

Plus Factors and Agreement in Antitrust Law¹

by

William E. Kovacic,² Robert C. Marshall,³ Leslie M. Marx,⁴ and Halbert L. White⁵

February 14, 2011

Abstract

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 paper, 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.”

¹ A previous version of this paper was titled “Plus Factors.” Acknowledgments. The authors are grateful to Charles Bates, Paul Johnson, Chip Miller, seminar participants at Wilmer Hale, as well as Graciela Mirales and participants in a workshop at the Federal Trade Commission, for many useful comments and suggestions. Robert C. Marshall thanks the Human Capital Foundation (www.hcfoundation.ru), and especially Andrey P. Vavilov, for support of the Center for the Study of Auctions, Procurements, and Competition Policy (CAPCP, <http://capcp.psu.edu/>) at Penn State University where he conducted this research. Leslie M. Marx thanks the National Science Foundation for support under grant #SES-0849349.

² Commissioner, U.S. Federal Trade Commission; Professor, George Washington University Law School (on leave). The views expressed in this Article are the author’s alone and not the views of the FTC or any of its members. wkovacic@ftc.gov

³ Penn State University, rcm10@psu.edu

⁴ Duke University, marx@duke.edu

⁵ University of California, San Diego, hwhite@weber.ucsd.edu

Table of Contents

1. Introduction	3
2. Definition of Concerted Action in Antitrust Law.....	8
2.1 Doctrine Governing the Use of Circumstantial Evidence to Prove an Agreement	9
2.2 Plaintiff's Burden of Proof.....	13
2.3 Interdependence and the Role of Plus Factors.....	17
3. Agreements to Suppress Rivalry Assessed through the Reactions of Buyers.....	22
4. Taxonomy of Cartel Conduct	28
4.1 Price Elevation.....	32
4.2 Quantity Restrictions	37
4.3 Internal Incentive Shifts	39
4.4 Allocation of Collusive Gain	40
4.5 Redistribution of Gains and Losses	41
4.6 Communication and Monitoring.....	42
4.7 Enforcement	43
4.8 Dominant-Firm Conduct by Cartels.....	44
5. Inferences Based on Plus Factors	46
6. Conclusion.....	49

1. Introduction

Competition law treats agreements among rival firms to set the terms on which they trade as extremely serious offenses.⁶ Most of the world's 112 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 exceed hundreds of millions – indeed, billions -- of dollars, and individuals in a growing number of countries face potent criminal sanctions.⁷

Central to the operation of laws that aggressively punish collusion is 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.⁸ If the same firm cooperates with its competitors to achieve this result, its executives may go to prison. Despite the crucial role of the concept of concerted action to this framework, no element of modern antitrust analysis in the United States and in other jurisdictions is more perplexing than the design

⁶ 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 & Ellen L. Frye, Overview, in *Cartel Regulation 3* (William Rowley & Martin Low eds., Getting the Deal Through, 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 savvy in their investigative and analytical techniques.”).

⁷ See William E. Kovacic, *Criminal Enforcement Norms in Competition Policy*, in *Criminalization of Competition Law Offenses* (Ariel Ezrachi & Caron Beaton-Wells eds., Oxford, Forthcoming) (discussing modern trends in sanctions for cartel offenses).

⁸ If implemented by a single firm, high prices have been said to be a sign of a healthy competitive process. Justice Antonin 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 lawful; it is an important element of the free-market system.”

of evidentiary standards to determine whether parallel conduct stems from collective or unilateral decision making.⁹

The struggle to develop suitable evidentiary standards for identifying agreements is substantial in the case of oligopolies. Firms in an oligopolistic industry recognize their mutual interdependence, understand that they are players in a repeated game, and act accordingly.¹⁰ In antitrust decisions about allegations of collusive pricing, this pattern of interaction – described by courts and commentators 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 non-collusively where they understand their role as players in the repeated oligopoly game.¹¹ In antitrust cases, courts permit the fact of agreement to be established by circumstantial evidence,¹² but they have required that economic circumstantial evidence go beyond parallel movement in price to reach a finding that the conduct of firms has crossed the line into the realm of potentially violating Section 1 of the Sherman Act.¹³ This additional economic circumstantial evidence is referred to collectively as “plus factors.”¹⁴

⁹The role of the agreement issue in antitrust policy outside the United States is analyzed in OECD, *Prosecuting Cartels without Direct Evidence* (2006), available at <http://www.oecd.org/dataoecd/19/49/37391162.pdf>; Albertina Albors-Llorens, *Horizontal Agreements and Concerted Practices in EC Competition Law: Unlawful and Legitimate Contacts Between Competitors*, 51 *Antitrust Bull.* 837 (Winter 2006).

¹⁰ See Jonathan B. Baker, *Two Sherman Act Section 1 Dilemmas: Parallel Pricing, the Oligopoly Problem, and Contemporaneous Economic Theory*, 38 *Antitrust Bull.* 143 (1993).

¹¹ See Andrew I. Gavil et al., *Antitrust Law in Perspective: Cases, Concepts and Problems in Competition Policy* 267-68 (2d ed., Thomson West, 2008).

¹² In *In re Text Messaging Antitrust Litigation*, 2010 U.S. App. LEXIS 26299, *16 (7th Cir. Dec. 29, 2010), Judge Richard Posner observed: “Direct evidence of conspiracy is not a sine qua non Circumstantial evidence can establish an antitrust conspiracy.”

¹³ 15 U.S.C. Sec. 1 (1994). See *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209, 227 (1993) (“conscious parallelism” is “not in itself illegal”); *Theatre Enters., Inc. v. Paramount Film Distrib. Corp.*, 346 U.S. 537, 541 (1954) (“Circumstantial evidence of consciously parallel behavior may have made heavy inroads into the traditional judicial attitude toward conspiracy; but ‘conscious parallelism’ has not read conspiracy out of the Sherman Act entirely.”); see also Phillip Areeda & Herbert Hovenkamp, *Antitrust Law Para. 1433a*, at 236 (3d ed.,

The interpretation of plus factors in the decision to prosecute and in the resolution of litigated cases has proven 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.¹⁵ Numerous judicial decisions have wrestled with the evaluation of plus factors in cases dealing with questions of agreement.¹⁶ 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, in a number of cases government prosecutors and private plaintiffs may find themselves relying more extensively on circumstantial proof to establish the fact of coordination. Such a development would place still heavier weight upon a proper understanding of plus factors in the treatment of conspiracy questions.

Aspen 2003) (“The courts are nearly unanimous in saying that mere interdependent parallelism does not establish the contract, combination or conspiracy” required for application of Section 1 of the U.S. Sherman Act)

¹⁴ ABA Section of Antitrust Law, *Antitrust Law Developments* 11-16 (6th ed. 2007).

¹⁵ See Richard A Posner, *Antitrust Law* 55-93 (2d ed., Chicago, 2001) (collecting and analyzing plus factors).

¹⁶ See *Antitrust Law Developments*, *supra* note 9, at 11-16 (collecting authorities).

