr. Beyer.

7 In In re Foundry Resins Antitrust Litigation, the district court relied on Dr. Beyer’s testimony in holding that impact could be proven through class-wide evidence notwithstanding the defendants’ reliance on “individualized pricing negotiations” and “market competition between the [d]efendants themselves.” 242 F.R.D. at 409-10.
price-increase announcements. When the district judge denied the motion for decertification, he had the benefit of the trial testimony. At trial, some of Dow’s witnesses acknowledged that price-increase announcements had affected the starting point for price negotiations. See SA 4095-4103, 4156-57 (testimony of Richard Beitel); id. at 3885-86 (testimony of Robert Wood).

The district judge could reasonably weigh the evidence and conclude that price-fixing would have affected the entire market, raising the baseline prices for all buyers. Based on the reasonableness of this finding, the judge had the discretion to treat impact as a common question that was capable of class-wide proof. See Blades v. Monsanto Co., 400 F.3d 562, 566 (8th Cir. 2005) (“If the same evidence will suffice for each [class] member to make a prima facie showing, then it becomes a common question.”).

The presence of individualized damages issues would not change this result. Class-wide proof is not required for all issues. Instead, Rule 23(b)(3) simply requires a showing that the questions common to the class predominate over individualized questions. Amgen v. Conn. Ret. Plans & Trust Funds, __ U.S. __, 133 S. Ct. 1184, 1196 (2013).

In price-fixing cases, courts have regarded the existence of a conspiracy as the overriding issue even when the market involves diversity in products, marketing, and

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8 The appendices do not include the evidence submitted to the district court for or against class certification. But we exercise our discretion to take judicial notice of the evidence presented on the motion for certification. See Guttman v. Khalsa, 669 F.3d 1101, 1127 n.5 (10th Cir. 2012).
prices. *In re Flat Glass Antitrust Litig.*, 191 F.R.D. 472, 484-85 (W.D. Penn. 1999); *In re Alcoholic Beverages Litig.*, 95 F.R.D. 321, 327 (E.D.N.Y. 1982); *In re Fine Paper Antitrust Litig.*, 82 F.R.D. 143, 151-53 (E.D. Penn. 1979); *In re Folding Carton Antitrust Litig.*, 75 F.R.D. 727, 734 (N.D. Ill. 1977); see also *In re Scrap Metal Antitrust Litig.*, 527 F.3d 517, 535 (6th Cir. 2008) (stating that “[p]redominance is a test readily met in certain cases alleging . . . violations of the antitrust laws,’ because proof of the *conspiracy* is a common question that is thought to predominate over the other issues of the case” (citation omitted) (quoting *Amchem Prods., Inc. v. Windsor*, 521 U.S. 591, 625 (1997))). Therefore, the district court acted within its discretion by treating common issues (involving the existence of a conspiracy) as predominant over individualized issues (involving negotiated prices). *See Gold Strike Stamp Co. v. Christensen*, 436 F.2d 791, 796 (10th Cir. 1970) (“[W]here the question of basic liability [in antitrust cases] can be established readily by common issues, then it is apparent that the case is appropriate for class action [under Rule 23(b)(3)].”).

With this determination, the district court acted within its discretion in certifying the class under Rule 23(b)(3), and nothing in *Wal-Mart* suggests an abuse of that discretion. In *Wal-Mart*, individualized proceedings were necessary because the common questions—the reasons for the pay and promotion disparities—could not yield a common answer “in one stroke.” *Wal-Mart*, 131 S. Ct. at 2551-52.

Here, however, there were two common questions that could yield common answers at trial: the existence of a conspiracy and the existence of impact. The district
court reasonably concluded that these questions drove the litigation and generated common answers that determined liability in a single “stroke.”  *Id.*

2. The Use of Extrapolation Techniques

Dow contends that the district court violated *Wal-Mart* by allowing the plaintiffs to use extrapolations to prove class-wide impact and damages. This contention is based on the plaintiffs’ reliance on Dr. McClave’s regression models (used to show impact) and his extrapolation models (used to estimate damages). Dow complains that: (1) the use of these models violated *Wal-Mart*’s prohibition against “trial by formula,” and (2) the models were defective because Dr. McClave did not use representative sampling. We reject both complaints.

When certifying the class, the district court relied on:

- the report and supporting models of Dr. Beyer, which Dow has not challenged on appeal, and
- the evidence of a standardized pricing structure, including price lists and parallel announcements of price increases.

The court did not even have Dr. McClave’s models or any other sort of extrapolation evidence. Thus, the court could not have erred by relying on Dr. McClave’s models when the class was initially certified.

But the plaintiffs did present Dr. McClave’s models before the district court ruled on Dow’s motion to decertify the class. For two reasons, we conclude that the court acted within its discretion when it denied the motion to decertify: (1) the motion was filed late, and (2) liability was not proven through a sampling of class members.
First, the court acted reasonably in determining that the motion was late. Dow waited until the day before trial to seek decertification even though it had received Dr. McClave’s report 21 months earlier. The court reasonably held that decertification at that juncture would have prejudiced the plaintiffs, who had “prepared for a long and complex trial at great expense” and who would have found it “much more difficult to assert individual claims at [that] time.” AA 523-24; see Davis v. Avco Fin. Servs., Inc., 739 F.2d 1057, 1062 (6th Cir. 1984) (“Despite the fact that as the case developed individual questions became more prominent vis a vis common questions of law and fact, there still were and are significant common questions such that we would not be justified in decertifying the class at this late date.”), overruled on other grounds by Pinter v. Dahl, 486 U.S. 622, 649-50 & n.25 (1988).

Second, reliance on Dr. McClave’s models did not result in a “trial by formula.” The Wal-Mart Court used this term to describe a novel method of calculating damages, where the district court determined the merits of individual claims by extrapolating from a sample set of class members. Wal-Mart, 131 S. Ct. at 2561. This method proved problematic because it displaced the “established . . . procedure for trying pattern-or-practice cases” under Title VII and, in doing so, deprived Wal-Mart of the right “to litigate its statutory defenses to individual claims.” Id.

Our circumstances are different. The plaintiffs did not seek to prove Dow’s liability through extrapolation. Rather, Dow’s liability as to each class member was proven through common evidence; extrapolation was used only to approximate damages.
*Wal-Mart* does not prohibit certification based on the use of extrapolation to calculate damages. *See* *Leyva v. Medline Indus., Inc.*, 716 F.3d 510, 514 (9th Cir. 2013).

Dow also complains that the models were defective because Dr. McClave did not use representative sampling. But Dow makes no attempt to:

- explain how the allegedly unrepresentative samples caused individualized questions to predominate, or
- tie its unrepresentative-sampling argument to an abuse of discretion by the district court.

We need not consider these issues, however, because Dow did not raise its present argument in the district court.⁹ *See, e.g., Walker v. Mather (In re Walker)*, 959 F.2d 894, 896 (10th Cir. 1992).

### B. Dow’s Comcast Argument

*Comcast* involved a class action based on the antitrust laws. The proposed class had alleged four theories of antitrust impact, three of which were rejected by the district court as incapable of class-wide proof. *See Comcast Corp. v. Behrend*, __ U.S. __, 133 S. Ct. 1426, 1430-31 (2013). The Supreme Court held that the class had not satisfied its burden of proving damages on a class-wide basis. *Id.* at 1434-35.

Class-wide damages were to be proven in *Comcast* solely through the testimony of Dr. McClave. The Court regarded Dr. McClave’s model as defective because it had “assumed the validity of all four theories of antitrust impact initially advanced,”

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⁹ In its brief opposing class certification, Dow argued that systems purchases should be excluded from the class definition. But that argument differs fundamentally from the one Dow is now asserting.
including the three that had been rejected by the district court. *Id.* at 1434. Because the model measured aggregate damages for all of the initial theories, the plaintiffs had no way to prove class-wide damages. And without such proof, the Court concluded, individualized questions would “inevitably overwhelm questions common to the class.” *Id.* at 1433.

Dow argues that Dr. McClave’s model here suffers from the “precise flaw” that precluded certification in *Comcast*: a “failure to distinguish between the impact and damages attributable to the liability theory [that was] pursued at trial and another liability theory” that was not. Appellant’s Opening Br. at 42 (emphasis removed). For the sake of argument, we can assume that Dow is correct.  

10 This assumption is generous because Dr. McClave used different types of benchmarks in *Comcast* and the present action.

In *Comcast*, Dr. McClave created a benchmark by constructing a hypothetical market that would have existed in eighteen counties if the defendant had not engaged in four separate types of anticompetitive conduct. *See Comcast*, 133 S. Ct. at 1429 & n.1, 1431, 1434-35; *Behrend v. Comcast Corp.*, 655 F.3d 182, 205 (3d Cir. 2011), rev’d, ___ U.S. __, 133 S. Ct. 1426 (2013); *Behrend*, 655 F.3d at 217-18 (Jordan, J., dissenting); *see infra* pp. 21-22. But before trial, the district court rejected the claims on three of the four types of anticompetitive conduct. *Comcast*, 133 S. Ct. at 1431; *see infra* p. 22. Though the plaintiffs’ claims changed, Dr. McClave’s model did not. *Comcast*, 133 S. Ct. at 1431. Thus, Dr. McClave’s benchmark in *Comcast* included thirteen counties no longer encompassed in the allegations of anticompetitive conduct. *Id.* at 1433-35; *Behrend*, 655 F.3d at 217-18 (Jordan, J., dissenting).

This defect does not exist in the benchmark that Dr. McClave used here because it was not based on any subsets of the market (such as counties where the alleged misconduct took place). Instead, the benchmark was based on the entire market, with Dr. McClave comparing actual prices to the prices that would have prevailed in a competitive market. Though one theory (customer allocation) dropped from the case, the market
ability to measure damages on a class-wide basis. Instead, the decision was premised on
the majority’s conclusion that without a way to measure damages on a class-wide basis,
individualized questions would “inevitably overwhelm questions common to the class.”
*Comcast*, 133 S. Ct. at 1433. *Comcast* does not control because: (1) the decision turned
on a concession that is absent here, and (2) we know from the actual trial that
individualized issues did not predominate.

First, unlike the claimants in *Comcast*, our plaintiffs did not concede that class
certification required a method to prove class-wide damages through a common
methodology. This distinction was highlighted in the *Comcast* dissent, which explained
that the plaintiffs’ concession on this point—an “oddity” specific to that case—was
outcome determinative. *Id.* at 1436-37 (Ginsburg & Breyer, JJ., dissenting).

Second, the procedural setting in *Comcast* was different. There, the issue was
whether the district court could determine before trial that the plaintiffs could prove
damages on a class-wide basis. In making that determination, the district court had only
Dr. McClave’s expert report, which based damages on a comparison between actual
prices and a model addressing theories already rejected by the district court. These
circumstances are absent here.

*Comcast* involved a class action against providers of cable television service. *See
id.* at 1430. According to the suit, the cable television providers violated the antitrust
laws by clustering services in a 16-county region. The class proposed 4 theories of damages from the clustering:

1. The clustering created an incentive for the cable operators to withhold sports programming from competitors.

2. The clustering reduced the level of competition from companies building cable networks in areas already being serviced.

3. The clustering reduced the “benchmark” competition that cable customers used to compare prices.

4. The clustering strengthened the cable operators’ power to bargain with companies providing content.

See id. at 1430-31. Before trial, the district court rejected three of these theories, holding that the plaintiffs could prove class-wide damage through only a single theory: reduction of competition from companies building cable networks in areas already being serviced. See id.

This ruling created a problem of proof for the class. It relied on a pretrial model by Dr. McClave that compared actual prices in the 16-county region to the prices that would have existed if the cable operators had not gained an incentive to withhold sports programming from competitors, reduced competition from companies building rival networks in areas already serviced, reduced price competition from rival cable companies, and strengthened the defendants’ bargaining power with companies providing content. See id. And the district court had already held that many of these alleged problems could not be used to prove class-wide damage. See id. With this ruling, Dr. McClave’s benchmarks became useless. Id. at 1433-35. And without another way to
prove class-wide damage, all class members would need to prove their own damages. *Id.* at 1433. The necessity of individual determinations on damages proved fatal to certification because the plaintiffs had not questioned the necessity of a methodology capable of measuring damages on a class-wide basis. *Id.* at 1430, 1434-35.

These problems do not exist here because Dow waited until after trial to raise the issue. Thus, by the time Dow presented its argument, Dr. McClave had already testified at trial.

In the trial, Dr. McClave testified “that nearly all class members had been impacted or overcharged” during the pertinent period. AA 940. In light of this testimony, the district court had the discretion to find a “fit” between the plaintiffs’ theory of liability (a nationwide conspiracy to fix prices) and the theory of class-wide damages.

This “fit” had been missing in *Comcast*. Without any other evidence of class-wide damages, the Supreme Court predicted that “[q]uestions of individual damage calculations [would] inevitably overwhelm questions common to the class.” *Comcast*, 133 S. Ct. at 1433.

This problem was absent here. The district court did not need to predict what would predominate at trial because by the time Dow raised this issue, the trial had already taken place. And because Dow did not request individualized determinations on
damages, the plaintiffs presented only class-wide evidence of damages. As a result, the district court knew from the actual trial that common issues of damages had predominated.

Dow complains that this approach masks a “disconnect” between Dr. McClave’s expert report and his theory of damages. But the expert report was never introduced in evidence. In Comcast, the district court had to rely on Dr. McClave’s expert report because the trial had not taken place. Here, the district court had the benefit of seeing what ultimately took place at trial. The court had no need to make a prediction based on

\[11\] At oral argument, counsel for Dow argued that it had sufficiently requested individualized damages calculations in its objection to class certification. Oral Arg. 15:34. But this objection did not constitute a request for individualized findings.

In the objection, Dow argued that the plaintiffs had failed to show that common evidence could be used to measure damages “for each putative class member.” ASA 126. The district court overruled the objection, but suggested a willingness to bifurcate the trial and decertify the class to obtain individualized findings on damages. AA 413-14.

Even with this suggestion by the district court, Dow never asked for individualized findings on damages. Instead, Dow asked for a single finding on class-wide damages. See, e.g., Dow’s Proposed Verdict Form & Written Questions at 2 (Jan. 17, 2013) (Doc. 2696-1) (“The total damages sustained by the members of the Class caused by that conspiracy were $______.” (emphasis added)); Dow’s Proposed Jury Instructions at 50-51 (Jan. 14, 2013) (Doc. 2690-2) (“Dow does not object to the proposed [damages] jury instruction with the proposed modifications.”); Dow’s Memorandum in Support of Dow’s Proposed Verdict Form at 6-7 (Jan. 17, 2013) (Doc. 2696) (“If the jury answers “YES,” then in response to Question 2(d) the jury must specify the total damages Class members sustained as a result of that conspiracy.”).

When questioned about the failure to seek individualized findings on damages, Dow’s counsel asserted that the district court had limited discovery to the named plaintiffs. Oral Arg. 16:00-16:08. We are not persuaded. Dow did not raise this excuse in its appellate briefs, and it has not pointed us to any such order limiting discovery.
the expert report. Instead, the district court could see that common issues of liability had predominated over individualized issues. In these circumstances, the court did not abuse its discretion by declining to decertify the class.

VIII. The Admissibility of Dr. McClave’s Testimony

Dow also argues that the district court erroneously allowed Dr. McClave’s expert testimony. We disagree.

A. Standard of Review

“We review de novo whether the district court applied the proper standard in determining whether to admit or exclude expert testimony.” Norris v. Baxter Healthcare Corp., 397 F.3d 878, 883 (10th Cir. 2005). If the proper standard was applied, we will reverse only for abuse of discretion. Id. An abuse of discretion occurs when a ruling is “arbitrary, capricious, whimsical or manifestly unreasonable or when we are convinced that the district court made a clear error of judgment or exceeded the bounds of permissible choice in the circumstances.” Id. (quoting Dodge v. Cotter Corp., 328 F.3d 1212, 1223 (10th Cir. 2003)).

B. Admissibility Requirements

Expert testimony is admissible only if it is relevant and reliable. Kumho Tire Co. v. Carmichael, 526 U.S. 137, 152 (1999). To ensure reliability, district courts play an essential “gatekeeping” role. Id. at 141. This role requires assessment of the expert witness’s qualifications and the reliability of the opinions. Ralston v. Smith & Nephew Richards, Inc., 275 F.3d 965, 969 (10th Cir. 2001).
C. Dow’s Arguments

Dow argues that Dr. McClave’s testimony was unreliable because of flaws in his multiple-regression analysis. Multiple-regression analysis is a statistical tool used to determine the relationship between an unknown variable (the “dependent” variable) and one or more “independent” variables that are thought to impact the dependent variable. Saks, Michael J., et al., Reference Manual on Scientific Evidence 179, 181 (2d ed. 2000).

The dependent variable in Dr. McClave’s models was market price. To identify the independent variables driving prices in a competitive market, Dr. McClave chose a benchmark period and tested various independent variables to find the combination that would accurately predict prices during the benchmark period. That combination of variables was then applied to the conspiracy period to calculate the prices that would have existed but for the conspiracy. Dr. McClave testified that when he compared the prices expected in a competitive market and the actual prices, he detected overcharges for the relevant products and attributed the overcharges to “something other than competition.” AA 1072-73, 1119.

