The American Antitrust Institute

July 28, 2014

United States Sentencing Commission
One Columbus Circle, NE,
Suite 2-500, South Lobby
Washington, D.C. 20002-8002

Attention Public Affairs - Priorities Comment

Dear U.S. Sentencing Commission:

We are writing pursuant to the Commission's Federal Register Notice of Proposed Priorities and Request for Public Comment, June 2, 2014, in which the Commission is seeking public comment on proposed priority policy issues for the amendment cycle ending May 1, 2015.[1] The Commission identified as being among it's tentative priorities: "2) Continuation of its work on economic crimes, including... (C) a study of antitrust offenses, including examination of the fine provisions in §2R1.1 (Bid-Rigging, Price-Fixing or Market Allocation Agreements Among Competitors); and (D) consideration of any amendments to such guidelines that may be appropriate in light of the information obtained from such studies."

The American Antitrust Institute (AAI) is an independent non-profit education, research, and advocacy organization. Our mission is to increase the role of competition, assure that competition works in the interests of consumers, and challenge abuses of concentrated economic power in the American and world economy. We promote the vigorous use of antitrust as a vital component of national and international competition policy.[2]

We are pleased the Commission is considering a study of the Guidelines' antitrust fine provisions. In this comment we urge the Commission to reconsider a crucial empirical finding it made in 1987 that has become a lynchpin of the formula used to calculate fines for collusion offenses. The 2013 Guidelines Manual, Chapter Two - Offense Conduct, Part R - Antitrust Offenses, Section 2R1.1, Commentary 3, reads as follows:

> "3....In selecting a fine for an organization within the guideline fine range, the court should consider both the gain to the organization from the offense and the loss caused by the organization. It is

[1] *Federal Register Notice of Proposed Priorities and Request for Public Comment*, 79 FR 31409 UNITED STATES SENTENCING COMMISSION 1 (Jun. 2, 2014), http:/ http://www.ussc.gov/sites/default/files/pdf/amendment-process/federal-register-notices/20140602_FR_Proposed_Priorities.pdf. The American Antitrust Institute previously submitted comments to the U.S. Sentencing Commission on this topic, on July 8, 2013. *See American Antitrust Institute Calls on US Sentencing Commission to Double Cartel Fines*, AMERICAN ANTITRUST INSTITUTE (Jul. 8, 2013), http://www.antitrustinstitute.org/sites/default/files/USSCAAILetter.pdf.

[2] Founded in 1998, AAI is a 501(c)(3) tax exempt Washington, D.C. corporation. For more information, *see* http://antitrustinstitute.org.

2919 ELLICOTT ST, NW • WASHINGTON, DC 20008
PHONE: 202-276-6002 • FAX: 202-966-8711 • bfoer@antitrustinstitute.org
www.antitrustinstitute.org

> estimated that the average gain from price-fixing is 10 percent of the selling price.... The purpose for specifying a percent of the volume of commerce is to avoid the time and expense that would be required for the court to determine the actual gain or loss.... "[3]

The antitrust enforcers almost always use this 10% estimate when they negotiate cartel fines with defendants. It effectively has become a strong presumption that in practice Defendants rarely challenge and the Courts routinely accept.[4]

Our comment makes three important points about the U.S. Sentencing Guidelines' (USSGs') cartel overcharge presumption. First, the evidence demonstrates there currently is significant underdeterrence of price fixing and other anticompetitive forms of horizontal collusion. Second, the general approach to calculating cartel fines embodied in the USSGs, which utilize a specific presumed overcharge, is sound and in the public interest. Third, the 10% cartel overcharge presumption in the Guidelines is much too low to achieve deterrence. The best evidence demonstrates that the Commission should double it to 20%. This change would move the Guidelines in the direction of both recent and historical evidence on average overcharges likely to result from collusion, yet still be a conservative resolution of the issues. Raising the 10% presumption should improve the overall level of cartel deterrence and raise consumer welfare.