This paper offers a way to raise 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.¹⁷ We refer to plus factors, or groups of plus factors, that lead to a strong inference of explicit collusion as “super plus factors.”¹⁸ The taxonomy as well as the framework we provide for assessing the probability of explicit collusion given a plus factor, or group of plus factors, provides an improved foundation from which enforcement authorities and courts can analyze 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 proving concerted action and instead relies on circumstantial evidence that the defendants conspired to fix prices or restrict output.¹⁹ Such an approach focuses on modern economic understandings of what cartel participants do to coordinate their behavior.

A key issue that is at the heart of assessing whether firm conduct is rooted in an agreement to suppress inter-firm rivalry is the reaction of buyers to the actions of sellers in a marketplace.²⁰ Each product/industry/market that is the subject of scrutiny for a potential Section 1 violation involves a distinct set of participants, actions, and payoffs. The role of buyers, and their potential resistance to

¹⁷ For an introductory discussion of Bayes Theorem see, Bernard W. Lingren, *Statistical Theory*, 3rd ed, New York: MacMillan Publishing Co, 1976, p. 41-42.

¹⁸ We use the term explicit collusion to mean an agreement among competitors that relies on explicit communication and/or transfers to suppress rivalry.

¹⁹ Direct evidence would include a record of meetings or communication to discuss and agree upon the components of cartel activity, which may include any of the following: pricing, allocations of the collusive gain, monitoring, or enforcement of the agreements.

²⁰ Business logistics and supply chain management are taught in many business schools throughout the world, including courses in competitive procurement. For example, a Masters in Supply Chain Management is offered through the Smeal School of Business at Penn State University where SCM820 is a course in Strategic Procurement <http://www.smeal.psu.edu/mps/curriculum/fyear.html>

actions by sellers that increase seller payoffs at the expense of buyers, appears to be significant in the implicit thinking of many policy decision-makers and courts when considering whether an observed conduct or outcome in the marketplace is the consequence of explicit collusion or not.²¹ Yet this underpinning for assessing plus factors has not been explicitly recognized. We believe that every producer selling a product in an industry conditions on the extent and nature of buyer reactions when attempting to raise prices, whether the actions of sellers are part of coordinated cartel conduct or not.²²

The paper proceeds as follows. We first describe the existing legal standards that courts and antitrust enforcement agencies use to define concerted action and review the existing literature regarding plus factors. We then discuss seller agreements as well as buyer responses to actions of oligopolistic sellers and the implications of each for plus factors. After that, we present a taxonomy for plus factors

²¹ “Oligopolists behaving in a legal and consciously parallel fashion could achieve high and rising prices, even as costs remain 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 Chem., Inc*, 158 F.3d 548, 565; (11th Cir. 1998). 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. It was not the presumption of the court that the buyers were passive. Rather, the court presumed that the buyers were players in the game, and thus much different from the customers of the gas stations in Carlton, Gertner, and Rosenfield (1997) *Communications Among Competitors: Game Theory and Antitrust*, 5 *Geo. Mason L. Rev.* 423 (1997).

²² As described in Marshall, Marx, and Raiff (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 is 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.” (EC decision in Vitamins 2001, Case COMP/E-1/37.512 at 325). In the EC decision in Cartonboard, cartonboard producers sometimes faced resistance 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 converters. 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....” (EC decision in Cartonboard 1994, Case IV/C/33.833, at 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.” (EC decision in Amino Acids 2000, Case COMP/36.545/F3 at 81)

and identify several super plus factors. We then offer a methodology, grounded in basic probability theory, for ranking plus factors in terms of their probative value.

2. Definition of Concerted Action in Antitrust Law

Modern competition law treats the detection, prosecution, and punishment of concerted horizontal price and output restraints to be the chief priority of antitrust policy making.²³ Commentators generally regard the enforcement of stringent rules against such agreements as antitrust's most important positive contribution to economic performance.²⁴ With increasing intensity, antitrust authorities around the world prosecute bid-rigging, price-fixing, and market allocation schemes.²⁵ Since the mid-1990s, a growing number of other jurisdictions have amended their laws to permit the prosecution of cartel offenses as criminal offenses.²⁶ Private suits in the U.S. courts to recover damages on behalf of cartel victims have

²³ See Scott Hammond & Ann O'Brien, *The Evolution of Cartel Enforcement Over the Last Two Decades: The U.S. Perspective*, in *Changes in Competition Policy Over the Last Two Decades* 11 (Malgorzata Krasnodebska-Tomkiel ed., Polish Office of Competition and Consumer Protection, 2010) (describing U.S. and international experience); William E. Kovacic, *An Integrated Competition Policy to Deter and Defeat Cartels*, 51 *Antitrust Bull.* 813, 813-15 (Winter 2006) (discussing modern enforcement trends).

²⁴ See, e.g., Robert H. Bork, *The Antitrust Paradox* 263 (1978) (praising 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").

²⁵ On the intensification of efforts by competition authorities outside the United States to prosecute cartels, see *International Competition Policy Advisory Committee to the Assistant Attorney General for Antitrust, Final Report* 164 (2000) (noting "heightened degree of international consensus among enforcers that cartels should be detected and prosecuted"); "Cartel Enforcement Goes Global: Jail, Fines, & Videotape," *Antitrust*, vol. 14, no. 3, at 6-45 (Summer 2000) (collection of articles discussing expansion of efforts by competition enforcement bodies to attack cartels); Harry First, *The Vitamins Case: Cartel Prosecutions and the Coming of International Competition Law*, 68 *Antitrust L.J.* 711 (2001) (suggesting that prosecution of vitamins cartel illustrates broader international acceptance of an anti-cartel norm).

²⁶ Kovacic, *supra* note 13; Hammond & O'Brien, *supra* note 21.

generated substantial recoveries,²⁷ 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 and illegal collective behavior.²⁸ Despite extensive judicial experience with the issue and despite major contributions by economists and lawyers about possible adjustments in the existing analytical framework,²⁹ the definition and proof of concerted action remain litigated issues in horizontal restraints cases under Section 1 of the Sherman Act.³⁰ 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.

2.1 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

²⁷ Harry First, *The Vitamins Case: Cartel Prosecutions and the Coming of International Competition Law*, 68 *Antitrust L.J.* 711 (2001) (describing remedies obtained in private cases challenging the vitamins cartel).

²⁸ See, e.g., *Holiday Wholesale Grocery Co. v. Philip Morris, Inc.*, 231 F. Supp. 2d 1253, 1270 (N.D. Ga. 2002), *aff'd sub nom. Williamson Oil Co. v. Philip Morris USA*, 346 F.3d 1287 (11th Cir. 2003) (law governing existence of agreement provides "little guidance" to determine when inference of concerted action is appropriate; legal standard sets line that is "ephemeral").

²⁹ Modern contributions that contain extensive discussions of the economic and legal literature include Phillip Areeda & Herbert Hovenkamp, *Antitrust Law* 68-101 (Aspen 2003); Richard Whish, *Oligopoly Theory and Economic Evidence*, in *European Competition Law Annual* 105 (Oxford 2006); Mark Armstrong & Steffen Huck, *Behavioral Economics as Applied to Firms: A Primer*, 6 *Competition Pol'y Int'l J.* 3 (2010); George A. Hay, *Horizontal Agreements: Concept and Proof*, 51 *Antitrust Bull.* 877 (Winter 2006); William H. Page, *Communication and Concerted Action*, 38 *Loy. U. Chi. L.J.* 405 (2007); William H. Page, *Twombly and Communication: The Emerging Definition of Concerted Action Under the New Pleading Standards*, 5 *J. Competition L. & Econ.* 439 (2009); Gregory J. Werden, *Economic Evidence on the Existence of Collusion: Reconciling Antitrust Law with Oligopoly Theory*, 71 *Antitrust L.J.* 719 (2004).