Dow argues that the testimony was inadmissible because Dr. McClave manufactured supra-competitive prices through “variable shopping” and “benchmark shopping.” We disagree.
1. “Variable Shopping”

In Dow’s view, Dr. McClave engaged in “variable shopping” by choosing variables based on whether they would generate supra-competitive prices. This argument bore on the weight of Dr. McClave’s opinions, not their admissibility.

a. The Need to Include the Major Factors

The validity of a regression analysis depends on selection of the appropriate independent variables. *E.g.* *Segar v. Smith*, 738 F.2d 1249, 1261 (D.C. Cir. 1984). Consequently, the exclusion of major variables or the inclusion of improper variables may diminish the probative value of a regression model. *Bazemore v. Friday*, 478 U.S. 385, 400 (1986). But such defects do not generally preclude admissibility, and courts allow use of a regression model as long as it includes the variables accounting for the major factors. *See id.* (“Normally, failure to include variables will affect the [regression] analysis’ probativeness, not its admissibility.”); *see also Koger v. Reno*, 98 F.3d 631, 637 (D.C. Cir. 1996) (“Following *Bazemore*, courts have taken the view that a defendant cannot undermine a regression analysis simply by pointing to variables not taken into account that might conceivably have pulled the analysis’s sting.”).

Dow challenges Dr. McClave’s exclusion of: (1) domestic demand variables for TDI, and (2) various demand variables for MDI and polyether polyols.

b. TDI

The district court reasonably concluded that Dr. McClave had a reliable evidentiary foundation to tie TDI exports to price. Dow challenges the exclusion of
domestic demand variables, but does not question the relevance of TDI exports. The exclusion of domestic demand variables was not fatal because Dr. McClave had no need to consider every measurable factor—just the “major” ones. *Bazemore*, 478 U.S. at 400. The district court reasonably found that Dr. McClave had accounted for the major factors affecting demand, and Dow’s arguments bore on the weight of Dr. McClave’s opinions, not their admissibility.

Dow argues that Dr. McClave mistakenly selected variables based on the data instead of picking variables that “made economic sense.” *Appellant’s Opening Br.* at 46. This argument does not invalidate the district court’s contrary finding.

For this argument, Dow relies on a law review article by Franklin Fisher. Franklin M. Fisher, *Multiple Regression in Legal Proceedings*, 80 Colum. L. Rev. 702 (1980). There, Dr. Fisher states that in multiple regression, the analyst “specifies the major variables that are believed to influence the dependent variable,” then tests the accuracy of the chosen variables. *Id.* at 705-06, 715. According to Dow, Dr. McClave did the opposite, picking variables based on his own data rather than picking variables based on what he would have expected.

But the district court could reasonably infer that Dr. McClave followed the protocol urged by Dow. Dr. McClave stated under oath that for TDI, he tested variables that best explained the changes in price, then tested how well these variables served to predict price changes. AA 2081, 2085. With this explanation, the district court concluded that TDI exports could reliably be used as a proxy for demand. *Id.* at 503. In
drawing this conclusion, the court pointed out that none of Dow’s experts had questioned the sufficiency of a relationship between TDI exports and demand. Id. Even now, Dow does not refer to any such evidence.12

Instead, Dow argues that Dr. McClave should have considered other independent variables addressing domestic demand. But Dr. McClave tested domestic demand variables and concluded they did not bear a statistically significant relationship to price. Id. at 2221. He explains that when he tested domestic demand variables, price decreased as demand increased. Id. at 2161. Dr. McClave regarded this finding as a “nonsensical negative sign[,]” which made domestic demand unusable as an independent variable affecting TDI prices. Id.

Dr. McClave pointed to other evidence substantiating his statistical conclusions that domestic demand proved less significant than exports. For example, a 2004 Bayer document identified exports as a driver of TDI prices. And the plaintiffs’ economic expert (John Solow, Ph.D.) opined that “the marginal demand driver for TDI was not

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12 In district court, Dow appeared to criticize Dr. McClave’s inclusion of TDI exports as a variable. Dow’s Mot. to Exclude Dr. McClave’s Test. at 20 (Aug. 17, 2012) (Doc. 2391) (stating that it was improper for Dr. McClave to use TDI exports rather than measures of U.S. demand). But on appeal, Dow appears to retract its criticism of Dr. McClave’s decision to include TDI exports as a demand variable. Dow’s Reply Br. at 15-16 (“The problem . . . is not the inclusion of TDI exports as a demand variable . . . ”).
domestic demand . . . but rather expert demand”). Corrected Solow Report at 22 n.71 (June 16, 2011).\(^\text{13}\)

Dr. McClave’s treatment of domestic demand is open to debate. But the district court had the discretion to accept Dr. McClave’s explanation for omitting variables addressing domestic demand. Thus, the district court did not abuse its discretion in concluding that Dow’s complaints bore on the weight of Dr. McClave’s testimony rather than its admissibility.

c. **MDI and Polyols**

In its opening brief, Dow devotes two sentences to the choice of variables for MDI and polyether polyols: “In specifying his MDI and polyols models, in contrast, Dr. McClave used only *domestic* demand variables and did not include a variable for exports. He continued his results-oriented approach in the MDI and polyols models by selectively picking and choosing among the variables used as a proxy for domestic demand.” Appellant’s Opening Br. at 46-47 (citations omitted). Dow followed the two sentences with a chart comparing Dr. McClave’s proxies for domestic demand with a report of the top uses in 2002. *Id.* at 47.

We question whether the two sentences and the chart fairly develop a claim challenging the use of variables for MDI and polyols. *See Thompson R2-J Sch. Dist. v. Luke P., ex rel. Jeff P.*, 540 F.3d 1143, 1148 n.3 (10th Cir. 2008). But even if we were to

\(^{13}\) Dr. Solow’s report was omitted from the appendices. But the report was filed in district court as an attachment and is subject to judicial notice. *See Guttman v. Khalsa*, 669 F.3d 1101, 1127 n.5 (10th Cir. 2012).
construe these sentences and the chart as a separate appeal point, it was not raised in Dow’s motion to exclude Dr. McClave’s testimony. See Dow’s Mot. to Exclude Dr. McClave’s Test., passim (Aug. 17, 2012) (Doc. 2391). Thus, if Dow has presented an appeal point for MDI and polyols, we would confine our review to the plain-error standard. See McKenzie v. Benton, 388 F.3d 1342, 1350-51 (10th Cir. 2004).

Dow’s brief assertions do not show an obvious error in Dr. McClave’s choice of variables for MDI or polyols. As a result, even if we were to construe Dow’s brief references to MDI and polyols as a separate argument, it would not warrant reversal under the plain-error standard. See, e.g., Royal Maccabees Life Ins. Co. v. Choren, 393 F.3d 1175, 1181-82 (10th Cir. 2005) (stating that the plain-error standard requires demonstration of an error “that is plain or obvious under existing law”).

2. **“Benchmark Shopping”**

Dow also argues that Dr. McClave engaged in “benchmark shopping,” arguing that he moved 2004 from the conspiracy period to the competitive/benchmark period in order to manufacture supra-competitive prices during the conspiracy period. The plaintiffs maintain that this decision was made for legitimate reasons. But even if Dow could prove otherwise, its benchmark-shopping argument does not implicate the reliability of Dr. McClave’s methodology.

Reliability “is primarily a question of the validity of the methodology employed by an expert, not the quality of the data used in applying the methodology or the conclusions produced.” Manpower, Inc. v. Ins. Co. of Penn., 732 F.3d 796, 806 (7th Cir.
Accordingly, a district court must admit expert testimony as long as it is based on a reliable methodology. It is then for the jury to evaluate the reliability of the underlying data, assumptions, and conclusions. *Id.* at 806-08.

Dow argues that Dr. McClave skewed the results by including 2004 data in the prices for the benchmark period. This argument involves a swearing match. Dow asserted to the district court that Dr. McClave had moved 2004 to the “benchmark” period in order to maximize damages. The plaintiffs disagreed, presenting Dr. McClave’s explanation that he had included 2004 as part of the benchmark period based on test results reflecting that 2004 prices “were more consistent with competition than collusion.” AA 2081, 2215. The district court resolved this swearing match in favor of the plaintiffs. SA 498. We have no basis to regard this resolution as an abuse of discretion. *See Hollander v. Sandoz Pharm. Corp.*, 289 F.3d 1193, 1204 (10th Cir. 2002).

IX. Sufficiency of the Evidence

Dow also challenges the sufficiency of the evidence regarding liability, arguing that the district court erred in denying the motion for judgment as a matter of law. We reject this challenge.

A. Standard of Review
We engage in de novo review of the district court’s denial of judgment as a matter of law, applying the same standard as the district court. *Myklatun v. Flotek Indus., Inc.*, 734 F.3d 1230, 1233-34 (10th Cir. 2013). This standard requires us to determine whether the evidence allowed a verdict for the plaintiffs. *See Wolfgang v. Mid-Am. Motorsports, Inc.*, 111 F.3d 1515, 1522 (10th Cir. 1997). In applying this standard, we view the evidence and related inferences in the light most favorable to the plaintiffs. *See Myklatun*, 734 F.3d at 1234. Judgment as a matter of law should not be granted “[u]nless the proof is all one way or so overwhelmingly preponderant in favor of the movant as to permit no other rational conclusion.” *Greene v. Safeway Stores, Inc.*, 98 F.3d 554, 557 (10th Cir. 1996).

This evidence, viewed in the light most favorable to the plaintiffs, was sufficient for a finding of liability.

**B. Dow’s Arguments**

Dow argues that: (1) there was insufficient evidence that the alleged price-fixing agreement was effectively implemented, (2) there was insufficient evidence of a conspiracy involving Lyondell, and (3) the jury necessarily rejected Dr. McClave’s models, leaving insufficient evidence of impact and damages. We reject each argument.

1. **Implementation of the Conspiracy**

Dow does not dispute:

- the existence of an agreement to coordinate price-increase announcements and try to make them stick, or
• the existence of evidence involving coordination in announcing price increases.

Rather, Dow questions the existence of evidence that the conspirators followed through with the agreement by requiring suppliers to make the price increases stick. Without evidence of follow-through, Dow argues, the price-fixing claim fails as a matter of law. We reject Dow’s argument.

a. Parallel Announcements of Price Increases

The argument rests on a purported distinction between two categories of price-fixing conspiracies: (1) those involving an agreement to set prices directly, and (2) those involving an agreement to announce price increases and try to make them stick. Conspiracies falling into the second category, Dow submits, require an evidentiary link between the price-increase announcements and subsequent prices. According to Dow, this evidentiary link is necessary because parallel price-increase announcements do not prove a conspiracy.

For the sake of argument, we can assume that evidence of parallel price-increase announcements would not establish a price-fixing conspiracy. But the plaintiffs did more than show parallel announcements. The evidence included admissions by industry insiders, collusive behavior, susceptibility of the industry to collusion, and setting of prices at a supra-competitive level.

For example, the plaintiffs presented testimony by Ms. Stephanie Barbour (Dow), who admitted that Dow had participated in a price-fixing conspiracy. Ms. Barbour
directly implicated at least three Dow executives in the conspiracy: Mr. Marco Levi, Mr. David Fischer, and Mr. Peter Davies.

Another key witness for the plaintiffs was Mr. Lawrence Stern (Bayer), who recounted numerous conversations he had had with his counterparts at Dow, BASF, and Huntsman. Mr. Stern described these conversations as “inappropriate,” for they pertained to future pricing and “the possibility of raising prices.” SA 912-14. Mr. Stern added that he had:

- discussed prices with David Fisher (Dow) on eight to fifteen occasions, and
- exchanged confidential pricing information with competitors to spur industry-wide price increases.

Id. at 896-97, 905.

Mr. Stern also testified that he had taken “unusual steps” to conceal his conversations with Bayer’s competitors. Id. at 881. For instance, he would use pay telephones instead of calling from his office and would use a prepaid phone card. Id. Other times, Mr. Stern met with competitors at off-site locations, such as coffee shops or hotels. Commenting on these secretive communications, the plaintiffs’ expert econometrician told the jury that “economists associate secrecy with collusion.” Id. at 2688.

Testimony about a conspiracy also came from others, such as:

- Mr. Edward Dineen (Lyondell), who implicated Mr. Jean Pierre Dhanis (BASF) and Mr. Robert Wood (Dow) in the conspiracy,
- Mr. Robert Kirk (Bayer), who confirmed Mr. David Fischer’s (Dow) involvement, and

- two Bayer executives (Ms. Michelle Blumberg and Mr. Gerald Phelan) who had grounds to suspect their colleague, Mr. Wolfgang Friedrich, of price-fixing.

The jury also heard from the plaintiffs’ expert, Dr. John Solow, who testified about: (1) collusive conduct he had observed in the polyurethane industry, and (2) the industry’s susceptibility to collusion.

Dr. Solow had observed four types of collusive conduct.

First, the defendant companies had issued “a series of . . . lockstep price increase announcements,” which came within weeks of each other, communicated the same or similar price increases, and were to take effect at about the same time. *Id.* at 2678-79, 2682.

Second, Dr. Solow noticed “a widespread pattern of communication” among the top executives of the defendant companies. *Id.* at 2679. Dr. Solow was struck not only by the frequency and secrecy of these communications but also by their timing, for the contacts frequently occurred within days of a lockstep price-increase announcement. *Id.* at 2706-09. This proximity suggested that the price-increase announcements had been coordinated. *Id.*

Third, Dr. Solow detected a “price over volume strategy,” where the companies would stick to their list prices even if it meant walking away from opportunities to earn business or make sales at lower, but still profitable, prices. *Id.* at 2679. In Dr. Solow’s
view, these actions would not take place in a competitive market and the companies were acting contrary to their interests. *Id.* at 2711-12.

Fourth, the defendant companies monitored one another to prevent cheating and to discipline any supplier that was found cheating. *Id.* at 2723.

Dr. Solow also testified that the polyurethane industry was “ripe for collusion” based on six features:  

1. Sales of polyurethane products were “concentrated in the hands of only a handful of firms” during the conspiracy period;  
2. the market had high barriers to entry;  
3. polyurethane products are homogenous;  
4. there were no close product substitutes available to customers;  
5. there was excess capacity for MDI, TDI, and polyether polyols during the conspiracy period, meaning that the companies could “produce more output than the customers actually want[ed] to buy,” putting a “strong downward pressure on prices;” and

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14 SA 2675.  
15 *Id.* at 2644.  
16 *Id.* at 2645.  
17 *Id.* at 2646.  
18 *Id.* at 2649.  
19 *Id.* at 2651-52.
6. the industry has several trade associations, which provided “an opportunity to engage in price fixing behavior.”\textsuperscript{20}

The evidence also included testimony by Dr. McClave. He testified that class members had been overcharged for polyurethane products because of “something other than competition.” AA 1072-73, 1119; SA 6297.

The evidence, viewed favorably to the plaintiffs, goes beyond parallel announcements of price increases.

b. Announcements of Price Increases v. Actual Price Increases

Dow argues that even if a conspiracy existed, it did not work because the plaintiffs could not tie the announcements to actual price hikes. But the plaintiffs had no reason to connect the two, for they were not trying to prove that the price-increase announcements caused supra-competitive prices. Instead, the plaintiffs were trying to prove that the supra-competitive prices were caused by the conspiratorial agreement; the price-increase announcements were merely an instrument used to effectuate that agreement.

The jury could have inferred that the announcements proved successful, for the trial included testimony that: (1) manufacturers sometimes used the announcements to avoid price decreases,\textsuperscript{21} and (2) some of the announcements were partially or fully

\textsuperscript{20} Id. at 2660-61.

\textsuperscript{21} SA 1964 (testimony of Mr. Jean-Pierre Dhanis).
accepted. From this testimony, the jury could have inferred that a conspiracy existed and that it caused prices to be higher than they would have been in a marketplace free of collusion.

2. Involvement of Lyondell

Dow argues the evidence was insufficient regarding Lyondell’s involvement in the conspiracy. This argument fails legally and factually.

The argument fails legally because even if the evidence had not shown Lyondell’s involvement, Dow would not have been exonerated. A defendant can incur liability for a conspiracy under § 1 of the Sherman Act so long as the defendant did not act unilaterally. See Copperweld Corp. v. Independence Tube Corp., 467 U.S. 752, 768 (1984). And, for the reasons discussed above, there is sufficient evidence of a conspiracy between Dow and the other defendant companies, regardless of Lyondell’s involvement.

Dow’s argument also fails factually because the evidence allowed a reasonable fact-finder to infer Lyondell’s participation in the conspiracy. The inference was possible based on evidence that: (1) Lyondell and Dow communicated before three price hikes,

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22 SA 892-93 (testimony of Mr. Larry Stern); id. at 4156 (testimony of Mr. Richard Beitel that price increases were fully paid for 40-50% of the announcements); id. at 299-300 (Bayer memorandum stating that “the price increases [are] becoming effective and being paid”); id. at 304 (Bayer memorandum stating that announcements of price increases allowed Bayer to benefit from the full impact); id. at 341-42 (Dow e-mails acknowledging that Dow had obtained “the full increases”); id. at 482 (Dow announcement in connection with pricing, stating “Its [sic] Working!!!!!!!!”); id. at 3438, 3502-03 (testimony of Dr. McClave that prices exceeded competitive levels from 1999 to 2003); id. at 2732 (testimony of Dr. Solow that the alleged conspiracy succeeded because nearly all class members had to pay the higher prices).
other conspirators discussed collusion in front of Lyondell’s representative, and (3) other manufacturers colluded.