The Current Level Of Cartel Sanctions Is Suboptimal

The United States imposes a diverse arsenal of sanctions against cartels.[5] Nevertheless, cartels probably are caught and convicted no more than 25% of the time.[6] Moreover, as the third section of this comment will show, illegal collusion historically has usually resulted in large overcharges.[7]

To analyze whether the current level of sanctions is optimal, Connor & Lande use the standard optimal deterrence approach.[8] This assumes corporations and individuals contemplating illegal

[3] *See* United States Sentencing Commission, Guidelines Manual, §2R1.1 (Nov. 2013), http://www.ussc.gov/sites/default/files/pdf/guidelines-manual/2013/manual-pdf/2013_Guidelines_Manual_Full.pdf. Commentary 3 also explains why this 10 percent figure is doubled to account for a number of factors before it is included in the fine determination calculations. "The loss from price-fixing exceeds the gain because, among other things, injury is inflicted upon consumers who are unable or for other reasons do not buy the product at the higher prices. Because the loss from price-fixing exceeds the gain, subsection (d)(1) provides that 20 percent of the volume of affected commerce is to be used in lieu of the pecuniary loss under §8C2.4(a)(3)." We believe this doubling is warranted due to a number of factors, including the allocative inefficiency effects of market power, the umbrella effects of market power, and the fact that neither inflation nor prejudgment interest is explicitly considered in fine calculations even though many years typically pass between cartel overcharges and the imposition of the fine. *See* John M. Connor & Robert H. Lande, *Cartels as Rational Business Strategy: Crime Pays*, 34 CARDOZO L. REV. 427, 455-62 (2012), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1917657.

[4] *See* John M. Connor & Robert H. Lande, *How High Do Cartels Raise Prices? Implications for Optimal Cartel Fines*, 80 TULANE L. REV. 513, 524 (2005), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1917657.

[5] These include criminal fines and restitution payments for the firms involved, and prison, house arrest and fines for the corporate officials involved. Both direct and indirect victims can sue for mandatory treble damages and attorney's fees. For analysis of these issues, *see id*.

[6] *See* Connor & Lande, *supra* note 3, at 462-68. Their review of the literature shows a probability of 20-24%.

[7] *Id*. at 427.

[8] *Id*. at 431-47. This study also employed a behavioral approach that reached the same conclusions. *Id*.

collusion will be deterred only if expected rewards are less than expected costs, adjusted by the probability the illegal activity will be detected and sanctioned. To undertake this analysis they first calculate the expected rewards from cartelization using a new and unique database containing information on 75 cartel cases. They survey the literature to ascertain the probability cartels are detected and the probability detected cartels are sanctioned. They calculate the size of the sanctions involved for each case.[9]

Their analysis shows that, overall, United States' cartel sanctions are probably only 9% to 21% as large as they should be to protect potential victims of cartelization optimally.[10] This means that, despite the existing sanctions, collusion remains a rational business strategy. Cartelization is a crime that on average pays. In fact, it pays very well. Significantly higher cartel sanctions should be imposed, and this should save consumers many billions of dollars each year.

The Guidelines' Use of A Specific Overcharge Presumption To Calculate Fines Has Been Wise

The USSGs for antitrust have, since their inception, employed a presumption as to the size of cartel overcharges, and for more than twenty years have used this as the lynchpin of its fine calculations. This approach has proven to be extremely desirable and has constituted an important enforcement tool. The structure of the USSGs makes fine levels more predictable for would-be cartelists. The 10% starting point, together with other specific adjustments, make expected fines relatively easy to compute in advance of a guilty plea. Such predictability assists with the general deterrence of anticompetitive collusion, and reduces enforcement and administrative costs significantly.

The present Guidelines do not simply incentivize those specific cartel members that have been caught to not do it again. The fines also deter would-be cartelists generally. The goal of general deterrence is especially important for a crime like price fixing which is extremely difficult to detect and prove.[11] The past can never truly be corrected through fines (indeed, that is what private actions are for). Thus, consumer welfare is better served by preventing future price fixing throughout our economy than to calculate the "correct" penalty for past crimes.

The alternative to Guidelines built upon average injuries in the past would be a case-by-case approach. However, this would require prosecutors to calculate the precise size of the overcharges in every case beyond a reasonable doubt and set fines to reflect these firm-specific overcharges. This approach superficially might appear to be "fair" to each defendant, but case-by-case overcharge calculations in fact have many disadvantages. Predictability for business would decrease and the deterrent effects of the Guidelines would be significantly undermined. The *actual* amounts by which cartels raised prices or are fined, years after the illegal collusion occurs, is much less important from a public policy perspective. Rather, what is crucial is the belief of potential cartelists *ex ante* as to how much they can increase profits, their likelihood of being caught, and the severity of likely punishment. To the extent there is rational forethought,

[9] These include corporate fines, individual fines, payouts in private damage actions, and the equivalent value (or disvalue) of imprisonment or house arrest for the individuals convicted. *Id*.
[10] *Id*. at 474-84.
[11] For the importance of optimal cartel deterrence, *see id. passim*. For the probability of cartel detection, *see id*. at 462-68.

these predictions guide would-be cartelists' decision as to whether they will attempt to form a cartel.