³⁰ 15 U.S.C. Section 1 (1994).

the existence of an agreement requires courts to decide when challenged conduct constitutes an agreement and how such an agreement may be proven in a trial.

Modern judicial efforts in the United States to define concerted action originate in four Supreme Court decisions, beginning with *Interstate Circuit, Inc. v. United States*³¹ in 1939 and ending with *Theatre Enterprises v. Paramount Film Distributing Corp.*³² 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.³³

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.”³⁴

Seven years later, in *American Tobacco Co. v. United States*,³⁵ the Court addressed the agreement issue in reviewing conspiracy to monopolize charges under Section 2 of the Sherman Act. The Court

³¹ 306 U.S. 208 (1939).

³² 346 U.S. 537 (1954).

³³ 306 U.S. at 226.

³⁴ *Id.* at 227.

³⁵ 328 U.S. 781 (1946).

stated that “[n]o formal agreement is necessary to constitute an unlawful conspiracy.”³⁶ 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.”³⁷

In 1948 in *United States v. Paramount Pictures, Inc.*,³⁸ the Court reiterated *Interstate Circuit's* agreement formula. In considering Section 1 and Section 2 conspiracy claims, the Court said “[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.”³⁹

The formative period of agreement decisions ended in 1954 in *Theatre Enterprises*. There the Court said “[c]ircumstantial evidence of consciously parallel behavior may have made heavy inroads into the traditional judicial attitude toward conspiracy; but ‘conscious parallelism’ has not read conspiracy out of the Sherman Act entirely.”⁴⁰

As a group, the four cases establish three conceptual points of reference. 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.

³⁶ *Id.* at 809.

³⁷ *Id.* at 810.

³⁸ 334 U.S. 131 (1948).

³⁹ *Id.* at 142.

⁴⁰ 346 U.S. at 541.

Subsequent Supreme Court decisions have tried to capture these principles in a new formula. In 1984, in addressing minimum resale price maintenance (RPM) conspiracy allegations in *Monsanto Co. v. Spray-Rite Service Corp.*,⁴¹ the Court observed:

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.⁴²

Neither the *Monsanto* standard nor its predecessor formulas provides a useful basis for identifying concerted action. These tests show that the concept of agreement encompasses more than a direct exchange of assurances, yet they offer no 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 interdependent conscious parallelism to be a “conscious commitment to a common scheme.” Each firm in an oligopoly knows that the effect of its acts depends on the reactions of its rivals. All producers perceive that price increases will be accepted only if all firms raise prices. Realizing their interdependence, each firm decides, without consulting its rivals, to match competitor 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 with the decisions of its rivals, each firm can be said to have “consciously committed” itself to participate in a “common scheme.”

⁴¹ 465 U.S. 752 (1984).

⁴² *Id.* at 768.

2.2 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.⁴³ 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.*⁴⁴ 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 Section 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.”⁴⁵

Quoting *Monsanto*, the *Matsushita* Court then specified the plaintiff's burden of proof when the defendant seeks summary judgment or a directed verdict against claims when circumstantial evidence alone 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 Section 1 must present evidence that ‘tends to exclude the possibility’ that the alleged conspirators acted independently [Plaintiffs] in this case, in

⁴³ See, e.g., *ES Dev., Inc. v. RWM Enters.*, 939 F.2d 547, 554 (8th Cir. 1991) (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 *American Tobacco Co. v. United States*, 328 U.S. 781, 810 (1946)).

⁴⁴ 475 U.S. 574 (1986).

⁴⁵ *Id.* at 588.

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].⁴⁶

As in *Monsanto*, the Court in *Matsushita* sought to reduce error costs associated with excessively broad application of liability standards.⁴⁷ 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 emphasized that mistaken inferences of conspiracy could injure consumers by deterring firms from offering low prices.⁴⁸

Matsushita had a deep impact on the litigation of cases in which the plaintiff relied on circumstantial evidence to prove the fact of concerted action. Among other effects, *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. As it had done in *Monsanto*, the Court in *Matsushita* emphasized the costs that could flow from a failure to apply the agreement standard with sufficient rigor. *Monsanto* had mentioned the availability of treble damages in private cases and noted that resale price maintenance arrangements – like all other conduct forbidden by the Sherman Act – could be prosecuted as a crime.⁴⁹ As noted above, *Matsushita* warned that careful examination of the economic plausibility of

⁴⁶ *Id.*

⁴⁷ *Monsanto* emphasized the dangers of discouraging legitimate discussions between producers and their dealers. 465 U.S. at 763.

⁴⁸ 475 U.S. at 587. *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 *Matsushita* and therefore might be subject to more liberal standards of proof.

⁴⁹ *Monsanto*, 465 U.S. at 763. The Justice Department seldom prosecutes resale price maintenance as a crime. Yet, when the Supreme Court issued the *Monsanto* decision in 1984, it had been barely three years since DOJ's most recent use of criminal process to challenge an RPM agreement. *United States v. Cuisinarts, Inc.*, 1981 WL 2062 (D. Conn. 1981).

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 *Matsushita's* plausibility screen backwards to the pleading stage of antitrust litigation. In *Bell Atlantic Corp. v. Twombly*,⁵⁰ 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 *Matsushita* plausibility standard to evaluate motions to dismiss. In that context, "an allegation of parallel conduct and a bare assertion of conspiracy will not suffice."⁵¹ 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."⁵² The Court observed that a more rigorous examination of the plaintiff's pleadings was necessary lest the plaintiff (and classes of plaintiffs) be permitted to set in motion the costly process of civil discovery and extract unjustified settlements from defendants.⁵³

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

⁵⁰ 550 U.S. 544 (2007).

⁵¹ *Id.* at 556.

⁵² *Id.* at 570.

⁵³ *Id.* at 559-560.

system. Perceived excesses with private rights of action (the prosecution element) and the mandatory trebling of damages for victorious plaintiffs (the remedy component) have caused the Court to engage in “equilibration”⁵⁴ – 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, where the only issue is whether an illicit agreement was formed and considerations of actual effects are irrelevant.

To examine the links among liability rules, evidentiary standards, the identity of the prosecutorial agent, and remedies is to see several possible paths for future adjustments to the treatment of conspiracy issues. One approach, discussed in more detail below, is to develop a better analytical approach to evaluating the probative value of various plus factors and, as this paper 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, there presumably will be less hesitation to impose severe sanctions (e.g., treble damages or criminal punishment) when those factors suggest the defendants have engaged in pernicious misconduct.

Another path 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 over-deterrence 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

⁵⁴ 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).

test, there should be a difference in the proof required when the Federal Trade Commission uses its administrative adjudication process and seeks injunctive relief compared to a private class action that will be tried before a jury and will result in an automatic trebling of any damages awarded.