First, the plaintiffs presented evidence that Mr. Mario Portela (Lyondell) had communicated with Mr. Marco Levi (Dow) immediately before at least three lockstep price-increase announcements. See SA 3147-51, 3224-30; AA 1772-92.

Second, the evidence included testimony by Mr. Edward Dineen (Lyondell), who told the jury that: (1) he had attended a dinner with Mr. Jean-Pierre Dhanis (BASF) and Mr. Robert Wood (Dow), and (2) during the dinner, Mr. Dhanis made “comments regarding pricing and market conditions for urethanes” that made Mr. Dineen feel “uncomfortable from an antitrust perspective.” SA 1984-85. The fact that Mr. Dhanis felt comfortable discussing prices in front of Mr. Dineen suggests the involvement of one or more Lyondell executives.

Finally, the evidence suggested participation by virtually every large manufacturer. This evidence could have led the jury to infer participation by Lyondell. See In re Flat Glass Antitrust Litig., 385 F.3d 350, 363 (3d Cir. 2004) (“If six firms act in parallel fashion and there is evidence that five of the firms entered into an agreement, . . . it is reasonable to infer that the sixth firm acted consistent with the other five firms’ actions because it was also a party to the agreement.”).

3. Effect of the Jury Verdict on Dr. McClave’s Models

The jury found no injury for the 23-month period preceding November 24, 2000. AA 513-14. From this finding, Dow infers that the jury partially rejected Dr. McClave’s
models. With this inference, Dow argues that Dr. McClave’s models are invalid; and without valid models, Dow continues, the plaintiffs lack sufficient evidence of impact and damages. This series of inferences does not allow us to disturb the jury’s unequivocal findings on impact and damages.

We conclude that:

- the plaintiffs’ failure to prove a conspiracy for part of the alleged conspiracy period does not invalidate the finding of liability for part of this period, and
- we have no reason to believe that the jury rejected Dr. McClave’s models in their entirety.

As the district court recognized, the jury may have fully credited Dr. McClave’s models, but found the evidence insufficient to find an injury before November 24, 2000.

Citing In re Rail Freight Fuel Surcharge Antitrust Litigation, Dow contends that the models are invalid because they “detect[,] injury where none could exist.” Appellant’s Opening Br. at 51 (quoting In re Rail Freight Fuel Surcharge Antitrust Litig., 725 F.3d 244, 252 (D.C. Cir. 2013)). This case does not apply.

In In re Rail Freight, an expert witness found damages for plaintiffs who were bound by rates agreed to before the alleged conspiracy. 725 F.3d at 252. Thus, the plaintiffs could not have been harmed by the conspiracy. Id. And, under Comcast, the D.C. Circuit Court of Appeals regarded certification as questionable because damages might not be provable through class-wide evidence. Id. at 252-53. This analysis does not apply here for two reasons.
First, *In re Rail Freight* involved a certification challenge decided on interlocutory review; at that stage, the Court of Appeals could only predict whether common issues would predominate for purposes of class certification. Here, we have the benefit of knowing what happened at the trial: Common issues predominated over individualized issues. Thus, the D.C. Circuit’s concern lacks any bearing on whether common issues predominated here.

Second, Dr. McClave’s model does not suffer from the same flaw identified in *In re Rail Freight*. There, the appeals court could not credit the expert’s opinion because his methodology yielded damages for a time period in which prices had been freely set. Thus, the expert found damages for plaintiffs who could not possibly have suffered injury. Here, by contrast, Dow has not identified a single class member for whom injury was impossible.

Rather, Dow asks us to infer a flaw based on the jury’s finding of no damages for a specific time period. We cannot draw that inference, for the jury could have limited the time period for the conspiracy based on Dow’s explanation for prices before November 24, 2000. Thus, the jury might have limited the conspiracy period while agreeing with Dr. McClave’s analysis of pricing after November 24, 2000.

For both reasons, the flaw in *In re Rail Freight* does not exist here, and the jury’s finding does not imply a failure to prove impact or damages after November 24, 2000.

X. **The Damages Award**
Dow’s final challenge involves the award of damages. Dow argues that: (1) the damages award had no evidentiary basis, and (2) the resulting judgment violated the Seventh Amendment.

A. Evidentiary Support for the Award

The jury assessed damages of $400,049,039 even though Dr. McClave had calculated damages of $496,680,486. Dow contends that the jury’s assessment was speculative because it deviated from Dr. McClave’s figure and lacked any other evidentiary support. We reject this contention.

In evaluating this argument, we must view the evidence in the light most favorable to the plaintiffs,23 upholding the jury’s damages award unless it is “clearly, decidedly or overwhelmingly against the weight of the evidence.”24

In entering judgment based on the damages award, the district court reasoned that the jury might have discounted Dr. McClave’s figure based on:

- Dow’s arguments regarding systems,
- skepticism about Lyondell’s involvement in the conspiracy, or
- a belief that the conspiracy had a shorter duration than Dr. McClave assumed.

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23 Snyder v. Moab, 354 F.3d 1179, 1187-88 (10th Cir. 2003).
Id. at 537. Dow does not question these possibilities. Instead, Dow insists that the jury had no evidentiary basis for a smaller amount because the plaintiffs had not “introduce[d] the underlying calculations or provide[d] the jury with the information necessary to adjust [Dr.] McClave’s . . . damages figures if they disagreed with any of his assumptions.” Appellant’s Opening Br. at 63. We reject Dow’s argument.

Dow assumes that the jury could not adjust Dr. McClave’s damages figure without his “underlying calculations” or some other “tool.” Id. at 63-64. This assumption is incorrect, for a jury can reduce an expert’s calculations on damages even when unable to “run the exact numbers and calculations of [a damages] model with ‘mathematical certainty.’” MedCom Holding v. Baxter Travenol Labs., Inc., 106 F.3d 1388, 1400-01 (7th Cir. 1997); see Russo v. Ballard Med. Prods., 550 F.3d 1004, 1018 (10th Cir. 2008) (rejecting the defendant’s argument that the jury’s award “exceeded what the record evidence could support” when the jury awarded an amount lying “somewhere in between the extremes suggested by the evidence received at trial”); see also In re Scrap Metal Antitrust Litig., 527 F.3d 517, 533-34 (6th Cir. 2008) (rejecting the defendant’s argument that “the jury must have resorted to speculation” to arrive at a damages award of $11.5 million, when the expert calculated damages of $20.9 million); Tuf Racing Prods., Inc. v. Am. Suzuki Motor Corp., 223 F.3d 585, 591 (7th Cir. 2000) (rejecting the defendant’s argument that the jury’s award should be set aside as “‘speculative’” when the plaintiff’s expert calculated damages of $1.2 million, but “the jury awarded only a bit more than 10 percent of that”).
B. The Seventh Amendment

Dow also challenges the district court’s decision to permit allocation of the damages award according to Dr. McClave’s damages model. According to Dow, this method of distribution violates the Seventh Amendment by taking from the jury “the question of liability and the extent of the injury by an assessment of damages.” Dimick v. Schiedt, 293 U.S. 474, 486 (1935). We disagree.

Because this argument implicates a constitutional question, our review is de novo. J.R. Simplot v. Chevron Pipeline Co., 563 F.3d 1102, 1115 (10th Cir. 2009).

According to Dow, the Seventh Amendment problem arises not from the use of Dr. McClave’s model to distribute damages, but from the application of a pro rata reduction to reflect the jury’s award of a lesser amount. The court’s across-the-board reduction is problematic, Dow says, because the reason for the jury’s reduction is unknown. Dow argues that: (1) the reduction was based on a finding that certain class members suffered no injury, and (2) as a result, Dow was unable to have a jury determine which class members had suffered less damage than Dr. McClave had figured. Appellant’s Opening Br. at 65.

We reject this argument because Dow has no interest in the method of distributing the aggregate damages award among the class members. See Allapattah Servs., Inc. v. Exxon Corp., 333 F.3d 1248, 1258 (11th Cir. 2003) (“[A] defendant has no interest in how the class members apportion and distribute a[n] [aggregate] damage [award] among themselves.”); Six (6) Mexican Workers v. Ariz. Citrus Growers, 904 F.2d 1301, 1307
(9th Cir. 1990) (“Where the only question is how to distribute the damages, the interests affected are not the defendant’s but rather those of the silent class members.”). And Dow cannot complain about the uncertainties inherent in an aggregate damages award because Dow never requested individualized findings on damages. See supra pp. 23-24 & note 11.

Dow claims an interest in the allocation of damages to ensure that all class members are bound by the judgment. But Dow fails to identify any threat to the binding effect of the judgment. The three cases that it cites are inapplicable.

In Phillips Petroleum Co. v. Shutts, the defendant challenged the trial court’s jurisdiction over the class plaintiffs, raising a legitimate concern that the judgment would not bind all class members. 472 U.S. 797, 805 (1985).

Carrera v. Bayer Corp. likewise involved a class-wide judgment with an uncertain binding effect. 727 F.3d 300, 310 (3d Cir. 2013). The class there had been decertified because there was insufficient evidence of an ascertainable class. As a result, the class members could argue that they were not bound by the judgment. Id.

Dimick v. Schiedt was a case about additur. 293 U.S. 474 (1935). There, the Supreme Court held that the Seventh Amendment is violated when a court “assess[es] an additional amount of damages” beyond that found by the jury. Id. at 486-87.

Unlike the defendants in Phillips and Carrera, Dow has not identified any reason to believe that the judgment here would fail to bind all class members. And the district court.
court reduced the jury’s damages award, rather than add to it as in *Dimick*. Accordingly, these cases do not apply.

We conclude that Dow has not established a Seventh Amendment violation.

**XI. Conclusion**

We affirm, rejecting Dow’s challenges to the order for class certification, the refusal to decertify the class, the admission of Dr. McClave’s testimony, the sufficiency of the evidence, and the award of damages.
This class action concerns an alleged price-fixing conspiracy in the market for titanium dioxide. The Plaintiff class representatives Haley Paint Company, Isaac Industries, Inc., and East Coast Colorants, LLC, doing business as Breen Color Concentrates, and the class of titanium dioxide purchasers whom they represent (together, “Plaintiffs”) claim that Defendants Kronos Worldwide Inc. (“Kronos”), and Cristal USA Inc., formerly known as Millennium Inorganic Chemicals, Inc. (“Millennium”), together with E.I. du Pont de Nemours & Co. (“DuPont”), Huntsman International LLC (“Huntsman”), and Tronox Inc. (“Tronox”), engaged in an unlawful conspiracy in violation of Section 1 of the Sherman Act, 15 U.S.C. § 1, to fix, raise, or maintain the price of titanium dioxide in the United States.

1 Titanium dioxide ("TiO2") is a “dry chemical powder that is the world’s most widely used pigment for providing whiteness, brightness, and opacity . . . to many products, particularly paints and other coatings.” See Mem. Op. Granting Mot. for Class Certification 2, ECF No. 337 (internal quotation omitted).

2 This case was originally filed against five entities: DuPont, Huntsman, Kronos, Millennium, and the National Tioxide Company Limited. See Am. Consolidated Compl. (ECF No. 51). In addition, the Consolidated Complaint alleged that the following persons were co-conspirators, though they were not named as parties: Lyondell Chemical Company (“Lyondell”); Tronox; the consulting company International Business Management Associates, Inc. (“IBMA”); and James R. Fisher (“Fisher” or “Jim Fisher”), the President and Chief Executive Officer of IBMA. Alleged co-conspirators Lyondell and Tronox were never named in this action, presumably because each filed for bankruptcy.
Plaintiffs allege that as a consequence of the unlawful conspiracy, the Defendants were successful in charging artificially inflated prices for titanium dioxide.

Presently pending before this Court are two Motions for Summary Judgment filed by Kronos (ECF No. 432) and Millennium (ECF No. 439), as well as a Joint Motion for Summary Judgment submitted by the two Defendants jointly (ECF No. 442). The parties’ submissions have been reviewed, and a hearing was held on June 25, 2013. For the reasons that follow, this Court DENIES the Motions for Summary Judgment filed by Kronos (ECF No. 432) and Millennium (ECF No. 439) and the Joint Motion for Summary Judgment (ECF No. 442), as it pertains to the remaining Defendants Kronos and Millennium.

BACKGROUND


under Chapter 11 of the United States Bankruptcy Code in January 2009. Further, the Plaintiffs did not name IBMA or Jim Fisher as parties to this case. The National Titanium Dioxide Company Limited, which is domiciled in the Kingdom of Saudi Arabia, was dismissed from this action for lack of personal jurisdiction on March 31, 2011. See Mot. Dismiss Op. & Order, ECF Nos. 103 & 104. Finally, on August 6, 2013, this Court ordered a stay of all proceedings between the Class Plaintiffs, DuPont, and Huntsman, as those parties have reached agreements in principle to settle and release the class claims in this litigation, as against DuPont and Huntsman. See Stay Order, ECF No. 484. All told, the remaining Defendants in this case are Millennium and Kronos.

3 The Defendants’ pending Motion to Compel Arbitration and Stay Proceedings, Dismiss for Improper Venue, Strike Jury Demands, and Amend the Class Definition (ECF No. 423) will be addressed in a separate Memorandum Opinion.
Concentrates, are small purchasers of titanium dioxide. They bring this case under Section 1 of the Sherman Act, alleging that the Defendants, as well as DuPont, Huntsman, and Tronox Inc. (“Tronox”), which are the market leaders in the production of titanium dioxide, conspired to fix prices during a period from February 1, 2003 to the present (the “Class Period”). They seek treble damages and injunctive relief under the Clayton Act, 15 U.S.C. §§ 4, 16.

The Plaintiff class representatives bring suit on behalf of a class defined as “[a]ll persons and entities who purchased titanium dioxide in the United States directly from one or more Defendants or Tronox, or from any predecessors, parents, subsidiaries, or affiliates thereof, between February 1, 2003, and the present.” Order Granting Mot. Certify 2, ECF No. 338. The Plaintiffs’ allegations center on the following evidence: the crisis in the titanium dioxide industry prior to the Class Period; DuPont’s entrance into a European trade group, the Titanium Dioxide Manufacturers Association (“TDMA”), which created greater opportunities for interaction among the pigment producers; the introduction of a statistics program, which allowed the Defendants to collect global industry information; the routine communication of confidential, commercially sensitive information to other firms and industry consultants during the Class Period; repeated price increase announcements allegedly executed in lockstep by the Defendants Millennium and Kronos, DuPont, Huntsman, and Tronox; and interfirm sales of titanium dioxide.

At the outset, this Court notes that the Plaintiffs’ case stands on circumstantial evidence alone—there is no “smoking gun” that explicitly reveals an agreement to conspire.

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4 Tronox is a former subsidiary of Kerr-McGee Corporation (“Kerr-McGee”). This Memorandum Opinion refers to the company as Tronox and Kerr-McGee interchangeably.
Nevertheless, in the absence of an admission of guilt by the Defendants, the Plaintiffs may rely on purely circumstantial, or “ambiguous,” evidence from which the existence of a conspiracy may be inferred. See *In re High Fructose Corn Syrup Antitrust Litig.*, 295 F.3d 651, 654, 661-62 (7th Cir. 2002) (“[M]ost cases are constructed out of a tissue of [ambiguous] statements and other circumstantial evidence, since an outright confession will ordinarily obviate the need for a trial.”).

A. Declines in Price and Consumption of Titanium Dioxide: 1990s through 2001

In the 1990s, the titanium dioxide industry suffered substantial declines in consumption and price. See generally Pls.’ App. M, ECF No. 451-28 (documenting presentations, reports, e-mails, and articles on the subject of unprecedented declines in price and consumption of titanium dioxide). A Huntsman marketing report in 2001, for example, indicated that the real price per ton of titanium dioxide plummeted from $3,200 in 1991 to $1,900 in 2000. See id. at entry 08/xx/2001 (no exact date in original). An editorial written by industry consultant Jim Fisher (“Fisher”) of International Business Management Associates, Inc. in 2002 confirmed these declines. See id. at entry 05/24/2002; see also PX 53, ECF No. 451-88. Specifically, Fisher spoke of a 6 percent decline in world pigment consumption leading to lower price levels “not seen since the early 1990s.” Id. Echoing this evidence, a Millennium “Corporate Strategy” report described a decline in “industry profitability . . . driven by overcapacity and a decline in real prices . . . over the last decade.” Pls.’ App. M, entry 04/02/2003.

In particular, 2001 was considered a “disastrous” year. Id. at entry 06/11/2002. Two titanium dioxide plants—Millennium’s plant in Baltimore, Maryland and Kerr-McGee’s plant
in Antwerp, Belgium—“were forced” to close in 2001, and the pigment producers were “bloodied badly” by falling prices and reduced profit margins. Id. at entries 02/01/2002 & 06/17/2002. Ian Edwards, DuPont’s Global Business Director, was quoted as saying that in 2001 “capacity utilization was lower than at any point in the 1990s,” while Gary Cianfichi, Millennium’s Director of Sales for Europe, explained that prices declined by about 15 percent due to poor demand, utilization, and operating rates. Id. at entry 10/21/2002. As a Millennium “Press Briefing” presentation summarized, “TiO2 profitability hit an all time low” in the fourth quarter of 2011. Id. at entry 11/18/2002. Because of these declines in the market, the Plaintiffs argue that the Defendants were motivated to create a cartel.