Case-by-case calculations also would be much more expensive for taxpayers (and for defendants) than the current system.[12] Moreover, although preliminary calculations are common, full and final overcharge calculations of overcharges have rarely been done in DOJ or in private damages cases. Although thousands of private damage actions have been filed in cartel cases, almost every private cartel damages suit settles or is dismissed before an overcharge can be calculated by a neutral observer and made part of the public record of the case.[13] As a practical matter, should the Antitrust Division be required to prove the size of the overcharges in each case, it would be unable to bring as many cases. This would lead to less cartel deterrence and would harm consumers and the economy generally. The only ones who would benefit would be cartelists and their attorneys and economists.[14]

Another advantage of the USSG' current presumption-based approach is that the parties can, if they wish, contest it. As the Guidelines' Commentary notes, in special cases a different overcharge amount can be used: "In cases in which the actual monopoly overcharge appears to be either substantially more or substantially less than 10%, this factor should be considered in setting the fine within the guideline fine range."[15] Indeed, the Guidelines are themselves only advisory, not binding, although their judgments cannot be lightly disregarded.[16] Because, as the next section will demonstrate, the overwhelming majority of cartel overcharges greatly exceed 10%, it is not surprising that defendants rarely challenge its use. But the possibility that defendants can contest it in appropriate cases is another reason for the USSG to retain a rebuttable overcharge presumption.

<u>The Guidelines' Presumption That Price Fixing Raises Prices by 10% Should Be Doubled</u>

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[12] It is impossible to determine how much litigation costs would increase if overcharges were ascertained in every case, but surely it would be substantial. It is often difficult to determine whether or when a group of firms conspired to fix prices. The ease of answering this question pales, however, compared to the costs of ascertaining and proving in court how much prices rose as a result of a cartel. Under the current fining approach the Department of Justice usually only needs to prove that collusion occurred and to show the amount of commerce involved. If the government were also required to demonstrate how high prices rose as a result of the cartel, its burden would increase substantially. Although it is impossible to know whether the amount of prosecutorial resources required to successfully prosecute a cartel would, e.g., double or sextuple, it is clear that the increase would be significant. So would the amount of time required to complete the case.

[13] The case-by-case approach to calculating **c**artel damages - under the pressures of a litigation setting - is so difficult, risky, expensive, controversial, uncertain, and lengthy that final estimates of damages by the parties are put off as long as possible. Connor & Lande tried to find every final litigated cartel overcharge case in history but - perhaps surprisingly - were only able to find 25. *See* Connor & Lande, *supra* note 4, at 556. Of course, many private cartel cases are dismissed because they lack merit. For a discussion of settlement in this context, and why settlement amounts are likely to be an extremely unreliable guide as to the size of the underlying cases' overcharges, *see id.*

[14] The burden of proving overcharges in each case would be so large that if political issues were to require the Commission to choose between maintaining the current 10% overcharge presumption and switching to a case-by-case analysis, we would urge the Commission to maintain the current 10% presumption, as removal of a presumption in cartel cases would be more damaging than the realistic increase in penalties that would result from a case-by-case approach would be beneficial.

[15] *See* United States Sentencing Commission, <u>Guidelines Manual</u>, §2R1.1 (Nov. 2012), *available at* http://www.ussc.gov/sites/default/files/pdf/guidelines-manual/2012/manual-pdf/2012_Guidelines_Manual_Full.pdf.

[16] *See* Kimbrough v. United States, 552 U.S. 85, 109 (2007).

This 10% presumption has been in the Sentencing Guidelines since their inception,[17] and to our knowledge the Commission has never seriously re-examined whether 10% is the best figure to use. Although we do not know how the Commission arrived at 10%, it may be significant that when the Commission was in the process of formulating these Guidelines the then-Assistant Attorney General for Antitrust, Douglas Ginsburg, stated in a Hearing before the Sentencing Commission that "price fixing typically results in price increases, that has harmed the consumers in a range of 10 percent of the price...."[18] We know of no other estimates presented to the Commission at that time, and the Commission might well have accepted and used AAG Ginsburg's estimate. We note that Ginsberg's estimate is unlikely to have included any international cartels, the type that now accounts for most U.S. cartel fines and that usually generate the highest overcharges.