2.3 Interdependence and the Role of Plus Factors

As noted in the introduction to this paper, in markets characterized by interdependence, each firm realizes that the effect of its actions depends upon the response 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 recognized by *Theatre Enterprises* 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."⁵⁵ 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.⁵⁶ These include but are not limited to:

- The defendant's participation in past collusion-related offenses.
- Evidence that the defendants had the opportunity to communicate or actually did so.

⁵⁵ Louis Schwartz et al., *Free Enterprise and Economic Organization: Antitrust* 439 (6th ed. 1983).

⁵⁶ See Richard A. Posner (2001), *Antitrust Law*, 2nd ed. University of Chicago Press, p. 69-79,

- The use of facilitating devices such as delivered pricing or most favored nation clauses.
- Industry characteristics (product homogeneity, frequent transactions, readily observed price adjustments, high entry barriers, and high concentration) that are conducive to successful coordination.

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:⁵⁷

- * 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 defendants created the opportunity for regular communication.
- * 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.

Two basic problems have attended judicial efforts to identify and evaluate plus factors. First, courts have failed to establish an analytical framework that explains why specific plus factors have stronger or weaker evidentiary value or to present a hierarchy of such factors. 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. Nor do courts ordinarily devote great effort to evaluating the economic significance of each factor. This *ad hoc* approach makes judgments about the resolution of future cases problematic and gives an impressionistic quality to judicial decision making in agreement-related disputes.

⁵⁷ See Gavil et al., *supra* note 11, at 310-11.

The failure in modern cases to provide a hierarchy of plus factors and explain the competitive significance of each might be attributed to one of the less discussed but most important Supreme Court decisions of the 1960s. In *Continental Ore Co. v. Union Carbide & Carbon Co.*,⁵⁸ the Court stated that “plaintiffs should be given the full benefit of their proof without tightly compartmentalizing 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.”⁵⁹ 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. *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 will not be understood by looking at each factor in isolation.

The variation in judicial analysis of plus factors also suggests that the outcome in many agreement cases depends upon the court’s unarticulated intuition about the likely cause of observed parallel behavior. Judges appear to vary in their acceptance of the proposition in *Theatre Enterprises* that conscious parallelism does not always bespeak concerted behavior. On the one hand, judges who regard pricing uniformity as a sign of collaboration will give lip service to *Theatre Enterprises* but will expand the range and reduce the quantum of conduct that, when added to parallel behavior, can support a finding of agreement. On the other hand, judges who see parallelism as a desirable, natural manifestation of rivalry are likely to display a greater reluctance 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.

⁵⁸ 370 U.S. 690 (1962).

⁵⁹ *Id.* at 699.

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.⁶⁰ Under *Matsushita*, defendants might argue successfully that observed parallelism is as consistent with what agreement doctrine has recognized 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 are likely to preclude effective antitrust intervention.

The refinement of federal merger enforcement policy in the past twenty years has placed increasing reliance on economic theories that illuminate the conditions in which consolidation is likely to have net anticompetitive effects. Among other features, the versions of the DOJ/FTC Horizontal Merger Guidelines issued in 1992⁶¹ and in 2010⁶² 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

⁶⁰ The formative treatment of this point is Baker, *supra* note 10. See also Carlton et al., *supra* note 19.

⁶¹ The 1992 Horizontal Merger Guidelines are reprinted in 4 Trade Reg. Rep. (CCH) & 13,104.

⁶² The 2010 Horizontal Merger Guidelines were issued on August 18, 2010 and are available at <http://www.ftc.gov>.

allocation mechanisms that divide the collusive gain, and (iii) monitor compliance and stand prepared to punish nonconcrete deviant behavior.

A reformulated standard in circumstantial evidence cases would be organized to focus on the fulfillment of 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 have 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 as likely as not 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 communicate their intentions and confirm 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 non-market prices, swaps, or patent cross-licensing agreements. The existence of a means for monitoring compliance might be revealed by establishing a pattern of bilateral exchanges of pricing information among competitors or exchanges of data through trade associations.

3. Agreements to Suppress Rivalry Assessed through the Reactions of Buyers

Firms in oligopolistic industries recognize their mutual interdependence and act upon that recognition. It would be unreasonable to expect firms not to do so. As noted above, the assessment of what is and what is not an agreement when firms are given the right to recognize and act upon their mutual interdependence remains unclear from court decisions.

Consider the following example. 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. 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 only interact as rivals in the marketplace. If we start with each firm announcing \$10, there is no one who would characterize that pricing as being an agreement – from an economist's viewpoint, pricing at marginal cost yields the largest surplus to consumers and zero profits for each of the two firms. However, suppose 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. Suppose in the next period the same prices are called out – same outcome. In the next period firm A calls out \$15 while firm B calls out \$25 – now firm A gets all 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, 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 is calling out \$25, dividing the demand equally, and each earning a profit of \$15 per unit.

Consider the question of 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. 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 we to decide the issue without regard to remedies, we would deem such conduct to be an agreement in violation of Section 1 of the Sherman Act. As discussed in Section 2 above, courts and enforcement agencies cannot address the agreement question without being aware of remedial issues that stand in the background. Courts are left with a substantial conundrum because they cannot meaningfully instruct firms to not react to their rivals' pricing.

Staying with our example, there has been an unarticulated assumption that the buyers are passive in this market, accepting prices as called out by the two firms.⁶³ But suppose that buyers are not passive in our case. Rather, suppose that buyers strongly resist price increases. Specifically, when each firm calls out a price of \$25, each buyer is doing 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 as opposed to just the current period. 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 inter-firm communication between the sellers beyond the calling out of prices, or assurances between sellers that any deviant conduct will be rectified with the damaged

⁶³ In fact, the well known example in Carlton et al., supra note 19, of two gas stations in a town calling out the monopoly price also presumes that buyers are passive.

seller 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 thus can take actions to resist the price increases of the oligopolists, then if the price of \$25 persists by the sellers they 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, there would also be an agreement in violation of 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. In the background is an expectation of an aggressive buyer reaction. In other words, although in each case there would be an agreement, in each case the critical issue for finding whether an agreement was a violation of the antitrust laws was the assumption regarding the reaction of a third party, the buyers, to the elevated prices.⁶⁴ The exact same pricing outcome by sellers would be viewed by the courts in a completely different way depending on whether the buyers were passive, as in the first scenario, or aggressive, as in the second scenario.

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, and if some other price, say \$100, wasn't the joint-profit-maximizing price. If \$100 was conjectured as a possible joint profit maximizing price, then \$25 might be viewed as the consequence of active buyer resistance. Then the court may find itself unable to rule against the duopoly as being in violation of Section 1.

Overall, firms in an oligopoly are players in a repeated game. The game has incomplete information and substantial information asymmetries. The firms know many things that buyers do not

⁶⁴ See supra notes 19-20 and accompanying text.

know. Each firm has information that other firms do not have. Courts can attempt to resolve information asymmetries through discovery, but that process is only partial.

When the firms in an industry are players in a repeated game with substantial incomplete and asymmetric information, the court can return to an analysis of 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. To see this, note that 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. Rather, our conduct, in aggregate, can be modeled through an industry-wide demand curve as well as firm-specific demands where cross-price elasticities of demand can be specified. 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, where firms who 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 consists of the profit in the event a given firm wins times the probability that the firm wins. These two are inversely related, and a bidder seeks the optimal balance between them. Buyers rely on competitive bidding processes to police the market in that it reveals information to the buyers that they may not have known about the suppliers, their products, and pricing. When buyers are engaged in competitive procurements to buy from suppliers, and the buyers can undertake a number of actions in that context to enhance their surplus, they are active players in the oligopoly game.