DuPont is the global leader in the titanium dioxide industry. Its pigment production occurs in North America, and it enjoys a cost advantage over its competitors because of its relatively inexpensive process of production called the chloride process. See generally Pls.’ App. O, ECF No. 451-30. Kronos, Millennium, Huntsman, and Kerr-McGee, on the other hand, are the major European producers of titanium dioxide. They are members of the Titanium Dioxide Manufacturers Association (“TDMA”), a trade group founded by the European producers of titanium dioxide and part of a larger trade association for the European chemical industry, the Conseil Européen des Fédérations de l’Industrie Chimique (“CEFIC”), based in Brussels, Belgium. See PX 9, ECF No. 451-44. Prior to the Class Period, the TDMA members participated in a statistics program through which they shared information regarding their titanium dioxide production. See id. Because the TDMA
included only the European pigment producers, the program’s data was limited to the European section of the industry. See id.

DuPont sought membership in the TDMA, but until 2002 the TDMA restricted its membership to European producers. See id. According to Millennium’s Gary Cianfichi, some TDMA members preferred to exclude non-European producers to prevent their access to the valuable production information shared in the TDMA’s statistics program, “especially consumption of TiO2 and inventory information.” Id. at MIC0024893. Other TDMA members, however, favored including DuPont in the group, because with the addition of DuPont, the statistics program could be expanded to include global production data. Id. Millennium, for one, advocated expanding the TDMA to include DuPont. See id.

As early as January 27, 2000, the TDMA held a meeting at which the members discussed the possibility of expanding the group’s membership to include non-European producers and forming a new global statistics program. See PX 1, ECF No. 451-36. Discussions continued at TDMA meetings throughout 2000 and 2001, with some members, in particular Kerr-McGee, voicing opposition to the inclusion of DuPont, while others remained convinced of its advantage to the industry. See, e.g., PX 2, ECF No. 451-37; PX 5, ECF No. 451-40; PX 11, ECF No. 451-46; PX 16, ECF No. 451-51. In September 2001, the TDMA’s General Committee held a meeting at CEFIC’s headquarters in Brussels. See PX 16 at MIC04280832. At that meeting, the members agreed to move forward with a new global statistics program (“the Global Statistics Program”), in which the current TDMA members and DuPont would participate. See PX 21 at MIC0325371, ECF No. 451-56. To include DuPont, the committee acknowledged that the TDMA would have to amend its
operating rules. See PX 16 at MIC04280832. In addition, the committee determined that the Global Statistics Program would serve as the TDMA’s sole statistics program, and that the onus would be on individual TDMA members to ensure that their participation in the program complied with their home countries’ antitrust laws. See id.

At a TDMA General Committee meeting on January 24, 2002, in Saariselka, Finland, the TDMA members unanimously agreed to change the TDMA operating rules and permit DuPont to participate as an “Associate Member.” PX 29, ECF No. 451-64. An Associate Member could participate in the Global Statistics Program but would have no voting rights in the TDMA. Id. at MIC0025554. The concept of “Associate Membership” was specially created to permit DuPont, as well as a Japanese titanium dioxide manufacturer ISK,5 to join the TDMA without having to open the trade group to other companies. Id.

Around the time of the January 24, 2002 meeting, industry consultant Jim Fisher was also proposing to the Defendants his own program for collecting sales data from all of the major titanium dioxide producers. See PX 27, ECF No. 451-62. As Fisher’s proposal explained, it would be “critical for producers to have accurate information about their success in the market as well as knowing share positions of their competitors for sales as well as for inventory levels.” Id. at IBMA-Fisher 000568. Just a few months later, Fisher authored an editorial for a pigment industry newsletter called “TiO2 Worldwide Update,” which is issued by a company called ARTIKOL, in which he commented on the industry’s lack of profitability in 2001 due to increased pigment inventories and a “steady fall in pigment prices.” PX 53 at IBMA-Fisher 001783. “To avoid sharp swings in TiO2 pigment

5 ISK is not involved in this action.
selling prices and uncontrolled growth in pigment inventories,” Fisher recommended that pigment producers “more carefully monitor trends in end-use sectors and trends in demand for end-use products.” Id. at IBMA-Fisher 001784. Though the Defendants did not take up Fisher’s proposal, they moved forward with the TDMA’s Global Statistics Program. Fisher’s proposal and the changes to the TDMA in 2002 demonstrate that members of the titanium dioxide industry and industry consultants were becoming convinced of the need to share industry information.


At a TDMA meeting on September 24, 2002, DuPont and the Japanese titanium dioxide producer ISK were formally approved as Associate Members. See PX 59 at MIC0020230, ECF No. 451-94. By that time, the details of the Global Statistics Program were set. The TDMA agreed that the program would involve monthly reporting of the previous month’s sales production and inventory figures, starting with the October 2002 period, to CEFIC. PX 57 at KROWW00165909, ECF No. 451-92. CEFIC would then consolidate the data and return it to the TDMA members via e-mail. Id. at KROWW00165913. The program data that CEFIC collected would represent end use
figures rather than regional figures, in order “to maintain data confidentiality.” See PX 59 at MIC0020230. Kronos warned the TDMA members that the statistics generated by the Global Statistics Program were confidential and could not be shared with anyone outside of the TDMA. PX 60, ECF No. 451-95. In addition, all of the TDMA members agreed to a “one-off” exchange of historical data for the years 2000 through 2002. PX 59 at MIC0020230.

The Plaintiffs argue that by expanding the TDMA’s membership to include DuPont and creating the Global Statistics Program, the Defendants were able to disaggregate the consolidated statistical data provided by CEFIC and track individual firm inventories, market share, and capacity utilization. See generally Pls.’ App. E. This theory is supported by an e-mail written by Paul Bradley, a Huntsman employee, on September 18, 2002, in which he discussed the “new improved” Global Statistics Program. PX 58, ECF No. 451-93. Bradley wrote that with the data from DuPont, ISK, and the European TDMA members, the program would account for “75-80% of world production,” and Huntsman would be able “to derive Kronos (Canada), Millennium (Brazil), and DuPont (Brazil/Mexico) production as a total number by difference (CEFIC Americas less USA).” Id. at HILLC006005282. Under the old statistics program, Bradley noted, they were left to estimate that production information. Id.

The Plaintiffs allege that because of the TDMA’s Global Statistics Program, the Defendants were able to accomplish what Fisher had predicted months earlier—“avoid sharp swings in pigment selling prices and uncontrolled growth in pigment inventory.” PX
Sections C and D of this Memorandum Opinion address the Defendants’ changed behavior following the initiation of the Global Statistics Program.

C. Parallel Price Increase Announcements

In Plaintiffs’ Appendix B, the Plaintiffs submit a detailed record of price increase announcements by the Defendants Millennium and Kronos, as well as DuPont, Huntsman, and Tronox, characterizing this behavior as a “paradigm shift.” See Pls.’ App. B, ECF No. 451-14. They point first to the series of announcements following the January 24, 2002 TDMA meeting in Saariselka, Finland, which this Court discussed above. Four days after that meeting, DuPont announced a price increase of $0.05 per pound, effective March 1, 2002. Then Huntsman, Kronos, Millennium, and Tronox all followed suit with a price increase of the same amount and with the same effective date. See Pls.’ App. B at effective date 3/1/2002. Another series of price increase announcements was initiated on June 11, 2002, when DuPont announced a price increase of $0.06, to be effective on July 1, 2002. See id. at effective date 7/1/2002. Within three days, Millennium and Kronos matched that price increase. See id. Two weeks later, Huntsman announced a price increase of equal amount, effective August 1, 2002, which Tronox followed. See id.

These particular instances represent the beginning of a long pattern of seemingly coordinated price increase announcements by the Defendants Millennium and Kronos, as
well as DuPont, Huntsman, and Tronox, during the Class Period. In 2003, the five pigment producers executed two sets of price increase announcements. In January 2003, Millennium, Kronos, DuPont, and Huntsman each announced a price increase of $0.06 per pound, to be effective on February 1, 2003. See id. at effective date 2/1/2003. Tronox published a price increase announcement of the same amount, effective February 15, 2003, within two weeks of the Defendants’ announcements. See id. at effective date 2/15/2003. The second wave of announcements came in September 2003, when DuPont led a price increase of $0.06, effective October 1, 2003. See id. at effective date 10/1/2003. Defendants Millennium and Kronos, as well as Huntsman and Tronox, followed suit within twenty days. See id.


By nearly parallel, this Court refers to sets of price increase announcements in which the amounts differed by $0.01 or $0.02 cents, or where a pigment producer’s announced increase was to be effective on a later date. See, e.g., Pls.’ App. B at effective dates 6/15/2004 (all pigment producers but Kronos announcing a price increase of $0.04 per pound, to be effective on June 15, 2004) & 7/1/2004 (Kronos announcing a price increase of $0.04, effective July 1, 2004, just after the other four pigment producers).
From 2005 through 2010, the Defendants engaged in a similar pattern of pricing behavior. All in all, Millennium, Kronos, DuPont, Huntsman, and Tronox published parallel, or in a few cases nearly parallel, price increase announcements four times in 2005,8 once in 2006,9 twice in 2007,10 three times in 2008,11 three times in 2009,12 and four times in 2010.13 While DuPont initiated the price increases in most cases, Kronos and Millennium occasionally announced first. See generally Pls.’ App. B. Notably, Huntsman never led a price increase announcement until August 24, 2010, after the Plaintiffs filed their initial Complaint in this action on February 29, 2010.14 On November 8, 2010, Huntsman initiated another price increase announcement, which all of the Defendants matched. See id. at effective date 1/1/2011.

All of these price increase announcements occurred in relatively close proximity, but a few particularly demonstrate the five pigment producers’ tendency to execute the announcements in lockstep. For example, DuPont announced a price increase of $0.06 per pound on September 29, 2005, at 11:00 a.m. E.S.T., which Tronox matched within seven hours and Kronos matched within eight hours. See PX 134, ECF No. 415-169. That evening, Millennium’s Jim Clover sent an e-mail to Gary Cianfichi and others at Millennium, commenting that their competitors’ announcements were “too much fun to ignore.” PX

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14 See id. at effective date 9/1/2010. It is noteworthy that Huntsman, a self-described “small fry” among producers of titanium dioxide, had the lowest United States market share of any of the original five Defendants during the Class Period. Huntsman Mot. Summ. J. 4, ECF No. 430.
Millennium and Huntsman announced parallel price increases the next day. See Pls.’ App. B at effective date 10/1/2005. Similarly, DuPont announced a $0.06 per pound price increase, to be effective January 1, 2010, on December 7, 2009. See id. at effective date 1/1/2010. Two days later, on December 9, 2009, Kronos, Millennium, and Tronox matched the increase, and Huntsman followed suit on December 11, 2009. See id. These instances suggest that the Defendants engaged in little deliberation before making their pricing decisions.

The context surrounding these price increase announcements is also important to consider. The TDMA’s General Committee met in person three times a year, almost always in January, May, and September. See generally Pls.’ App. A (cataloging competitor contacts during the Class Period). The Plaintiffs proffer that each price increase announcement came within sixty days of a TDMA General Committee Meeting. See id. This fact is of limited value, considering that with three meetings in January, May, and September, a sixty-day period before and after each meeting covers nearly every day of the year. The Plaintiffs also submit, however, that 88 percent of the price increase announcements listed in Plaintiffs’ Appendix B came within 30 days of a General Committee meeting of the TDMA. See Pls.’ Apps. A & B. This fact deserves greater attention, as it suggests that the Defendants may have used the TDMA meetings to communicate their pricing plans, coordinate price increases, and confirm that each competitor would follow the leader on a price increase.

A comparison of the price increases documented in Plaintiffs’ Appendix B with those that occurred in the prior eight-year period gives support to the Plaintiffs’ characterization of the Defendants’ changed behavior as a “paradigm shift.” The Plaintiffs submit Plaintiffs’
Exhibit 92, a chronology of titanium dioxide price increases in the United States from 1998 through 2004. See PX 92, ECF No. 451-127. Whereas Appendix B documents eight price increase episodes involving all of the pigment producers at issue—the Defendants Millennium and Kronos, DuPont, Huntsman, and Tronox—during a three-year period from January 2002 through January 2005, there was only one industry-wide increase in 2000 and none in 2001. Compare Pls.’ App. B at effective dates 3/1/2002-1/1/2005, with PX 92. Even more to the point, during the entire 1994-2001 period, Millennium’s predecessor SCM, Kronos, DuPont, Huntsman, and Tronox together engaged in just one parallel price increase, in 1995. See PX 92. There were just three price increases in which four of the five pigment producers at issue participated—in 1994, 1998, and 2000. See id. These figures stand in stark contrast to the nine-year period from 2002 through 2010, during which all of the pigment producers participated in twenty-five parallel price increase announcements. See App. B. Finally, while there was a rescinded price increase by Kronos in September 1994, see PX 92, no price increase was rescinded by any of the pigment producers during the entire Class Period. After a careful analysis of the preceding period of eight years—before DuPont joined the TDMA and the Global Statistics Program was initiated—it becomes clear that the frequency and nature of the Defendants’ price increase announcements changed dramatically.

Finally, the Plaintiffs urge that these price increases occurred during a period in which demand for titanium dioxide in the United States was either low and stable, or in decline. See generally Pls.’ App. K. The Plaintiffs also emphasize that this period was marked by excess industry capacity. See generally Pls.’ Apps. D & K. These market factors would generally
result in reduced prices. Thus, the Plaintiffs contend, the titanium dioxide industry was conducive to price-fixing.

D. Increased Interfirm Communications and Other Evidence of Cartel Practices

The Plaintiffs also proffer a mass of evidence demonstrating increased communications among competitors, alleged signaling by competitors to each other of their intent to increase price, and the sharing of firm-specific titanium dioxide information with competitors and industry consultants, especially Jim Fisher, during the Class Period. *See, e.g., Pls.’ App. A, ECF No. 451-13 (recording industry-wide and multi-lateral meetings of the pigment producers); Pls.’ App. C, ECF No. 451-15 (documenting statements by the Defendants allegedly indicating motive, contact with competitors and industry consultants, parallel price increases, reliance on the Global Statistics Program data, and price signaling); Pls.’ Apps. F1, F2 & F3, ECF Nos. 451-19, 20 & 21 (detailing communications between the Defendants and industry consultant Jim Fisher); Pls.’ App. J, ECF No. 451-25 (noting alleged price signaling by the Defendants). In the interest of brevity, this Court focuses its attention on Plaintiffs’ Appendix C, which is the most concise record of the issues that the Plaintiffs contend defeat summary judgment and raise genuine issues of material fact.*

After careful review, this Court finds that Plaintiffs’ Appendix C reveals the following: (1) statements by the Defendants that are suggestive of cartel behavior, including references to greater discipline and more informed decision making as a result of the sharing of production information; (2) announcements of price increases seemingly followed in lockstep, coupled with statements by the Defendants suggesting a goal of stabilizing relative market share in the industry; (3) the routine sharing of information between the individual
firms and industry consultant Jim Fisher; (4) increased communications regarding price increases shortly after the Defendants received the monthly consolidated data of the Global Statistics Program, as well as statements by the Defendants emphasizing the confidential nature of the program; and (5) statements by the Defendants indicating their awareness that their behavior might appear collusive. Some of the most demonstrative items included in Plaintiffs’ Appendix C are described herein.

1. Greater Discipline

Statements by the pigment producers emphasizing industry discipline and more informed decision making suggest that the Defendants may have been engaging in cartel behavior. Around the time of a TDMA General Committee meeting held in Brussels on September 27, 2001, Millennium produced a “Strategic Planning Presentation” and included a slide titled “TiO2 Industry Trends.” See PX 22 at MIC04080305, ECF No. 451-57. The list of “Trends” included “[p]ossibly more discipline on pricing and capacity.” Id. On April 17, 2002, David Vercollone of Millennium wrote to his colleagues at Millennium that the TDMA’s Global Statistics Program was “an important effort for us to get the industry to make more informed decisions” and “the best opportunity we have in structuring industry data for all our collective needs.” See PX 45 at MIC05771277, ECF No. 451-80. Vercollone’s uses of “we” and “our” suggest he was speaking about the benefits of the Global Statistics Program to the members of the TDMA, not just Millennium.

At an industry-wide conference in Miami, Florida in February 2003, Millennium’s former Vice President of Global Coatings Bruce Zwicker gave a presentation in which a slide referred to possible industry “tightness” in the future. See PX 69 at MIC00078617,
ECF No. 451-104. Ian Edwards, DuPont’s Global Business Director for titanium dioxide, also presented at the conference. See PX 223, ECF No. 451-258. Subsequently, Edwards explained in an e-mail to others at DuPont that his “goal at the time had been to stress the need for the industry to get its’ [sic] financial house in order.” Id. Edwards added that the “written version,” which he attached to the e-mail, “is fairly cautious in how [he] said that—verbally at the conference [he] was more direct.” Id.

Finally, Millennium’s John Hall sent an e-mail on December 14, 2007, to his colleague Jim Clover and others at Millennium regarding the need to “improve price.” PX 179, ECF No. 451-214. Hall recommended that Millennium “[b]e disciplined, keep [its] volume, do not take others.” Id. When asked at a deposition what Hall meant by “do not take others,” he explained that he was referring to the volume of titanium dioxide sales of Millennium’s competitors. PD6, Hall Dep. 48-49, ECF No. 451-328.

2. Coordinated Price Increases with the Goal of Stabilizing Market Share

Plaintiffs’ Appendix C also contains numerous statements by the Defendants that are suggestive of coordinated price increase announcements, with a goal of stabilizing market share. On January 7, 2002, Dave Young of DuPont sent an e-mail to his colleagues regarding a “Price Increase Initiative.” PX 25, ECF No. 451-60. Under the heading “Timing,” Young described two alternatives. Id. The first was to announce the price increase on “February 4, effective March 1.” Id. The second alternative involved a price increase announcement on “January 25, effective February 15.” Id. The latter option, Young wrote, “could give our competitors a change [sic] to announce ‘differently’ on March 1.” Id. On June 14, 2002, Connie Hubbard, DuPont’s Competitive Intelligence Manager,
drafted an entry in DuPont’s “Competitive Intelligence” database regarding a discussion she had with industry consultant Jim Fisher on June 7, 2002, several days before DuPont’s June 11, 2002 price increase announcement. See PX 56, ECF No. 451-91. In the entry, Hubbard noted that Jim Fisher had called her to confirm that Huntsman had announced a “$150/T increase” in North America. Id. Hubbard noted that “[a]s this call came before the DuPont announcement, [she] told [Fisher] that [she] had not seen any press release or announcement on Huntsman (or DuPont) and asked him his source.” Id.

On August 25, 2004, Millennium’s European sales director Tim Edwards sent an e-mail to Gary Cianfichi, regarding a draft price increase announcement. See PX 97, ECF No. 451-132. Edwards suggested that the October 1 announcement date was “a bit early,” while an announcement on November 1 would give “others [a] chance to get on their horses.” Id. On September 13, 2004, Bob Lee, Millennium’s Chief Executive Officer, as well as Millennium’s Deputy General Counsel and Director of Corporate Development, met with Tom Keenan, the President of Huntsman, and Mahomed Maiter, Huntsman’s Vice President, in Baltimore, Maryland. See PX 100, ECF No. 451-135. The next day, Millennium’s Gary Cianfichi sent an e-mail to colleagues, stating “now that we have competition on board for the Oct 1 price increase announcement, please relook at your agents[’] commissions.” PX 101, ECF No. 451-136.

DuPont’s DeLisle Plant in southern Mississippi was shut down due to Hurricane Katrina in August 2005. In November 2005, Tronox’s Vice President of Investor Relations Robert Gibney sent an e-mail to colleagues about DuPont’s strategy regarding the DeLisle Plant. See PX 138, ECF No. 451-173. According to a report by financial firm JP Morgan,
the head of DuPont’s coating division stated that DuPont would “bring DeLisle up gradually and NOT flood the market with product.” *Id.* Gibney also wrote that DuPont would not be “aggressively pursuing their lost share and will be diligent in bringing the volume back to the market.” *Id.*

On July 9, 2007, Michael Card of Millennium sent an e-mail to colleagues with the subject line “2008 Sales Plan.” *See* PX 170, ECF No. 451-205. Card wrote that Millennium’s market share was 20 percent in the year to date, while the company’s historical share was 21 percent. *Id.* Regarding the market share that Millennium was “not getting,” Card stated, “[w]e should have this extra share—customers have been and want to buy this from us. Competitors will let us have this.” *Id.* at MIC01374700.

On or about November 21, 2007, Millennium’s Jim Clover made a handwritten notation reading, “Don’t steal DuP tonnes.” PX 177, ECF No. 451-212.

Huntsman’s Mike Quinn sent an e-mail to colleagues on June 3, 2008 with the subject line “Pricing Posture.” PX 194, ECF No. 229. Quinn explained, “There is strong evidence that pricing of TiO2 in plastics markets will increase effective June 1... Our position at this time is that we support implementing a 3 cpp price increase this month... but will defer to the market competitives brought forth by the larger TiO2 suppliers.” *Id.* “Remember,” Quinn added, “we can’t lead a price increase but we sure can kill it; and we won’t be left behind if others push the pricing up.” *Id.*

Lastly, on December 4, 2008, Joe Maas of Kronos sent an e-mail to his colleagues about Kronos’s November 2008 sales. PX 219, ECF No. 451-254. Mass wrote that the company’s sales volume “was the lowest November volume since 1998 and the worst sales
volume month since December 2003!”  *Id.*  The “good news,” Maas explained, was that Kronos’s “average price worldwide increase[d] by 17 US$/MT and we have now realized since May a total average price increase of 205 US$/MT.”  *Id.*  He concluded, “[i]t appears that we and our competitors are prepared to reduce production rather than chase phantom volume.”  *Id.*

3. Communications with Jim Fisher

The Plaintiffs document numerous examples of communications between the Defendants and Jim Fisher in which sensitive information was exchanged or the Defendants acknowledged Fisher’s role in sharing industry information. Under the Plaintiffs’ theory, Jim Fisher acted as a conduit, helping to facilitate the alleged price-fixing conspiracy. For example, on May 23, 2002, Joe Maas of Kronos sent an e-mail to Jim Fisher noting that his family was looking forward to their vacation at Fisher’s new home. PX 52, ECF No. 451-87. Maas also mentioned “on a business note” that he had heard Huntsman announced a price increase of “150$/mt????!!!”  *Id.*  “It sounds weird to me,” wrote Maas, “[c]an you confirm anything from your lofty position??”  *Id.*

On July 31, 2003, Gary Cianfichi of Millennium sent an e-mail to his colleagues John Hall and Rick Rowe with the subject line “US TiO2 stats.”  PX 79, ECF No. 451-114. In the e-mail, Cianfichi primarily reported that Millennium had decided to “stop our US TiO2 statistics reporting to the [Department of Commerce]” in order “not to telegraph a possible US TiO2 inventory buildup by us and others.”  *Id.*  He concluded the email, “PS – John – also note that Bob asked me to talk to Fisher to ask him to do a little job for us – ascertain
relative TiO2 inventory levels for some of our key competitors. A little task but I'll speak to Jim this week on this.” *Id.*

In March 2005, the pigment producers attended an industry-wide conference in Cannes, France. PX 125, ECF No. 451-160. Jim Fisher later wrote, in the context of an expert report for unrelated litigation, that at the conference, the pigment producers “discussed the need to take advantage of tight market conditions to improve pricing.” PX 126 at TRONOX0000089, ECF No. 451-161. Fisher’s report went on to mention that John Hall of Millennium “noted in his presentation that the industry should avoid responding to increased demand with ‘over-investment in capacity’ as had happened in the past.” *Id.* This piece of evidence suggests that Fisher was privy to pricing information of the titanium dioxide producers, as well as that the producers shared that information with each other as well as with Fisher.

On August 29, 2007, Connie Hubbard of DuPont drafted an entry in DuPont’s Competitive Intelligence database with the subject line “Comments from Jim Fisher.” PX 171, ECF No. 451-206. Hubbard noted that Fisher had told her, regarding “pricing,” that he was “[v]ery confident that Tronox, Kronos, and Huntsman will follow.” *Id.*

Lastly, on December 2, 2009, Joe Maas of Kronos sent an e-mail to Jim Fisher and attached what Maas titled an “R&D Org Chart.” PX 241, ECF No. 451-276. Although Gary Cianfichi of Millennium is not mentioned in the e-mail’s header, the Plaintiffs aver that the chart came from Cianfichi’s files. In the body of the e-mail, Maas wrote to Fisher, “please do not copy it verbatim [sic] and screw up a few facts so it does not look like too much inside info.” *Id.*
4. The Global Statistics Program

Throughout the Class Period, the Defendants stressed the confidential nature of the Titanium Dioxide Manufacturers Association’s Global Statistics Program. On May 5, 2003, Millennium’s Gary Cianfichi sent an e-mail to colleagues at Millennium and included the first quarterly end use data from the new Global Statistics Program. PX 76, ECF No. 451-111. Cianfichi set out “what we can and can not do” with the statistical data. Id. at MIC01140263. He explained that the statistics could not be copied or given to anyone without his approval, as they had “a high level of very confidential information in them that we do not want others to see. Others include both internal [Millennium] people at any level, customers, journalists, outside consultants, vendors trade groups etc.” Id. Cianfichi emphasized, “We do not want anyone even referring to the existence of this type of data to any other parties.” Id. Later in the e-mail, Cianfichi explained that any references made to the public regarding market details should be described as “[Millennium] estimates and never as CEFIC data.” Id.

Kronos’s Henry Basson passed along to Kronos colleagues an e-mail from Gary Cianfichi at Millennium about the confidential nature of the Global Statistics Program. PX 105. Basson wrote, “Any TDMA statistics that are shared with you or any specifics which you may share with your co-workers, should UNDER NO CIRCUMSTANCES BE DIVULGED TO ANY THIRD PARTIES as this information is Confidential to the TDMA members.” Id.

Likewise, the Defendants made statements suggesting the Global Statistics Program’s influence on the pricing decisions of the Defendants. On June 16, 2006, DuPont’s Ian
Edwards sent an e-mail to colleagues at DuPont regarding price increases announced by Millennium and Huntsman on the previous day. PX 148, ECF No. 451-183. “The timing may be no coincidence,” Edwards explained, because “their reading of the CEFIC info like ours should give them confidence that [North America] price increases can be prosecuted despite the flat market in [North America] itself.” Id. That same day, Connie Hubbard of DuPont forwarded a Kronos price increase announcement to Edwards, copying other colleagues and stating, “Ian, Looks like John’s leadership woke up the majors and the May CEFIC data gave them some conviction.” PX 149.

5. The Defendants’ Awareness of Their Seemingly Coordinated Behavior

Finally, it is crucial to note that some of the contents in Plaintiffs’ Appendix C suggest that the Defendants were aware that their pricing behavior would appear coordinated to the outside world, and they attempted to minimize any appearance of collusion. On February 23, 2005, Millennium’s Gary Cianfichi drafted a memorandum regarding the company’s “price announcement process.” PX 123 at MIC0029317, ECF No. 451-158. The primary subjects of the memorandum were the methods of issuing price increase announcements in the “Internet age” and the “[c]ompetitive landscape” in the titanium dioxide industry. Id. The memorandum concluded with two lists titled, “What [Millennium] wants to do” and “What we do not do.” Id. The first item on the second list read, “No colluding, no history of colluding—we are professional and know the requirements.” Id.

Likewise, on May 22, 2008, DuPont’s Ian Edwards sent an e-mail to his colleague John Gallagher with the subject line, “reactions to R&H surcharge, and our plan for coatings
price?” PX 192, ECF No. 451-227. In the e-mail, Edwards said it was “evident that the plan we seem to be working around today, whereby we announce an intent to raise price and then in effect wait until others take action (or make firm commitments to action) that we can follow, simply isn’t working for us.” Id. Edwards noted parenthetically, “in addition, we cannot get exposed to any interpretation of our price increase announcements as being price signaling.” Id.

On May 29, 2008, DuPont’s Peter O’Sullivan sent an e-mail to colleagues at DuPont about a global price increase that would be announced shortly before an American Coatings Show in Charlotte, North Carolina. PX 193 at DUPTIO20965019, ECF No. 451-228. “Tomorrow we will issue a global price increase announcement,” O’Sullivan wrote, and “[m]aking public announcements in close proximity to a large industry gathering requires heightened awareness to the inappropriateness of interactions with competitors.” Id. “I know we are always mindful of the perception any dialogue with competitors can leave with others, but please be certain next week to refrain from any dialogue with any competitors.” Id.

Around the same time, Millennium modeled some of its price increase announcements off of the announcements of other pigment producers. On June 25, 2008, Millennium’s Manager of Global Corporate Communications explained to colleague Jim Clover that Millennium should not use DuPont’s language when drafting its own announcements. PX 195, ECF No. 451-230. “I know we have the [DuPont] announcement there as a reference,” the manager wrote, “but as a practice we shouldn’t do that even in draft form.” Id. at MIC02023612. On September 2, 2008, DuPont announced a price
increase to be effective immediately. *See* Pls.’ App. B at effective date 9/2/2008. The next day, Millennium’s Manager of Global Corporate Communications “made some changes” to its draft announcement in which it would be matching DuPont’s price increase, because the draft was “too much like DuPont’s.” PX 207.

Most recently, on September 2, 2010, after the Complaint in this case was filed, Millennium’s Dave Murrer sent an e-mail to his colleagues with the subject line, “DuPont Price increase – North America +$0.08 Oct 1.” PX 253, ECF No. 451-288. His e-mail was responding to a colleague’s statement about a Huntsman price increase announced on August 24, 2010. *Id.* This was the first time in the North American market that Huntsman initiated a price increase, and each Defendant followed it, though with different amounts and dates on which the increases would become effective. *See* Pls.’ App. B. The colleague wrote, “Wow – we now have different dates and amounts from all 3 that have announced. . . . I am not sure what our position will be or legal implications, but I would stick with our date and amount.” PX 253 at MIC00117020. “A key learning from this is we should have waited to announce.” *Id.*

E. Interfirm Sales of Titanium Dioxide

Finally, the Plaintiffs submit evidence showing that the Defendants discussed, and in some case agreed to, interfirm sales of titanium dioxide, as well as entered into joint ventures and swapped raw materials. *See generally* App. H, ECF No. 451-23. According to the Plaintiffs, “in times of need, Defendants routinely assisted each other, rather than compete and sell directly to each other’s customers.” Pls.’ Resp. in Opp. 92. One example is the joint venture between Huntsman and Kronos, the Louisiana Pigment Company. The Plaintiffs’
argue that the joint venture facilitated the alleged conspiracy by giving the two competitors opportunities to collude. In a January 2002 monthly report produced by Huntsman, the firm noted the financial performance of the Louisiana Pigment Company. See PX 37, ECF No. 451-72. The report included that the joint venture’s production declined to “9082 te, the reduced rate being a result of the JV partner wishes due to high Y/E stocks.” Id. at HILLC000549126. This report seems to suggest that Huntsman agreed to reduce the joint venture’s output because of Kronos’s large inventory.

Another example is a series of transactions between Millennium and DuPont in early 2007, in which Millennium purchased titanium dioxide from DuPont. The Plaintiffs’ expert Dr. Lamb analyzed these sales and found that Millennium paid a price of eighty-eight cents per pound for DuPont’s product, while the lowest price paid by any other purchaser in January 2007 was nine cents higher. See PX 284, ECF No. 451-319. The average price paid by other purchasers during this time period was nineteen cents higher per pound than the price charged to Millennium. Id. Instead of competing for Millennium’s customers, DuPont appears to have provided help to Millennium, selling titanium dioxide at a rate lower than that on the market.

Finally, the Plaintiffs stress an e-mail from December 2008—during the economic recession—in which Millennium’s John Hall wrote to a colleague in Saudi Arabia, with the subject line “A concept – ‘Co-opertition.’” PX 215, ECF No. 451-250. In the e-mail, Hall introduced a possibly “crazy idea . . . perhaps worthy of some consideration” because of the “very difficult times.” Id. He proposed that Millennium consider consolidating “production with a competitor in order to increase rates and reduce cost for similar product in the
market.” *Id.* Hall later testified that he came up with the word “co-opertition” himself and suggested the idea because of “a lot of excess capacity” and “very weak demand” in the titanium dioxide industry. PD 6, Hall tr. 171-73, ECF No. 451-328.

**F. Contrasting Evidence**

A great deal of the evidence submitted by the Plaintiffs is not in dispute. Rather, the parties clash in their interpretation of the facts and the legal significance to be assigned to them. The Defendants do not contest, for example, that profits were “unappealing” and prices were decreasing during the years prior to the Class Period. *See* Joint Mot. for Summ. J. 29, ECF No. 459. Moreover, there is no dispute that the TDMA amended its operating rules to allow DuPont to participate as an “Associate Member”; that the TDMA thereafter established a new Global Statistics Program, which was kept secret; and that the price increase announcements recorded in Plaintiffs’ Appendix B occurred. The Defendants argue, however, that this conduct happened as a result of the Defendants’ lawful, procompetitive business purposes, and that the evidence therefore cannot withstand summary judgment.

1. Vigorous Price Competition

Notwithstanding the mountain of evidence essentially conceded by the parties, there are some disputes about key facts. First, the Defendants contend that contrary to the Plaintiffs’ argument, there was vigorous competition among the five largest producers of titanium dioxide both before and during the Class Period. They cite to Defendants’ Appendix B,\(^{15}\) which documents numerous instances from August 1999 until March 2010 in

\(^{15}\) Defendants’ Appendix B is attached to their Joint Motion for Summary Judgment, ECF No. 443.
which the Defendants Millennium and Kronos, DuPont, Huntsman, and Tronox took business away from a competitor by outbidding, undercutting a price, matching a competitive bid, approving a price reduction, or delaying or refunding a price increase. See generally Defs.’ App. B.