Suppliers recognize this policing function and, consistent with playing in a repeated game, will act to mitigate the policing function of the competition. Buyers as players in the game, receive bids, evaluate them, and make a determination as to whether additional measures should be undertaken to ensure that competition is doing what they want it to do – namely, obtaining the largest surplus by policing the sellers. If further measures are required, then the buyers, as true players in the game, will take such measures. If the sellers' bids yield to this pressure, then it may well have been the case that the sellers, who are players in a repeated game with substantial incomplete and asymmetric information, were not doing anything additional to suppress competition among themselves other than recognizing their long-run interaction in a game setting. However, if the sellers do not yield and hold to their initial bids, which were 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.⁶⁵ If the mechanism is producing 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 do it and thus initially excludes the new entrant, but after seeing an exceptionally high lowest bid from the procurement, a buyer

⁶⁵ Concerns regarding agency problems have sometimes led to an emphasis on 'transparency in bidding,' particularly with respect to federal government procurements. As shown by Marshall and Marx (2009), pre-auction transparency in the form of transparent registration, and real-time transparency in the form of revelation of the identities of the active bidders or identity of the current high bidder in ascending-bid auctions increase susceptibility to collusion. If the primary motivation for "transparency in bidding" is concern about the possibility of corruption by the auctioneer, then post-auction transparency, where auction results are made public after the conclusion of the auction, may provide sufficient information to monitor the auction process without being as pro-collusive as pre-auction or real-time transparency.

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 players in the oligopoly game, or, they can be vigorous in their pursuit of incremental surplus from sellers, or, 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 Carlton et al. (1997) example of two gasoline stations in a small town achieving monopoly price without communication seems quite compelling,⁶⁶ but it quickly wilts when contrasted with the market for vitamin A500 USP which was produced by only two firms throughout the 1990's. Despite being repeat cartel offenders (Roche and BASF), these firms 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 get to a monopoly price, it becomes increasingly clear that the Carlton, Gertner, and Rosenfield (1997) 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.

However, one need only make small changes to the environment of Carlton, Gertner, and Rosenfield (1997) in order to reach an environment where tacit agreement is insufficient to achieve the monopoly price. For example, if prices are not observable and demand has at least a small random

⁶⁶ The gas station example of Carlton et al., supra note 19, fits well within the standard Folk Theorem environment - two firms compete by setting prices, where those prices are perfectly observable and can be adjusted instantaneously, and profit of each firm is determined by the two prices and a fixed demand curve. As Carlton et al. note, in this environment, one would not be surprised to find that tacit collusion can support the monopoly outcome. 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 so have no ability to take actions that might disrupt the ability of the two firms to maintain their tacit agreement.

component,⁶⁷ then one enters the environment of Green and Porter (1984).⁶⁸ Green and Porter show that in their environment equilibria exist that allow the firms to obtain supra-competitive profits, but they argue that such equilibria would be expected to require an explicit agreement among the firms.⁶⁹

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 supra-competitive 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 characterizing a tacit agreement.

4. 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, “if we observe fixed relative market shares among a subset of firms then the firms exhibiting those relatively fixed shares are effectively colluding through the use a market share allocation scheme.” But, since “A implies B” does not logically yield “B implies A,” what then is a plus factor?

⁶⁷ This is consistent with Stigler’s (1964) assumption that firms do not observe their rivals’ prices but rather infer them imperfectly from their own demand.

⁶⁸ Edward J. Green and Robert H. Porter (1984), “Noncooperative Collusion under Imperfect Price Information,” *Econometrica* 52(1), 87-100. The model of Green and Porter (1984) is stated in terms of quantity competition. See Tirole (1988, Section 6.7.1.1, p.262f) for a price competition model in the same spirit.

⁶⁹ Green and Porter observe in their footnote 5 that “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.”

One issue with the current characterization of plus factors is that there is no taxonomy for them. Relatedly, there is no ranking of plus factors, even within broad groupings, of their relative probative value. It is common to note that much depends on the nature of a specific product, industry, and marketplace in considering a given plus factor; however, at the current time, all plus factors tend to reside in the same five-gallon bucket, essentially without distinction.

As an example, we can contrast two plus factors. Consider fixed relative market shares among a subset of firms in an industry to be one. There are numerous non-collusive explanations that can exist for fixed relative market shares among firms in an industry. In contrast, consider vertical foreclosure conducts by a subset of firm in an industry, targeted at one or a few small firms in the industry, where no single firm in the subset has sufficient market power to act unilaterally as a dominant firm. The former plus factor appears to be quite weak while the latter is strong and compelling. If a ranking is that easy between two plus factors, without describing any features of the product, industry, or marketplace, then it is clear that at least a broad ranking of plus factors is possible. As will be 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 its likelihood otherwise.

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

A. Raise prices above what they would have been without the conspiracy.⁷⁰

B. Reduce total industry-wide quantity below what it would have been without the conspiracy.⁷¹

⁷⁰ Stigler (1964) emphasizes “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 highly untypical. Also, this caveat would create an ongoing difficulty for exposition. Therefore, we simply discuss price increases by a cartel.

- C. Change within-firm incentives so as to inhibit interfirm competition and foster higher prices.
- D. Allocate the collusive gain among members.
- E. Redistribute gains and losses among members so as to maintain compliance with the agreement.
- 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 non-compliant 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 has to be consistent with one or more of these. So, at a minimum, plus factors can be classified by these eight. Consider the list of 14 plus factors from Posner (2001):

1. Fixed relative market shares
2. Marketwide price discrimination
3. Exchanges of price information
4. Regional price variations
5. Identical bids for non-standard products

⁷¹ Related to the previous footnote, it is well known that extensive price discrimination can actually increase quantities brought to the market (while extracting large amounts of consumer surplus). Again, this would be highly untypical and, in addition, create ongoing exposition difficulties, so we simply discuss the restriction of quantity by a cartel.

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 concern action A, cartel pricing (2, 4, 5, 6, 7, 9, 10, 12, 13). Only one concerns action F, interfirm communication and monitoring (3), and that only addresses the exchange of price information. None of these plus factors concerns action E, the redistribution of gains and losses among cartel members so as to maintain compliance with the agreement. Only “6” is related to action G, the threat of abandoning collusive conduct if there is substantial non-compliant conduct, and that is quite indirect. Only “1” concerns action D, the allocation of the collusive gain among members, and it only concerns one type of allocation mechanism. With regard to a cartel undertaking dominant-firm conduct, i.e., action H, “7” and “14” address that, but again in a restrictive sense.

None of the Posner plus factors addresses action C, changing within-firm incentives. Nor do they address action B, reducing industry-wide quantity, even though in certain cases, effective cartel management may require agreements in this dimension.

The strength of an inference of collusion that can be drawn from individual Posner (2001) 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 is experiencing 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 "13"), whereas others require access to detailed internal records of the cartel members (such as "3"), while yet others require sophisticated econometric analysis (such as "12").