The Defendants pay particular attention to their conduct in the aftermath of Hurricane Katrina, when DuPont’s plant in DeLisle, Mississippi was forced to shut down. See Ex. C-1, DUPTIO20629072. As a result of the plant’s closure, DuPont was unable to serve some of its customers, and its share fell to 23 percent, a record low during the Class Period. See Defs.’ Ex. A-13, Willig Report 19 fig. 1. DuPont lost a substantial amount of its business to Millennium and Kronos during this time. For example, Millennium expressed to its employees the following goals for the third quarter of 2005: “accessing [DuPont] outage volume opportunities for Millennium”; “[t]aking on additional volume that we believe is strategic to us long-term”; and “[t]aking on short term opportunistic volume to fill up our plants.” Defs.’ Ex. C-2, MIC03651712. Likewise, Kronos instructed its sales force to “take this opportunity to contact all [of Kronos’s] accounts and target accounts to identify additional business potentials” and “to figure out a way to lock up some of the Katrina windfall business long term.” Defs.’ Exs. C-3, KROWW00114535 & C-4, KROWW00100671. The Defendants insist that these internal documents suggest competitive, not collusive, activity.

Moreover, the Defendants emphasize that the efforts of Millennium and Kronos to take business away from DuPont succeeded, resulting in fluctuations in market share at the customer level that lasted long after DuPont’s DeLisle plant reopened. See, e.g., Defs.’ Exs.
The Defendants admit, however, that DuPont eventually recovered its overall share to “pre-Katrina levels.” Joint Mot. Summ. J. 12.

2. Overall Changes in Market Shares and Shares at the Customer Level

The Defendants contend that their shares of sales to individual customers and to all United States customers fluctuated throughout the Class Period, demonstrating vigorous competition among the Defendants. See Ex. D-78, Lamb Mar. 5, 2013 Dep. 174-79. For example, the Defendants point to Sherwin Williams, the top purchaser of titanium dioxide from the Defendants in 2010. DuPont’s share of Sherwin Williams sales increased from 36 percent in 2005 to 46 percent in 2007, and then fell to 39 percent in 2008 when Millennium and Tronox took some of DuPont’s share. Defs.’ Ex. A-2, Hamilton Oct. Report Attach. 2. Later, however, DuPont won back the share it lost. See Defs.’ Ex. A-9, Murphy Report ¶ 121; Defs.’ Ex. 12. Likewise, DuPont’s share of sales to another high-volume purchaser, AkzoNobel, fell from 74 percent in 2005 to an extremely low 4 percent in 2010. Id. In that year, Millennium and Tronox became AkzoNobel’s primary suppliers of titanium dioxide. Id. Beyond those two examples, the Defendants’ expert economist Professor Robert Willig identified other instances when “customers shifted a substantial portion of their purchases between the firms from year to year.” Defs.’ Ex. A-13, Willig Report ¶ 33 & figs. A-1A to A-1C.

The conflicting evidence creates a dispute of fact, which must await resolution at trial. While the Plaintiffs argue that there was overall market share stability during the Class Period, the Defendants emphasize the customer-specific price competition. More
importantly, the parties engage in a battle of the experts to prove whether the pigment producers’ overall market share remained stable during the Class Period. The Defendants’ expert Dr. Willig finds significant fluctuation in market share during the Class Period. For example, the Defendants argue that “DuPont’s share of all U.S. TiO2 sales swung between 28% and 33% during the Class Period; Millennium’s between 20% and 22%; Tronox’s between 18% and 23%; Kronos’s between 16% and 20%; and Huntsman’s between 8% and 10%.” Joint Mot. Summ. J. 15 (citing Defs.’ Ex. A-13, Willig Report 17 tbl. 1). The Plaintiffs, on the other hand, rely on the analysis of Dr. Lamb, who applied a “coefficient of variation” test and observed “little variance in market share among the cartel members during the Class Period.” Pls.’ Resp. in Opp. 100 (citing Lamb Rebuttal Report ¶¶ 125-26 & tbl. 7). Even assuming the Defendants’ expert was correct, the Plaintiffs argue, the overall market share remained relatively stable, with DuPont’s share hovering around 30 percent, Huntsman’s around 10 percent, Kronos’s between 16 and 20 percent, and Millennium’s around 20 percent.

3. Lack of Punishment

The Defendants maintain that the Plaintiffs can show no proof of a punishment mechanism. Punishment, the Defendants aver, would usually occur in a price-fixing conspiracy when members of the conspiracy undercut their competitors and shift shares at the customer level, as in this case. As the Plaintiffs’ expert Dr. Hamilton acknowledges, “a credible punishment mechanism” to penalize cheaters is an important component of a cartel. Ex. A-3, Hamilton Feb. Report ¶ 41. However, while the Defendants’ expert Professor Murphy finds no instances of punishment, the Plaintiffs’ expert Dr. Hamilton does identify
documents suggesting the use of a punishment mechanism, or at least an awareness that such a mechanism was available, before and during the Class Period. See id. ¶¶ 54, 57-59.

4. LowerMargins During the Class Period

The Defendants contend that they earned significantly lower margins during the Class Period as compared to the years prior to the Class Period. Reduced profit margins, they argue, are additional evidence of the vigorous competition among the top five titanium dioxide producers. The Defendants assert that the average gross profit margins of DuPont’s titanium dioxide business plummeted from 43.34 percent prior to the Class Period to 27.59 percent during the Class Period. See Defs.’ Ex. A-13, Willig Report ¶ 83 & tbl. 4A. Likewise, Kronos’s margins fell from 15.13 percent to 7.93 percent, and Millennium’s margins fell from 17.32 percent to 14.53 percent. Id. The operating margins of DuPont, Kronos, and Huntsman also declined, in some cases precipitously. Id. ¶ 61 & tbl. 4B.

According to the Defendants, these decreases in margins during the Class Period contradict the Plaintiffs’ theory that the Defendants created a cartel to increase prices and profit margins in the wake of an industry crisis and a particularly catastrophic year in 2001. The Plaintiffs respond, however, that the evidence in the record shows that the Defendants were able to raise prices during the Class Period, which resulted in increased profit margins. They rely on the expert opinion of Dr. Lamb, who found that the Defendants’ price increases resulted in aggregate overcharges of between $2.1 and $2.7 billion. See Lamb Rebuttal Report ¶¶ 9, 12. Accordingly, this fact is genuinely disputed by the parties.
5. Evidence that the Plaintiffs Allegedly Misconstrue

Finally, the Defendants jointly point out some evidence that they believe the Plaintiffs have misconstrued. They contend, for example, that the Class Period saw increases in demand until the economic recession in 2009. See Joint Mot. Summ. J. 31-32. They further noted that Dr. Lamb ignored increases in global (as opposed to United States) demand, resulting in his underestimating the level of demand for titanium dioxide during the relevant time period. Id. at 32-33. Lastly, the Defendants pointed out at the motions hearing on June 25, 2013, that Plaintiffs’ Appendix A records countless instances in which the pigment producers attended meetings, conferences, and the like. However, those alleged opportunities to conspire should be discounted, the Defendants argue, because the employees of the firms who had pricing authority for North America’s titanium dioxide market seldom were in attendance.

6. Millennium’s Three Changes in Ownership During the Class Period

In Millennium’s individual Motion for Summary Judgment (ECF No. 439), the party reasserts many of the facts included in the Defendants’ Joint Motion for Summary Judgment. However, Millennium also points out that during the decade-long Class Period, Millennium experienced three changes in ownership and operated under numerous management teams. See, e.g., Defs.’ Ex. 3-1, Cianfichi Dep. 175; Murrer Dep. 106; Ex. 2-8; Ex. 3-2, Vercollone Dep. 26; Ex. 3-4, De Jong Dep. 26-27; Ex. 3-5, Verrett Dep. 147. Considering that the greater the number of people involved in a cartel, the more likely the cartel is to be detected, Millennium suggests that these leadership changes render the Plaintiffs’ conspiracy allegations implausible.
7. Kronos’s Surcharges, Joint Venture, Operating Capacity, and Involvement with Jim Fisher

In addition to the facts cited by the Defendants in their Joint Motion for Summary Judgment, Kronos highlights in its individual Motion (ECF No. 432) four additional facts. First, Kronos argues that, unlike the other four largest pigment producers, Kronos levied energy surcharges on its customers twice in 2008. See Pls.’ App. B at effective dates 6/15/2008 & 7/1/2008. Kronos suggests that its decision to announce these additional increases, independent of the other pigment producers and with full knowledge that Kronos could lose business as a result, cuts against the Plaintiffs’ theory of carefully coordinated behavior on the part of the Defendants Millennium and Kronos, DuPont, Huntsman, and Tronox.

Second, Kronos points out that it entered a joint venture, the Louisiana Pigment Company, with Huntsman ten years before the alleged price-fixing began. Kronos asserts that it did so for legitimate, procompetitive business reasons. Third, Kronos contends that the Defendants Millennium and Kronos, DuPont, and Huntsman all operated their plants at capacity throughout the Class Period. Kronos Ex. 2, Willig Report ¶ 80, fig. 4C, tbl. 3B (“[C]apacity utilization in North America for all [original Defendants] was well over 90% for most of the class period.”). This fact, Kronos contends, contradicts the Plaintiffs’ assertion that the Defendants purposely curtailed production to influence market price. Finally, Kronos stresses that it never hired Jim Fisher during the Class Period, a fact casting doubt on the Plaintiffs’ theory that Jim Fisher acted as a conduit for the cartel. See Kronos Ex. 58, IBMA-FISHER001189; Ex. 39, Wigdor Dep. 253:8-255:22.
STANDARD OF REVIEW

Because the correct standard of review was heavily debated both in the briefing and during the motions hearing on June 25, 2013, this Court sets out in greater detail than usual the legal standard by which to determine whether a genuine issue of material fact exists. When a Sherman Act claim is made against firms of a highly concentrated industry, as in this case, certain economic antitrust principles play a role in the summary judgment standard. As this Court describes in greater detail herein, it is rational for firms in a highly concentrated market to take into account the actions of their competitors and to follow those actions, assuming no external market factors dissuade them from doing so. This phenomenon, which is called conscious parallelism, is not in itself illegal. Thus, allegations of parallel conduct alone cannot survive summary judgment, and plaintiffs must bring forward evidence showing the existence of certain “plus factors,” the most important of which is non-economic evidence of an agreement not to compete.

A. Evidence that Tends to Exclude the Possibility of Independent Action

Summary judgment is appropriate when “there is no genuine dispute as to any material fact” such that “the movant is entitled to judgment as a matter of law.” Fed. R. Civ. P. 56(a). Where the moving party has presented a properly supported motion for summary judgment, the non-moving party must present significant probative evidence to establish that genuine issues of material fact exist. Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 247 (1986). For a dispute to be genuine, the non-moving party “must do more than simply show that there is some metaphysical doubt as to the material facts,” but instead must “come forward

The Plaintiffs in this case allege that the Defendants, with co-conspirators DuPont, Huntsman, and Tronox, violated Section 1 of the Sherman Act by engaging in a horizontal price-fixing conspiracy to raise the price of titanium dioxide in the United States to supracompetitive levels. To prove the existence of a horizontal price-fixing conspiracy, a plaintiff must demonstrate the following: “(1) the existence of an agreement, combination, or conspiracy, (2) among actual competitors, (3) with the purpose or effect of ‘raising, depressing, fixing, pegging, or stabilizing the price of a commodity,’ (4) in interstate or foreign commerce.” *In re Med. X-Ray Film Antitrust Litig.*, 946 F. Supp. 209, 215-16 (E.D.N.Y. 1996) (quoting *United States v. Socony-Vacuum Oil Co.*, 310 U.S. 150, 223-24 (1940)).

An antitrust plaintiff must present “direct or circumstantial evidence that reasonably tends to prove that the [alleged conspirators] had a conscious commitment to a common scheme designed to achieve an unlawful objective.” *Monsanto Co. v. Spray-Rite Serv. Corp.*, 465 U.S. 752, 768 (1984). In *Monsanto*, the issue was whether the plaintiff had presented sufficient evidence to survive a motion for directed verdict on its claim that its distributorship was terminated pursuant to a price-fixing agreement by the defendant and other wholesalers. *Id.* at 759. The Supreme Court held that the United States Court of Appeals for the Seventh Circuit had applied an incorrect standard when it relied on mere evidence that the plaintiff’s distributorship was terminated following complaints by other distributors that plaintiff was cutting prices. *Id.* at 759, 768. In rejecting that standard, the Supreme Court recognized that allowing too broad a range of inferences from “highly
ambiguous” evidence increased the potential for antitrust lawsuits to “deter or penalize perfectly legitimate conduct.” *Id.* at 763-64. Thus, the Court concluded that the nonmoving party had to present “evidence that tends to exclude the possibility of independent action.” *Id.* at 768.

In *Matsushita*, 475 U.S. 574 (1986), the Supreme Court applied the *Monsanto* standard in the summary judgment context. Because a plaintiff must show evidence tending to exclude the possibility of independent action, the Court determined that “conduct that is as consistent with competition as with an illegal conspiracy does not, standing alone, support an inference of an antitrust conspiracy.” *Id.* at 588 (citing *Monsanto*, 465 U.S. at 764). The plaintiffs in *Matsushita* were American television manufacturers that brought suit against Japanese television companies, alleging that they had conspired for more than two decades to drive down the price of televisions in the United States and force the plaintiffs out of the market. *Id.* at 577-78. The Supreme Court reasoned that the alleged “predatory pricing” conspiracy—a twenty-year scheme to depress prices at a significant loss to the defendants, so that they might one day recoup their losses by making monopoly profits in a cartelized American market—was implausible, meaning it made no economic sense. *Id.* at 588-94.

Against the backdrop of extremely implausible conspiracy allegations, the Court found no evidence “that is sufficiently unambiguous to permit a trier of fact to find that [the defendants] conspired.” *Id.* at 597.

Importantly, the Supreme Court in *Matsushita* held that “antitrust law limits the range of permissible inferences from ambiguous evidence in a § 1 case.” *Id.* at 588. In other words, plaintiffs “must show that the inference of conspiracy is reasonable in light of the
competing inferences of independent action.” *Id.* This standard articulated in *Matsushita* has been consistently applied in cases concerning allegations of price-fixing. *See In re Publ’n Paper Antitrust Litig.*, 690 F.3d 51 (2d Cir. 2012); *In re Flat Glass Antitrust Litig.*, 385 F.3d 350 (3d Cir. 2004); *In re High Fructose Corn Syrup Antitrust Litig.*, 295 F.3d 651 (7th Cir. 2002); *In re Citric Acid Litig.*, 191 F.3d 1090 (9th Cir. 1999).\(^{16}\)

Although it is clear that the *Matsushita* standard governs whether granting summary judgment is proper, it is equally clear that the particular facts of each case determine how high a burden that standard imposes. *See, e.g., Publ’n Paper, 690 F.3d at 63 (“[T]he range of inferences that may be drawn from [ambiguous] evidence depends on the plausibility of the plaintiff’s theory.”); High Fructose Corn Syrup, 295 F.3d at 661 (“More evidence is required the less plausible the charge of collusive conduct.”). Indeed, the Supreme Court in *Eastman Kodak Co. v. Image Technical Services, Inc.*, 504 U.S. 451, 468 (1992), explained that *Matsushita*’s requirement “that the plaintiffs’ claims make economic sense did not introduce a special burden on plaintiffs facing summary judgment in antitrust cases.” The Court emphasized that a moving party is not entitled to summary judgment simply because it “enunciates any economic theory supporting its behavior, regardless of its accuracy in reflecting the actual market.” *Id.* (emphasis in original). Rather, “*Matsushita* demands only that the nonmoving party’s inferences be reasonable in order to reach the jury, a requirement that was not invented, but merely articulated, in that decision.” *Id.*

\(^{16}\) The *Matsushita* standard has likewise been applied in cases alleging illegal restraints of trade other than price-fixing, such as the alleged agreement to boycott at issue in *Merck-Medco Managed Care, LLC v. Rite Aid Corp.*, 201 F.3d 436 (4th Cir. 1999) (unpublished table decision).
Plaintiffs alleging an implausible conspiracy face a high burden to show evidence that tends to exclude inferences of legitimate competitive behavior. By contrast, where plaintiffs allege a plausible conspiracy—one that makes economic sense—a lower “tends to exclude” standard applies. Publ’n Paper, 690 F.3d at 63. Accordingly, when a plausible conspiracy has been alleged, a plaintiff need not “disprove all nonconspiratorial explanations for the defendants’ conduct” to prevail at summary judgment. Id. (quoting Phillip E. Areeda & Herbert Hovenkamp, Antitrust Law § 14.03b, at 14-25 (4th ed. 2011)). Especially relevant to this case, the United States Court of Appeals for the Second Circuit has held that where “a plaintiff relies on ambiguous evidence to prove its claim, the existence of a conspiracy must be a reasonable inference that the jury could draw from that evidence; it need not be the sole inference.” Id. (emphasis in original). When determining whether a jury could reasonably infer that there was a conspiracy, this Court must view the totality of the evidence. See High Fructose Corn Syrup, 295 F.3d at 655-56 (cautioning against the supposition that “if no single item of evidence presented by the plaintiff points unequivocally to conspiracy, the evidence as a whole cannot defeat summary judgment”).