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

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

4.1 Price Elevation

Given that a plus factor is supposed to be something beyond conscious parallelism in conduct, often parallel pricing, to infer collusion, it seems a bit odd to have 9 of Posner's 14 plus factors be about

price. In fact, cartels have taken great comfort in the fact that, at the end of the day, courts are typically not going to rely on economic evidence about price to infer collusion.⁷²

This being said, 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.⁷³ As another example, in Rubber Chemicals, one of the components of the conspiracy was “issuing price announcements and price quotations in accordance with the agreements reached.”⁷⁴ Similar charges have been made against firms

⁷² See 94/601/EC: Commission Decision of 13 July 1994 relating to a proceeding under Article 85 of the EC Treaty (IV/C/33.833 - Cartonboard) saying, “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 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.” (para 73)

⁷³ United States v. F. Hoffmann-La Roche Ltd, Crim. No. 3:99-CR-184-R, May 20, 1999, Transcript of Plea of Guilty and Sentencing at 10-11.

⁷⁴ U.S. Department of Justice Press Release, “Crompton Corporation Agrees to Plead Guilty for Participating in Rubber Chemicals Cartel,” March 15, 2004. Available at: http://www.usdoj.gov/opa/pr/2004/March/04_at_160.htm.

in sorbates,⁷⁵ monochloroacetic acid and organic peroxides,⁷⁶ polyester staple,⁷⁷ high pressure laminates,⁷⁸ amino acids,⁷⁹ carbonless paper,⁸⁰ cartonboard,⁸¹ and graphite electrodes.⁸²

Since prices are typically determined by a major industrial buyer through competitive procurements, the direct manipulation of those prices 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.

Price announcements are largely about sellers adjusting buyers’ expectations in a publicly observable way and, as a consequence, lowering buyer resistance to price increases. Consider two scenarios – one where there are no price announcements but buyers are confronted with surprisingly higher prices from their competitive procurements versus a second scenario where exactly the same bids are submitted by sellers, but in the weeks prior to the bidding the sellers had made similar price announcements with similar justifications for the price increase. In the first scenario, buyers will be more

⁷⁵ U.S. Department of Justice Press Release, "Top Japanese Executives Indicted in Price-Fixing Conspiracy," July 25, 2000. Available at: <http://www.usdoj.gov/opa/pr/2000/July/423at.htm>.

⁷⁶ U.S. Department of Justice Press Release, "International Chemical Corp. Agrees to Plead Guilty, Pay Fines for Participating in Multiple Criminal Antitrust Conspiracies," March 14, 2002. Available at: http://www.usdoj.gov/atr/public/press_releases/2002/10835.wpd.

⁷⁷ See *Hollinee LLC vs. Nan Ya Plastics Corp., et al.*, U.S. District Court, Western District of North Carolina, Charlotte Division, October 2002.

⁷⁸ “In Re: High Pressure Laminates Antitrust Litigation,” Master File No.:00 MD 1368 (CLB), U.S. District Court for the Southern District of New York, June 18, 2003.

⁷⁹ EC Decision in Amino Acids at 53 and 164.

⁸⁰ EC Decision in Carbonless paper, 2001, Case COMP/E-1/36.212 at 233 and 236.

⁸¹ EC Decision in Cartonboard at 20 and 76.

⁸² U.S. Department of Justice Press Release, “German Company and Chief Executive Officer Each Agree to Pay Record Fines for International Conspiracy,” May 4, 1999. Available at: http://www.usdoj.gov/atr/public/press_releases/1999/2411.htm.

apt to resist the higher prices than in the second because in the second they are relatively confident that they are not confronting an idiosyncratic factor-price shock but, rather, all their competitors are confronting a similar shock, whereas in the first scenario they have no such assurance and need to take measures to assure that their firm is not being comparatively disadvantaged. This is consistent with the fact that all procurement divisions at major firms have limited budgets and must allocate scarce administrative resources so as to procure a large number of factors, in aggregate, at least cost, in absolute terms as well as relative to their competitors.⁸³ Any product market where sellers are regularly using price announcements is one where 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 (2008) emphasize the distinction between public price announcements and private notification by sellers to buyers.⁸⁴ 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. In addition, public announcements allow suppliers to monitor actions of their rivals.

Marshall, Marx, and Raiff (2008) characterize collusive price announcements in the vitamins industry as: 1. made relatively more frequently than non-collusive price announcements; 2. occurring at somewhat regular intervals;⁸⁵ 3. gradual in the sense of involving relatively modest individual price

⁸³ If procurement divisions at major firms had unlimited budgets, they would maximally resist all price increases and so actions on the part of a cartel to minimize price resistance would have no effect.

⁸⁴ In any industry with an active trade press there will be no distinction because the trade press will unearth private announcements and report them.

⁸⁵ The regularity of cartel price announcements reflects the common use by cartels of a regular meeting schedule. For example, each quarterly cartel meeting might be followed by a new price announcement, giving a quarterly structure to the price announcements. That said, if buyers or enforcement authorities were to emphasize the regularity of price announcements in detecting cartels, a cartel could move its price announcements to a more random schedule.

increases; 4. typically “joint announcements,” with one firm leading and then others matching soon thereafter; and 5. typically having long lead times before the new price becomes effective.

The gradualism of price increases, the use of joint announcements, and lead times before the effective date of the price increase directly address buyer resistance. The value of gradualism is apparent in Electrical and Mechanical Carbon and Graphite Products, where cartel members faced buyer resistance because of the size of the price increase they announced.⁸⁶ 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 aggressive price negotiations with the firms to be worthwhile.⁸⁷ 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 being heavily resisted by buyers before incurring disruptions in cartel market shares.⁸⁸

⁸⁶ In addition, as noted by Harrington (2006), gradual price increases may reduce the probability that an illegal conspiracy to increase prices is detected.

⁸⁷ The EC decision in Vitamins states that, “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.” (EC decision in Vitamins at 203-204.)

⁸⁸ Approximately 50% 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 where explicit collusion was unlikely, only 5% of price announcements were made prior to the effective dates for the price increases. (See Marshall, Marx, and Raiff, 2008) Because of the role that the pre-announcement 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, (*U.S. v. Sugar Inst.*, 15 F. Supp. 817, 830, 908 (S.D.N.Y. 1934)) but the Supreme Court reversed that portion of the district court order. (*Sugar Inst. v. U.S.*, 297 U.S. 553, 603 (1936)) More recently, a prohibition on advance price announcements was included in the 1967 consent agreement in *U.S. v. Pennsalt Chem. Corp.* (*U.S. v. Pennsalt Chem. Corp.*, 1967 Trade Cas. (CCH) P71,982, at 83,475 (E.D. Pa. 1967)) In addition, in *Ethyl Corp.*, (In re Ethyl Corp., 3 Trade Reg. Rep. (CCH) at 22,546 (F.T.C. Mar. 22, 1983)) the Federal Trade Commission found advance announcement of price changes to have an anticompetitive effect.