B. Evidence Beyond Mere Parallel Conduct in a Case Involving an Oligopoly

Even when the alleged conspiracy is a plausible one, courts “have been cautious in accepting inferences from circumstantial evidence” if the alleged anticompetitive conduct can plausibly be explained by the rational, procompetitive conduct of businesses in an oligopoly. See Flat Glass, 385 F.3d at 358-59 (quoting Areeda & Hovenkamp § 1429, at 207). Because this case involves a market dominated by a few firms, making it highly concentrated, “any single firm’s ‘price and output decisions will have a noticeable impact on the market
and on its rivals.”” Id. For this reason, “when a firm in a concentrated market (i.e., an ‘oligopolist’) is deciding on a course of action, ‘any rational decision must take into account the anticipated reaction of the other [] firms.”” Id. This phenomenon, known as interdependence or “conscious parallelism,” is not in itself illegal, but may evidence price-fixing. In re Ethylene Propylene Diene Monomer (EPDM) Antitrust Litig., 681 F. Supp. 2d 141, 167 (D. Conn. 2009) (finding “six lockstep price increases” to be strong circumstantial evidence of a price-fixing agreement, despite the fact that conscious parallelism is not itself unlawful).

Evidence of parallel conduct in an oligopoly, without more, is insufficient to withstand a motion for summary judgment. Flat Glass, 385 F.3d at 360. This is consistent with the statement in Matsushita that “conduct as consistent with permissible competition as with illegal conspiracy does not, standing alone, support an inference of antitrust conspiracy.” 475 U.S. at 588 (citing Monsanto, 465 U.S. at 764) (emphasis added). Instead, plaintiffs must demonstrate, in addition to merely parallel conduct, the existence of certain “plus factors” that are indicative of a conspiracy. Flat Glass, 385 F.3d at 360.

There are three kinds of “plus factors” on which courts most often rely to determine whether an inference of conspiracy is permissible: (1) “evidence that the defendant had a motive to enter into a price fixing conspiracy,” (2) “evidence that the defendant acted contrary to its interests,” and (3) “evidence implying a traditional conspiracy,” such as “non-economic evidence that there was an actual manifest agreement not to compete.” Id. at 360-61. The first plus factor, whether defendants had a “motive to enter a price fixing conspiracy,” refers to “evidence that the industry is conducive to oligopolistic price fixing, either independently or through a more express form of collusion.” Id. at 360. Indicators
that a market is conducive to collusion include the homogeneous and highly standardized, or commodity-like nature, of the product; a concentrated market dominated by a few sellers; high barriers to new players’ entry, such as high investment or fixed costs; and excess production capacity. Publ’n Paper, 690 F.3d at 65; Flat Glass, 385 F.3d at 361; High Fructose Corn Syrup, 295 F.3d at 656-57.

The second plus factor, evidence that defendants acted contrary to economic self-interest, means actions that are inconsistent with competition in the industry. Flat Glass, 385 F.3d at 361. Price increases that are not correlated with principles of supply and demand may be especially probative of behavior contrary to self-interest. Id. at 358 (“[A]bsent increases in marginal cost or demand, raising prices generally does not approximate—and cannot be mistaken as—competitive conduct.”); High Fructose Corn Syrup, 295 F.3d at 659 (deeming anticompetitive an across-the-board price increase based on sweetness of product, where the price based on cost would have been lower). Another example of conduct that is inconsistent with competition is when a seller that has excess production capacity buys product from a competitor, thereby maintaining consistent relative market share, rather than expanding production to meet demand. High Fructose Corn Syrup, 295 F.3d at 695.

While the presence of these first two “economic” plus factors—motive and conduct against economic interest—may be suggestive of collusion, “care must be taken with the first two types of evidence, each of which may indicate simply that the defendants operate in an oligopolistic market, that is, may simply restate the (legally insufficient) fact that market behavior is interdependent and characterized by conscious parallelism.” In re Ins. Brokerage Antitrust Litig., 618 F.3d 300, 322 (3d Cir. 2010) (citing Flat Glass, 385 F.3d at 360-61; Areeda
Accordingly, the first two plus factors are neither sufficient nor necessary to prove the existence of a conspiracy. See Flat Glass, 385 F.3d at 362 (“All of the above indicates that the price increases were collusive, but not whether the collusion was merely interdependent or the result of an actual agreement.”); High Fructose Corn Syrup, 295 F.3d at 655 (“Neither form of economic evidence is strictly necessary.”).

Because the first two plus factors may largely restate the phenomenon of conscious parallelism, the most important plus factor is “non-economic evidence ‘that there was an actual, manifest agreement not to compete.’” Flat Glass, 385 F.3d at 361 (quoting High Fructose Corn Syrup, 295 F.3d at 661). Sufficient non-economic evidence may be “proof that the defendants got together and exchanged assurances of common action or otherwise adopted a common plan even though no meetings, conversations, or exchanged documents are shown.” Id. (quoting Areeda & Hovenkamp § 1434b).

ANALYSIS

The Defendants move for summary judgment, contending that there is no basis in the record on which a jury could infer that the Defendants conspired to fix the price of titanium dioxide. They argue that the conspiracy alleged by the Plaintiffs is highly implausible and that the record is replete with evidence of fierce competition. Further, the Defendants emphasize—and the Plaintiffs do not contest—that this case rests entirely on circumstantial evidence, and “antitrust law limits the range of permissible inferences from ambiguous evidence in a § 1 case.” Matsushita, 475 U.S. at 588. Most importantly, the Defendants maintain that the evidence before this Court is equally consistent with competition as with collusion. Thus they argue that the Plaintiffs fail to meet their burden
of producing evidence tending to exclude the possibility that the Defendants were acting independently. See Matsushita, 475 U.S. at 588.

On all points the Defendants’ argument fails, as there are genuine issues of material fact to be resolved at the trial of this case. First, while the record contains some evidence of competition, that portion of the record must be weighed against the substantial portion on which a jury could permissibly infer a conspiracy. The record contains ample evidence for concluding that the Defendants agreed to raise prices and shared commercially sensitive information—by way of industry consultants, face-to-face meetings, and the Titanium Dioxide Manufacturers Association’s Global Statistics Program—to facilitate their conspiracy. While the Defendants’ argument in this regard is certainly suitable for trial, it does not advance their position at summary judgment. See High Fructose Corn Syrup, 295 F.3d at 655.

Second, that this case depends wholly on circumstantial evidence holds no sway. As the Fourth Circuit has explained, “[d]irect evidence is extremely rare in antitrust cases.” Am. Chiropractic Ass’n v. Trigon Healthcare, Inc., 367 F.3d 212, 226 (4th Cir. 2004). A case relying on direct evidence would of course be stronger for proving a price-fixing conspiracy, but echoing the finding of the Seventh Circuit, “most cases are constructed out of a tissue of [ambiguous] statements and other circumstantial evidence, since an outright confession will ordinarily obviate the need for a trial.” High Fructose Corn Syrup, 295 F.3d at 662. More importantly, the interpretation and weighing of conflicting circumstantial evidence is a role assigned to the jury at trial. As the United States Court of Appeals for the Ninth Circuit has aptly explained, “[t]o read Matsushita as requiring judges to ask whether the circumstantial
evidence is more ‘consistent’ with the defendants’ theory . . . would essentially convert the judge into the thirteenth juror.”  

In re Petroleum Prods. Antitrust Litig., 906 F.2d 432, 438 (9th Cir. 1990); see also Publ’n Paper, 690 F.3d at 65 (denying summary judgment despite the fact that the plaintiffs’ evidence “admits of alternative interpretations,” because “it is the province of the jury to determine how much weight to accord” that evidence); cf. Eastman Kodak, 504 U.S. at 468 (“Matsushita . . . did not introduce a special burden on plaintiffs facing summary judgment in antitrust cases.”).

The Defendants suggest that the evidence is susceptible to an inference of independent action, and that fact alone should secure them summary judgment in their favor. This Court, however, finds that the Plaintiffs present sufficient evidence to show “that the inference of conspiracy is reasonable” in light of the Defendants’ competing inference of independent action. Matsushita, 475 U.S. at 588; see also Publ’n Paper, 690 F.3d at 63 (holding that a reasonable inference need not be the sole possible inference). This Court addresses the evidence defeating summary judgment—not only the evidence of parallel conduct but also the presence of three plus factors indicative of collusion: (1) “evidence that the defendant had a motive to enter into a price fixing conspiracy,” (2) “evidence that the defendant acted contrary to its interests,” and, most relevant, (3) the non-economic evidence “implying a traditional conspiracy.” Flat Glass, 385 F.3d at 361. Though “antitrust law limits the range of permissible inferences from ambiguous evidence in a § 1 case,” Matsushita, 475 U.S. at 588, this Court finds that the Plaintiffs have met their burden at the summary judgment stage because a jury, viewing the evidence in the totality, could reasonably infer a price-fixing conspiracy by the Defendants.
I. Evidence Tending to Exclude the Possibility of Independent Action

An antitrust plaintiff must present “evidence that tends to exclude the possibility of independent action.” Monsanto, 465 U.S. at 768. Moreover, the Supreme Court has found that “conduct that is as consistent with competition as with an illegal conspiracy does not, standing alone, support an inference of an antitrust conspiracy.” Matsushita, 475 U.S. at 588 (citing Monsanto, 465 U.S. at 764).

This case involves allegations of horizontal price-fixing among oligopolists. Whereas the conspiracy alleged in Matsushita made no economic sense, the Plaintiffs in this case allege a plausible theory of conspiracy. Indeed, an agreement among the five largest producers of titanium dioxide “to fix prices at a supracompetitive level . . . makes perfect economic sense.” Flat Glass, 385 F.3d at 358. Yet even where a plaintiff’s theory is plausible, courts are “cautious in accepting inferences from circumstantial evidence” concerning pricing decisions by oligopolists. Id. This is because oligopolists in a highly concentrated market take into account the reactions of other firms when making decisions regarding, for example, pricing. See id. at 359 (quoting Areeda & Hovenkamp ¶ 1429, at 207). This phenomenon, called interdependence or conscious parallelism, can appear coordinated on its face, yet in fact reflect wholly independent action. Id. In In re Flat Glass Antitrust Litigation, the Third Circuit describes the phenomenon of conscious parallelism as follows:

[F]irm Beta might announce its decision to raise its price to X effective immediately, or in several days, or next season. The other [oligopolist] firms may each choose to follow Beta’s lead; if they do not increase their prices to Beta’s level, Beta may be forced to reduce its price to their level. Because each of the other firms knows this, each will consider whether it is better off when all are charging the old price or price X. They will obviously choose X when they believe that it will maximize industry profits.
Id. (quoting Areeda & Hovenkamp § 1429, at 207-08). Because the behavior of firms in an oligopoly may be mistaken as collusion, courts generally require a plaintiff to show more than mere parallel conduct. The plaintiff must also prove the existence of certain plus factors that indicate an environment conducive to price-fixing and conditions that make price-fixing, rather than competition, attractive. See High Fructose Corn Syrup, 295 F.3d at 657. In this case, the Plaintiffs present sufficient evidence of parallel conduct coupled with the three most commonly analyzed plus factors.

A. Parallel Conduct

The Plaintiffs’ case cannot stand alone on parallel conduct for the reasons articulated above. The parallel price increases in this case are nonetheless noteworthy, because they were so pervasive. From 2002 through 2010, Millennium, Kronos, DuPont, Huntsman, and Tronox participated in twenty-five parallel price increase announcements. See generally Pls.’ App. B. By contrast, during the prior eight-year period from 1994 through 2001, Millennium’s predecessor SCM, Kronos, DuPont, Huntsman, and Tronox engaged in just one parallel price increase. See PX 92. Moreover, price increases during the Class Period occurred seemingly in lockstep, with little deliberation by the competitor firms. In one particularly significant instance in September 2005, Tronox and Kronos matched a price increase announcement by DuPont within hours, and the other producers followed suit the next day. See id. at effective date 10/1/2005.

The sheer number of parallel price increases, when coupled with the other evidence in this case, could lead a jury to reasonably infer a conspiracy. Indeed, courts have denied summary judgment where a case relied on far fewer instances of parallel conduct. See Publ’n
Paper, 690 F.3d 51 (denying summary judgment where, among other evidence, plaintiffs relied on three parallel price increases over the course of one year); Flat Glass, 385 F.3d at 355 n.5 (finding a genuine dispute of material facts where the evidence included seven parallel price increases, “by the same amount and within very close time frames,” across a period of five years); EPDM, 681 F. Supp. 2d at 168 (denying summary judgment where plaintiffs alleged six lockstep price increases).

The Defendants suggest that this parallel conduct is nothing more than perfectly lawful conscious parallelism. To be sure, one characteristic of conscious parallelism is the “follow-the-leader” pricing behavior described by the Third Circuit in Flat Glass. 385 F.3d at 358 (quoting Areeda & Hovenkamp § 1429, at 207-08). However, that theory contemplates the possibility that a price leader would be forced to rescind its increase because competitors decided not follow it. Id. In this case, no producer rescinded a price increase during the Class Period. See Pls.’ App. B. Instead, over a period of nine years, the top five pigment producers in the world participated in twenty-five parallel price increases, close in time and nearly always identical in amount,17 and not once did the price leader back down.18

The Defendants also emphasize that their contracts with customers were individually negotiated. Thus, the prices actually paid were the result of individual bargaining, and no customer paid the price listed in the price increase announcements. This argument is quickly dispatched. Fixing the list price is itself a Sherman Act violation, regardless of whether the

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17 See generally Pls.’ App. B. Twenty of the twenty-five parallel price increases involved identical amounts. In five sets of increases, one or two of the pigment producers announced a price increase that differed by $0.01 or $0.02 cents per pound. Id.

18 Comparing the Class Period to the prior eight years, it is noteworthy that Kronos rescinded a price increase in September 1994. See PX 92.
actual purchases were at a lower price. *High Fructose Corn Syrup*, 295 F.3d at 656. Moreover, a higher list price artificially raises the starting point for negotiations, guiding actual prices higher. The Defendants would not raise list prices if they thought it would have no effect on sale prices. *Id.* In short, whether sellers were ultimately successful in making sales at the higher prices is irrelevant—“a horizontal agreement to fix prices need not succeed for sellers to be liable under the Sherman Act.” *Flat Glass*, 385 F.3d at 361-62 (citing *High Fructose Corn Syrup*, 295 F.3d at 656, and *Socony-Vacuum Oil Co.*, 310 U.S. at 224 nn.59).

In the end a jury could find, as the Defendants urge, that the twenty-five parallel price increase announcements in this case can be explained by conscious parallelism. Viewing the evidence in the totality, however, this Court finds that the Plaintiffs’ massive record tends to exclude the possibility of independent action. *See Publ’n Paper*, 690 F.3d at 63 (reasoning that a plaintiff need not “disprove all nonconspiratorial explanations for the defendants’ conduct” to prevail at summary judgment (quoting Areeda & Hovenkamp § 14.03b)). Considering the parallel price increases in combination with the other evidence discussed below, the determination whether these price increases are the result of independent or collusive behavior is a decision for the jury. Now this Court turns to an analysis of the three plus factors indicative of a conspiracy.

**B. Motive**

The first plus factor is “evidence that the defendant had a motive to enter into a price fixing conspiracy,” that is, “evidence that the industry is conducive to oligopolistic price fixing, either independently or through a more express form of collusion.” *Flat Glass*, 385 F.3d at 360. In this case, the first plus factor is satisfied. The structure of the United States
titanium dioxide market is conducive to price-fixing, based on multiple factors. First, the titanium dioxide market is highly concentrated, meaning the “market is controlled by a limited number of sellers.” Publ’n Paper, 690 F.3d at 65. The Defendants Millennium and Kronos admit that they, DuPont, Huntsman, and Tronox dominated the market during the Class Period. See Lamb Report §§ 21-28, ECF No. 410-9.

Second, titanium dioxide is a standardized, commodity-like product. See Publ’n Paper, 603 F.3d at 65 (finding an industry conducive to collusion where the product had “few substitutes”). The Plaintiffs’ economic expert Dr. Lamb found that while certain grades of titanium dioxide are considered specialty pigments, the majority of grades and almost all of the production are commodity pigments. Lamp Report ¶¶ 29-36. Further buttressing this conclusion is the fact that the Defendants frequently purchased titanium dioxide from the other pigment producers and sold them as their own products. See generally Pls.’ App. H. Ultimately, price was the most important factor for titanium dioxide customers, since there are few qualitative differences in the products sold by the Defendants. Based on this evidence, the Plaintiffs have proven titanium dioxide to be a commodity-like product.

Third, the large capital investment necessary to open a titanium dioxide plant created a high barrier to entry by new sellers. High barriers to entry make a market more susceptible to collusion. Publ’n Paper, 690 F.3d at 65; EPDM, 681 F. Supp. 2d at 169. Dr. Lamb found barriers to entry in the market making it “difficult or impossible for new suppliers to enter the market and undercut” the Defendants’ allegedly coordinated pricing. Lamp Report ¶¶ 42-50.
Fourth, the Plaintiffs allege facts showing that Defendants maintained excess capacity. Excess capacity “makes price competition more than usually risky and collusion more than usually attractive.” *High Fructose Corn Syrup*, 295 F.3d at 657. The Plaintiffs present a substantial amount of evidence indicating that the Defendants were aware of excess capacity in the industry. See, e.g., Pls.’ App. K, ECF No. 451-26, at entries 05/01/2002 (“Capacity utilization in 2001 was lower than it had been in over a decade (below 85%). Expect to get to about 89% this year.”) & 10/17/2005 (quoting a Millennium presentation stating that “[t]here exists enough latent capacity such that the industry operating rate is expected to oscillate around its historical average of about 88% . . . . Over 500 kmt of latent capacity has been identified across the industry”). The Defendants contest this fact, arguing that “capacity utilization remained at high levels until the great recession” and criticizing Dr. Lamb’s estimation of global excess capacity as overinclusive. See Joint Mot. Summ. J. 33. Because the parties dispute whether the Defendants had excess capacity, and both have evidence supporting their positions, this issue of material fact is genuinely disputed and therefore resists resolution at this stage.