Now turn to the actual bidding that occurs at the competitive procurements of the buyers. Identical bids can arise in many non-collusive environments. Further, it is difficult to imagine that participants in an explicit cartel assembled in a hotel room and determined that the right decision with respect to a procurement was to submit identical bids. The primary way to address whether any bids at a procurement, or a set of procurements, came from an explicit cartel requires a benchmark that is thought to be non-collusive. That could be a time period, a geographic region, or a related but separate product. But the analytic requirements are substantial in evaluating bid data relative to a benchmark. If that analysis is done well, the results can constitute a super plus factor – i.e., actions or conducts (in this case, pricing) that are highly unlikely to occur in the absence of a collusive agreement.⁸⁹ 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 non-collusive.⁹⁰ The predictive model would account for those demand and cost factors specific to the product market not potentially manipulable by a cartel (and only those), 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 where there was a suspicion of collusion. If actual prices fall outside the range of prices that would have prevailed under the non-collusive benchmark, with the range determined by a specified high confidence level, then this outcome can constitute a super plus factor.

4.2 Quantity Restrictions

If we think of an industry-wide demand curve for the product in question, a cartel is elevating price and reducing quantity relative to what would be accomplished if the sellers simply acted as

⁸⁹ “Super” plus factors are defined more precisely below.

⁹⁰ See Halbert L. White, Pauline Kennedy, and Robert C. Marshall, “The Measurement of Economic Damages in Antitrust Civil Litigation,” 2006, *Economics Committee Newsletter*, American Bar Association, Section of Antitrust Law, Spring, 17-22.

oligopolists in a repeated game without explicit collusion. The reduction in quantity often does not require even the mention of quantity by cartel members. Committing 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 where explicit restrictions in supply are needed for the implementation of the cartel agreement. For a well-known example, the 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. The role of quantity reductions to increase prices is well understood by governmental agricultural price support programs that pay farmers not to grow certain crops or to leave fields fallow. Recently, a suit was filed claiming that the United Potato Growers of America Inc. 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.”⁹¹

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 will be weaker evidence of collusion at the trough of a business cycle than if the same conduct occurred at the peak of economic activity. However, restrictions in supply by subsets of firms when demand is strong, profits are high, and prices are relatively high, leads to the strong inference of collusion for two reasons. First, there are substantial foregone profits from collusion by restricting supply when demand is strong. Second, buyers will be taking measures to resist price increases in such an environment

⁹¹ “‘OPEC of Potatoes’ Hit With Price-Fixing Action,” Law 360, June 18, 2010.

and it is quite unlikely that unilateral conduct by sellers would not take advantage of the opportunity to sell incremental units at high prices.

4.3 Internal Incentive Shifts

When a cartel forms, the firms participating in the conspiracy cannot issue a memo to all staff about the fact that upper management has opted for the suppression of 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.⁹²

Cartel firms may likely find themselves needing to change the incentives of their sales force after the inception of the cartel in order to comply with the agreement. In the pre-cartel period, many sales forces have incentives to pursue increases in market share. Such incentives are 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 be along the lines of “price before volume.”⁹³ This means that the sales force will be rewarded for

⁹² EC Decision in Amino Acids at 98.

⁹³ “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.’” (EC Decision in Vitamins at 200). “An illustration of the utilisation of the price targets is provided by Roche’s ‘pricing sheet’ for vitamins A and E issued to the business units in March 1991. The objective for vitamin A was to increase prices in CHF by 5 % to 10 % for 1991 while balancing out the USD/DEM price differential to discourage brokers. While Managers are instructed to hold the

maintaining prices at relatively high levels and will not be rewarded for gaining market share. This kind of shift in the incentives of a sales force could not be justified as a unilateral non-collusive action. If a firm did this individually it would likely find itself losing market share to rivals at a remarkable pace. Buyers resisting price increases would shift away from such a firm to other sellers who were still pursuing increases in market share. 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.

4.4 Allocation of Collusive Gain

The allocation of the collusive gain can occur through a market share agreement, a customer allocation, a geographic allocation, or some combination of these. As noted above, these allocations are also part of implementing the supply restriction and not just in place to divide the collusive gain. If a firm sells beyond its market share allocation, then some other firms are below theirs, and the former will be required to buy product from the latter at cartel prices at the end of the year. The latter firm is thus made whole while the former is incurring 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 may arise as part of non-collusive conduct by oligopolists in a repeated game setting.

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.” (EC Decision in Vitamins at 206-207)

“The key to the success of the price initiatives from 1988 onwards (as the producers realized) was maintaining a near balance between production and consumption. All members of the PWG were concerned that the relaunched price initiatives should not be undermined by substantial increases in the volume sold. This was referred to by Stora as a ‘price before tonnage’ policy (Stora Article 11 reply of 14 February 1992). It meant the major producers could agree price increases in the PWG with some certainty that they would be successful. The agreement reached in the PWG during 1987 included the ‘freezing’ of the west European market shares of the major producers at existing levels, with no attempts to be made to win new customers or extend existing business through aggressive pricing.” (EC Decision in Cartonboard at 51-52)

However, strong buyer resistance when firms are acting 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 there is explicit collusion. In the face of rising prices, we expect stronger buyer resistance and thus more variability in these three measures when firms are acting non-collusively. To see these measures actually become more stable and have less variability when prices are rising leads to the inference of explicit collusion.⁹⁴

4.5 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, for example 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 where one firm has produced more than its share while others have produced less.⁹⁵ In addition, if one seller buys anything from another at non-market prices, then a resource transfer is being made for which there is no reasonable non-collusive explanation. If the transaction were non-collusive in nature there would be

⁹⁴ However, the inference is weaker if the sellers are functioning at full capacity than if the sellers actually have 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.

⁹⁵ “In 1994 the rapid increase in demand for vitamin E for human consumption necessitated a revision of the quota allocated to Rhône-Poulenc. To maintain its agreed 16 % share of the overall market, Rhône-Poulenc had to increase its sales in the animal feed sector. The producers agreed in August 1994 that the Rhône-Poulenc share of the feed segment be capped at 21 %; if the agreed increase in quota in that area did not however give Rhône-Poulenc its full 16 % overall, 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.” European Commission Decision Case COMP/E-1/37.512 . Vitamins, 2001.

no need to disguise it through the purchase of product. Other transactions require scrutiny, such as patent licensing, cross-licensing, and patent pools as well as the settlement of seemingly frivolous lawsuits.⁹⁶

4.6 Communication and Monitoring

Communication is a central part of the operation of a cartel. 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.

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 with respect to the management of critical business information are not legitimate reasons. The sender may argue that it did not convey the information, but instead, each buyer gave this information to the receiver. Unless the buyer has designed a procurement process that is wholly transparent in all respects with regard to seller conveyances during the procurement process, how would a buyer gain by conveying information to a non-awardee about the terms offered by an awardee? In the absence of direct evidence that such conveyances were made, and that these conveyances were accurate, it is reasonable to assume that the sender transmitted the

⁹⁶ It is a relatively simple matter for firms in an oligopoly to be engaging 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.

information to the receiver. But the sender would have no unilateral self-interest in doing so. Thus, the motivation must be explicit collusion and, furthermore, there is an expectation of reciprocation.

With regard to firm-specific production information, again there is no reasonable explanation for such a conveyance by a non-collusive seller to another non-collusive seller. For example, unilateral knowledge of a rival's capacity utilization, inventory levels, or production costs will increase expected profits 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 such 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 is buying a large amount of product from another seller, there is no reasonable non-collusive reason for a third seller to be aware of such a transaction. From a cartel perspective, however, every member wants assurance that 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 the strong inference of collusion among the sender and receiver sellers.