Finally, the Plaintiffs offer adequate evidence to suggest that in the decade before the Class Period and especially in 2001, the Defendants suffered substantial declines in consumption and price of titanium dioxide. Kronos and Millennium both acknowledged this crisis in the industry. See Pls.’ App. M at entries 02/01/2002 (Kronos’s Joe Maas distributing a chart showing that “TiO2 prices declined 13% in the USA from January 2001 to January 2002”) & 10/21/2002 (Millennium’s Gary Cianfichi quoted as saying that “in 2001, capacity utilization was lower than at any point in the 1990s . . . [t]he poor demand,
utilization, and operating rates pushed prices down by about 15%). Reduced demand is a market condition “that favor[s] price cuts, rather than price increases.”  *Flat Glass*, 385 F.3d at 361. These market conditions therefore made “price competition more than usually risky and collusion more than usually attractive.”  *High Fructose Corn Syrup*, 295 F.3d at 657.

In sum, the Plaintiffs adequately show the titanium dioxide market to be “a textbook example of an industry susceptible to efforts to maintain supracompetitive prices.”  *Flat Glass*, 385 F.3d at 361 (citing Richard A. Posner, *Antitrust Law* 69-79 (2d ed. 2001)).

**C. Actions Against Self-Interest**

The second plus factor is evidence that defendants acted contrary to their economic self-interest. *Id.* at 361. In the antitrust context, behavior contrary to self-interest means actions that are “inconsistent with competition in the industry.”  *Id.* “[A]bsent increases in marginal cost or demand, raising prices generally does not approximate—and cannot be mistaken as—competitive conduct.”  *Id.* at 358. Indeed, price increases that are not correlated with principles of supply and demand may be especially probative of behavior contrary to self-interest. *Id.* at 362 (noting that “no evidence suggests that the increase in list prices was correlated with any changes in costs or demand”). Additionally, a seller that buys product from a competitor when it has excess capacity acts against its competitive self-interest. *High Fructose Corn Syrup*, 295 F.3d at 659. If a firm has excess capacity, but insufficient inventory to meet demand, self-interest would dictate expanding production to meet the demand. *Id.* Buying from a competitor rather than expanding production, however, maintains relative market share and “preserves peace among the cartelists.”  *Id.*
In this case, the Plaintiffs present sufficient evidence of the Defendants’ actions against their self-interest. They specifically cite evidence that the Defendants, as well as DuPont, Huntsman, and Tronox, shared confidential and commercially sensitive information about their businesses, see generally Pls.’ App. I, ECF No. 451-22; helped each other maintain relative market share, see generally Pls.’ App. H, ECF No. 451-23; and engaged in some interfirm sales at low prices rather than competing, see id. Moreover, the Plaintiffs argued that the pigment producers increased prices despite declining demand. See, e.g., PX 148 (DuPont’s Ian Edwards writing that Millennium’s and Huntsman’s “reading of the CEFIC info like ours should give them confidence that [North America] price increases can be prosecuted despite the flat market in [North America] itself.”).

The Defendants challenge these points on several grounds. They suggest that their sharing of information was procompetitive and that the Global Statistics Program is weak evidence, considering that the program did not involve the exchange of pricing information but only current sales, production, and inventory data. However, the oligopolistic structure of the titanium dioxide market may have made the direct exchange of price information unnecessary. See High Fructose Corn Syrup, 295 F.3d at 656 (finding that in a concentrated market, “elaborate communications, quick to be detected, would not have been necessary to enable pricing to be coordinated”). Frequent price increase announcements could have served as “signals,” making further exchange of actual price information superfluous. At least one economist recognizes that knowledge of market share is the most important information to sustain a conspiracy. See George S. Stigler, A Theory of Oligopoly, 72 J. Pol. Econ. 46 (1964) (“Fixing market shares is probably the most efficient of all methods of
combating secret price reductions.”). The Plaintiffs present sufficient proof that the Defendants used the Global Statistics Program to determine relative market share, firm inventories, and capacity utilization. See, e.g., PX 58 (e-mail of Huntsman employee Paul Bradley explaining one benefit of the Global Statistics Program—that they would be able to “derive” production information of competitor firms, information that under the old regime they could only estimate).

The Defendants also argue that interfirm sales were conducted for legitimate reasons. For example, the Defendants point out that some sales occurred because of plant failures or technological setbacks that necessitated purchasing product from another pigment producer. Moreover, they contend vigorously that price increases during the Class Period were justified by increasing costs, and that an analysis of global rather than United States demand would show that overall demand for titanium dioxide during the Class Period was not declining. These debates reflect genuine issues of material fact. While some evidence suggests that the Defendants’ actions are not easily explained without inferring collusion, other evidence presents possible pro-competitive business reasons for those actions. A jury must therefore decide whether the Plaintiffs’ interpretation of the evidence carries the day. See, e.g., Publ’n Paper, 690 F.3d at 65 (denying summary judgment despite the fact that the plaintiffs’ evidence “admits of alternative interpretations,” because “it is the province of the jury to determine how much weight to accord” that evidence).

D. Evidence Implying a Traditional Conspiracy

Because the first two plus factors may “largely restate the phenomenon” of conscious parallelism, the third plus factor—non-economic evidence that suggests a traditional
conspiracy—carries greater weight. *See, e.g.*, Flat Glass, 385 F.3d at 360. This evidence includes “proof that the defendants got together and exchanged assurances of common action or otherwise adopted a common plan even though no meetings, conversations, or exchanged documents are shown.” *Id.* at 361.

Ambiguous statements by competitors, taken as a whole, may support the inference of a price-fixing conspiracy. In *In re High Fructose Corn Syrup Antitrust Litigation*, the court cited as traditional conspiracy evidence several statements by the defendants referring to “an understanding within the industry not to undercut each other’s prices” and “support” for efforts to limit pricing, as well as references to competitors as friends and customers as enemies. 295 F.3d at 662 (noting that such statements would “win no friends for capitalism”). The court also identified evidence of a conspiracy in a defendant’s statement that there was an “understanding between the companies . . . that causes us not to . . . make irrational decisions,” and a notation by another defendant reading “entry of new entrants (barriers) and will they play by the rules (discipline).” *Id.*

In this case, the Plaintiffs have marshaled substantial evidence of just this sort. A limited portion of these statements are recorded in the Background Section of this Memorandum Opinion. In sum, there are competitor statements regarding industry “discipline” and the sharing of industry information through the Global Statistics Program to support the Defendants’ “collective needs.” *See, e.g.*, PX 22 at MIC04080305; PX 45 at MIC05771277; PX 179. There are also statements suggesting that the cause of the twenty-five parallel price increases during the Class Period was collusive coordination, not conscious parallelism. *See, e.g.*, PX 25 (DuPont’s Dave Young expressing a preference for timing a
price increase such that competitors would have a chance “to announce ‘differently’”); PX 97 (Millennium e-mail suggesting a later announcement date in order to give “others [a] chance to get on their horses”); PX 101 (Millennium e-mail stating, “we have competition on board for the Oct 1 price increase announcement”); PX 219 (Kronos e-mail noting that it “appears we and our competitors are prepared to reduce production rather than chase phantom volume”).

In addition, the Plaintiffs highlight communications involving industry consultant Jim Fisher that support the Plaintiffs’ theory that he served as a conduit in the alleged price-fixing conspiracy. See, e.g., PX 52 (Kronos employee asking Fisher to confirm a price increase from his “lofty position”); PX 79 (Millennium e-mail describing the firm’s interest in having Fisher “ascertain relative TiO2 inventory levels” of key competitors—a “little job for [Millennium]”).

The Plaintiffs further identify statements suggesting that the Global Statistics Program was a means by which the Defendants shared sensitive information and coordinated price increases. See, e.g., PX 148 (DuPont e-mail stating, in regard to price increases by Millennium and Huntsman, that “their reading of the CEFIC info like ours should give them confidence that [North America] price increases can be prosecuted despite the flat market”).

Finally, there are statements revealing the Defendants’ awareness of the potential appearance of collusion in the titanium dioxide industry. See, e.g., PX 207 (Millennium manager editing a draft price increase announcement because the draft was “too much like DuPont’s”); PX 253 at MIC00117020 (Millennium discussing a set of price increase
announcements after the Complaint in this action was filed and acknowledging that “we have different dates and amounts from all 3 that have announced . . . [a] key learning from this is we should have waited to announce”).

Communications between competitors, followed by a price increase by multiple sellers, may indicate that prices rose pursuant to an agreement. See Flat Glass, 385 F.3d at 364-67 (considering interfirn communications leading up to three price increase announcements); Publ’n Paper, 690 F.3d at 57-59 (analyzing three parallel price increases in the context of private meetings and phone calls that occurred shortly before them). Included in the record in this case are hundreds of meetings, industry conferences, and informal contacts among the Defendants Millennium and Kronos, DuPont, Huntsman, Tronox, and industry consultants during the Class Period. See generally Pls.’ Apps. A, F1-F3, H, & J. Moreover, the Plaintiffs show that 88 percent of the price increase announcements listed in Plaintiffs’ Appendix B came within thirty days of a General Committee meeting of the TDMA, a fact suggesting that the Defendants may have used the TDMA to coordinate price increases. See Pls.’ Apps. A & B. Evidence in the record also demonstrates that the pigment producers’ interactions often involved the subjects of pricing, inventories, supply and demand, and capacity utilization. See, e.g., PX 223 (Millennium presentation at an industry wide conference referring to possible industry “tightness” in the future); PX 69 (e-mail from Ian Edwards of DuPont noting that at an industry wide conference, he stressed “the need for the industry to get its’ [sic] financial house in order”). The Defendants contend that the Plaintiffs cannot build a case on this evidence since there is no direct proof that the contacts listed in Plaintiffs’ Appendix A were anything more than legitimate
meetings for procompetitive business purposes. These mere “opportunities to conspire,” the Defendants argue, are not proof of collusion. Joint Mot. Summ. J. 36-45. Yet the Plaintiffs have presented evidence, not only of the large number of contacts, but also of the content of these communications, that suggests cartel behavior. This is exactly the kind of circumstantial evidence that, when viewed in conjunction with the massive record in this case, could lead a jury to reasonably infer a conspiracy in restraint of trade. See High Fructose Corn Syrup, 295 F.3d at 655-56 (cautioning against the supposition that “if no single item of evidence presented by the plaintiff points unequivocally to conspiracy, the evidence as a whole cannot defeat summary judgment”).

* * *

Having carefully considered the sheer number of parallel price increase announcements, the structure of the titanium dioxide industry, the industry crisis in the decade before the Class Period, the Defendants’ alleged acts against their self-interest, and the myriad non-economic evidence implying a conspiracy, this Court finds that the Plaintiffs put forward sufficient evidence tending to exclude the possibility of independent action. For this reason, the Motions for Summary Judgment filed by Kronos (ECF No. 432) and Millennium (ECF No. 439), as well as the Joint Motion for Summary Judgment (ECF No. 442) as it pertains to the remaining Defendants Kronos and Millennium, are DENIED.

II. The Defendants’ Statute of Limitations Argument

In the final pages of the Joint Motion for Summary Judgment, the Defendants argue that apart from the reasons for entering summary judgment against the Plaintiffs’ entire Sherman Act claim, their claim for damages reaching back to February 2003 also fails based

In this case, the Plaintiffs’ original Complaint was filed on February 9, 2010. In order to allege a conspiracy beginning in 2002, the Plaintiffs must show that the limitations period should be tolled by fraudulent concealment. Otherwise, their claim for damages would be limited to the period four years prior to their filing of their Complaint—that is, the period starting February 9, 2006. To prove fraudulent concealment, the Plaintiffs must establish “that (1) the party pleading the statute [of limitations] fraudulently concealed facts which are the basis of a claim, and that (2) the claimant failed to discover those facts within the statutory period, despite (3) the exercise of due diligence. *Id.* (citing *Weinberger v. Retail Credit Co.*, 498 F.2d 552, 555 (4th Cir. 1974)). To satisfy the first element of the fraudulent concealment test, the Fourth Circuit’s test requires a plaintiff to provide “evidence of affirmative acts of concealment.” *Supermarket of Marlinton, Inc. v. Meadow Gold Dairies, Inc.*, 71 F.3d 119, 126 (4th Cir. 1995). That evidence “need not be separate and apart from the acts of concealment involved in the antitrust violation; rather, [the] proof may include acts of concealment involved in the alleged antitrust violation itself.” *Id.*
The Defendants maintain that the Plaintiffs cannot meet the three elements of the fraudulent concealment test. Essentially, they contend that the Plaintiffs had notice of the facts forming the basis of their claim since February 2003, when the Defendants Millennium and Kronos, DuPont, Huntsman, and Tronox began to publicly announce parallel price increases. They also contend that the Plaintiff did not exercise due diligence to discover the facts underlying this action. To bolster the Defendants’ claim, they highlight Dr. Lamb’s characterization of the price increase announcements as a “tell-tale sign of cartel behavior.” Defs.’ Ex. A-6, Lamb Oct. Report ¶ 84. They also point out Class Representative Mr. Haley’s statement during his deposition that “there’s always something in the back of my mind, that, yeah, if everything is going up and, economically, the country wasn’t doing all that well, what’s the reason.” Defs.’ Ex. D-2, Haley Dep. 209-11.

In further support of their argument, the Defendants point to the antitrust decision *GO Computer, Inc. v. Microsoft Corp.*, 508 F.3d 170 (4th Cir. 2007), in which the Fourth Circuit affirmed a decision to grant summary judgment on the basis of the Clayton Act’s statute of limitations for an antitrust claim. In *GO Computer*, however, there was little question that the plaintiff had been on notice approximately fifteen years prior to filing suit, since the plaintiff was twice involved in the Federal Trade Commission’s (“FTC”) antitrust investigation of the defendant company Microsoft. *Id.* at 178. The first time, an FTC investigator remarked to the plaintiff that the case against the defendants looked “like a textbook case of abuse of monopoly power.” *Id.* The second time, the plaintiff provided a declaration to the FTC, reporting specific conversations that provided proof of the antitrust violation. *Id.* In a book written by the plaintiff a few years later, the plaintiff reported more conversations that were
probative of the violation. *Id.* “What put [the plaintiff] so plainly on inquiry notice,” the Fourth Circuit explained, was “the multiplicity and specificity of information he had.” *Id.* at 179.

Unlike the case in *GO Computer*, this Court cannot say as a matter of law that the Plaintiffs were on notice of the facts underlying this action starting in February 2003, or should have been on notice had they exercised due diligence. The Plaintiffs have provided adequate evidence of fraudulent concealment to survive summary judgment on this ground. For example, they proffer numerous pieces of evidence suggesting that the Defendants attempted to minimize the appearance of collusion. See, *e.g.*, PX 193 (DuPont’s Peter O’Sullivan writing in advance of an industry conference that “[m]aking public announcements in close proximity to a large industry gathering requires heightened awareness to the inappropriateness of interactions with competitors . . . please be certain next week to refrain from any dialogue with any competitors”). The Defendants also kept secret the TDMA’s Global Statistics Program. See, *e.g.*, PX 76 (Millennium’s Gary Cianfichi stressing that the GSP was confidential and any references made to the public regarding market details should be described as “[Millennium] estimates and never as CEFIC data”); PX 105 (Kronos’s Henry Basson reminding colleagues that “[a]ny TDMA statistics that are shared with you or any specifics which you may share with your co-workers, should UNDER NO CIRCUMSTANCES BE DIVULGED TO ANY THIRD PARTIES”).

There is also evidence in the record indicating that the Defendants gave inaccurate information to customers in order to justify their price increases. For example, in a telephone conversation with a financial consulting firm, Jim Fisher explained that the
“published production capacities” of the pigment producers are “far below the real ones,” and that DuPont, Millennium, and Kerr-McGee had a total of “350,000 tons of unused capacity.” See PX 91 at IBMA-Fisher 006552, ECF No. 451-126. The notes reflect Fisher’s belief that those producers would “not want to talk about” their excess capacity, in order to be “able to tell their customers that they are tight and . . . demand a good price.” Id.

Based on this evidence, a reasonable jury could conclude that the Defendants fraudulently concealed evidence of collusion. For this reason, summary judgment as to the Plaintiffs’ claim for damages between February 2003 and February 2009 on the basis of the Clayton Act’s statute of limitations is DENIED.

CONCLUSION

For the reasons stated above, the Motion for Summary Judgment filed by Kronos Worldwide Inc. (ECF No. 432) and the Motion for Summary Judgment filed by Millennium Inorganic Chemicals (ECF No. 439) are DENIED. The Joint Motion for Summary Judgment (ECF No. 442), as it pertains to the remaining Defendants Kronos and Millennium, is likewise DENIED.

A separate Order follows.

Dated: August 14, 2013

/s/
Richard D. Bennett
United States District Judge