4.7 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 mechanism 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 was deemed to have violated the cartel agreement.⁹⁷ 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 redistributions 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 drop in the price level that ensues is consistent with such a breakdown, but it may be consistent with many non-collusive factors as well.

4.8 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 like a single firm, it looks to other ways to increase profits. One of these other ways is to adopt dominant firm conducts.⁹⁸ These may include predation against non-cartel producers, exclusive dealing, and other kinds of monopolization activities. This kind of conduct is relatively easy to observe and, if no member of the cartel is large enough on its own 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

⁹⁷ The International Steel Cartel established a "common fund." (Stocking and Watkins, pp.183, 190). The Aluminum Alliance used "guarantee deposits," which were in proportion to the firms' sales quotas. (Stocking and Watkins, pp.232, 253, 264). The Incandescent Electric Lamp Cartel required the deposit of "indemnity funds" at a Swiss corporation established for cartel purposes. (Stocking and Watkins, p.337)

⁹⁸ Dominant firm conduct by cartels was recently analyzed by Randal D. Heeb, Willaim E. Kovacic, Robert C. Marshall, and Leslie M. Marx "Cartels as Two-Stage Mechanisms: Implications for the Analysis of Dominant-Firm Conduct", 2009, *Chicago Journal of International Law* vol. 10, 213, p. 213-231. New research has shown that once cartels are concordant in that they have suppressed interfirm rivalry, they then act as dominant firms. See Robert C. Marshall, Leslie M. Marx, and Lily Samkharadze, "Dominant-Firm Conduct by Cartels", 2010, (<http://capcp.psu.edu/papers/year2010.html>).

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 the determination as to whether there exists a dominant firm in the industry. If so, then a specific dominant-firm conduct is analyzed to determine if it is anti-competitive. In contrast, we begin with the determination that there is no dominant firm in the industry, and then inquire if there are specific conducts that are typically associated with dominant firms, regardless of whether the conduct is pro or anti competitive, and draw the inference of a cartel from the presence of that conduct.

Of course, some conducts that are the focus of Section 2 investigations can be undertaken legitimately by smaller firms in an industry. So, 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 who each have 33% of the market and one firm that has 1% 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 conduct will survive due to the competitive pressure from the other two large firms. Second, if a 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 it is automatically disadvantaged relative to rivals since it bears a cost that rivals did not, but 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 that in aggregate have sufficient aggregate market power, 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.

5. Inferences Based on Plus Factors

Detecting a cartel is much like diagnosing whether a disease is present or not. 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 and the health of firms and markets because the underlying principles are the same.⁹⁹ In the context of cartels, as in any legal setting, it is recognized that 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 $P[C \mid E]$. The “P” stands for “probability”; “[|]” is to be read as “given.” When $P[C \mid E]$ is close to one, the evidence indicates a cartel was almost certainly operating. When it is close to zero, the evidence indicates a cartel was almost certainly not operating.

⁹⁹ The rules just alluded to are not rules of thumb, but are embodied in a precise mathematical formula for probabilities set forth almost two hundred fifty years ago by Thomas Bayes (1763). Thomas Bayes (1763). “An Essay towards solving a Problem in the Doctrine of Chances.” *Philosophical Transactions of the Royal Society of London* 53: 370–418.

Consider how the evidence of plus factors can be used to assess $P[C|E]$. 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, $P[C|F]$. Basic probability results yield Bayes Theorem:

$$P[C|F] = (P[F|C] \times P[C]) / (P[F|C] \times P[C] + P[F|\text{not } C] \times P[\text{not } C]),$$

where “not C” denotes the event “no collusion,” so that $P[F|\text{not } C]$ 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.¹⁰⁰

The next simplest element is $P[\text{not } C]$ -- this is the baseline probability a cartel was not operating.¹⁰¹ We always have $P[\text{not } C] = 1 - P[C]$, so once we know $P[C]$, we also know $P[\text{not } C]$.

¹⁰⁰ It would be more precise to introduce structural characteristics of a product/industry/market or market conditions outside the alleged cartel’s potential control as formal conditioning arguments, along with parallel conduct (most likely pricing), but we suppress this for notational simplicity.

¹⁰¹ This probability implicitly conditions on all the same product/industry/market structural elements, and parallel conduct (most likely pricing), that are in $P[C]$.

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 within-firm 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.

The information provided by a plus factor is not determined just 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 non-cartel behavior. This is determined by the last element in the formula, $P[F|\text{not } C]$. This 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. Specifically, suppose the behavior is one that a non-collusive rational competitor would be highly unlikely to engage in, like “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 non-market prices, and dominant firm conduct. These *super* plus factors are plus factors with the property that $P[F|\text{not } C]$ is quite small. That is, super plus factors are actions or conducts that are highly unlikely to occur in the absence of a collusive agreement.

The strength of a plus factor is governed by the relation between $P[F|C]$ and $P[F|\text{not } C]$. We let S represent the “strength” of a plus factor, calculated as the ratio $S = P[F|C] / P[F|\text{not } C]$. A little math gives

$$P[C|F] = 1 / (1+O/S),$$

where O represents the baseline odds against a cartel: $O = P[\text{not } C] / P[C]$.

From this, we see that whenever S increases, so does $P[C|F]$, the probability of a cartel given the plus factor. And whenever S decreases, so does $P[C|F]$, justifying our calling S a measure of plus factor

strength. We can also check that when $S=1$ (unit strength), then $P[C|F]=P[C]$. Accordingly, F is defined to be a plus factor if and only if $S > 1$. Further, this is mathematically equivalent to the condition that $P[C|F] > P[C]$. That is, F is only a “plus” factor if taking it into account increases the likelihood of a cartel having operated.¹⁰²

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, when multiple diagnostic factors are observed, the proper way to treat these 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* cited earlier. In addition, once represented and thought of within the simple and appropriate terms of conditional probabilities, both individual plus factors and constellations of plus factors can be ranked in terms of their probative value.

6. Conclusion

The resolution of many antitrust cases hinges upon 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.

¹⁰² In fact, there are also “minus” factors. These have S less than one, associated with behaviors that are more likely to be engaged in by non-colluders than by colluders.

The analysis of plus factors is one of the most unsettled and perplexing doctrinal issues of modern antitrust law. This paper proposes a formal definition of plus factors, a taxonomy for plus factors, and a coherent methodology for ranking them in terms of their probative value. We identify super plus factors, which lead to the strong inference of collusion. Plus factors should be considered in groups or constellations whenever these 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 partial listing of super plus factors

- 1) A subset of firms restricts production when prices and profits are 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 increasing.
- 3) A reliable predictive econometric model that accounts for all material non-collusive effects on price, estimated using benchmark data where conduct was presumed non-collusive, 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 non-collusive motivations.
- 6) There is a discrete change in the intrafirm incentives of sales forces, across a subset of firms during a given period, that shifts from the pursuit of marketshare 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.

As a final comment, if collusive firms come to understand that super plus factors will be used by courts to draw a strong inference of a Section 1 violation, then colluding firms will try to avoid conducts

that create super plus factors. But to avoid super plus factors greatly encumbers the profitability and stability of a cartel, perhaps even deterring the conspiratorial conduct.