In recent years a number of empirical studies have re-examined this issue. These studies have shown that price fixing usually raises prices by significantly more than 10%.

The most comprehensive of these analyses has been the recent study by Professor John Connor.[19] This surveyed more than 700 published economic studies that contain 2,041 quantitative estimates of the overcharges by hard-core cartels. His primary findings are that the *median* long-run overcharge for all types of cartels over all time periods has been 23%, and that the *mean* overcharge has been 49%.[20] There was no significant trend in cartel markups in recent years --the median and mean figures for collusion episodes ending since 2000 was 20% and 39%.[21] The mean of the average overcharge figures, 49%, is much higher than the median figure due to the presence of a number of extremely large overcharges in the sample.[22] Perhaps the most striking result is that 79% of cartel overcharges have been above the USSG's 10% presumption, and 56% have been above 20%.[23]

The overwhelming source of overcharge estimates in Connor's study is publications by economists. Connor & Lande also used a very different source to find cartel overcharges: final verdicts in litigated United States cartel cases. Because government enforcers are not usually required to calculate the actual overcharges in their cartel cases and because almost every private antitrust suit for damages settles or is dismissed before an overcharge can be calculated by a

[17] For the history of the presumption, *see* Connor & Lande, *supra* note 3, at 524-26.
[18] *See Sentencing Options: Hearing Before the United States Sentencing Commission (July 15, 1986)*, in UNITED STATES SENTENCING COMMISSION: UNPUBLISHED PUBLIC HEARINGS 1986, at 15 (1988).
[19] *See* John M. Connor, *Cartel Overcharges*, 29 RESEARCH IN LAW & ECONOMICS 249 (2014).
[20] *Id*. These figures include the 6% of cartels that were ineffective. Because these cartels are less likely to have been challenged, the 49% figure is conservative.
[21] *Id*. at Table 5 (median results) and Table 7 (mean results).
[22] *Id*.
[23] For additional results see Appendix 1, which is based upon Table 6 in John M. Connor, *Cartel Overcharges*, *supra* note 19. Partly in response to this evidence on cartel overcharges, the European Commission in 2006 substantially revised its fining guidelines. They significantly raised their "starting point" percentage (roughly similar to the USSC's 10% overcharge presumption) and toughened many of the factors that enhance fines for hard-core price fixing. The 2006 revisions are one of the main reasons that EC cartel fines – previously lower than comparable U.S. fines -- have surpassed U.S. cartel fines in size and severity. *See generally Fines for Breaking EU Competition Law*, EUROPEAN COMMISSION (Nov. 2011), http://ec.europa.eu/competition/cartels/overview/factsheet_fines_en.pdf.

neutral fact-finder and made part of the public record of the case, [24] there have been only a very small number of litigated cartel verdicts. The authors were only able to find 25 litigated final cartel verdicts issued since 1890 to analyze. The cartels in these cases were found to have had median overcharges of 22% and average overcharges of 31 percent.[25]

Thus, the two sources (economic studies and cartel verdicts) produced very similar median cartel overcharges, of 23% and 22% overall. The average overcharge results were 49% for the economic studies and 31% for the verdicts. The Guidelines currently presume the "average" gain from collusion is 10%, and the corresponding "average" overcharges computed in the two samples we cite (economic studies and verdicts in cases) are 49% and 31%. Accordingly, our recommendation that the Commission double the 10% presumption is conservative.

Conclusions

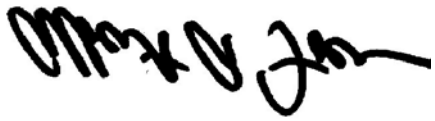
When the Commission formulated its estimate that price fixing on average raises prices by 10% it did so on the basis of the best evidence available in 1987.[26] But the evidence that has accumulated during the 27 years since then strongly suggests this estimate is significantly low.

The 10% presumption is of course a crucial underpinning of antitrust fine calculations. Raising it to 20% would double the amounts in the recommended antitrust fine range. In total, corporate antitrust fines have been between $272 million and $1.472 billion each year since 2005.[27] Doubling the 10% presumption would result in a considerable increase in the funds available to the Crime Victim's fund, for compensating victims of violent crimes, as well as lead to improved deterrence of price fixing and other cartel behavior.[28]

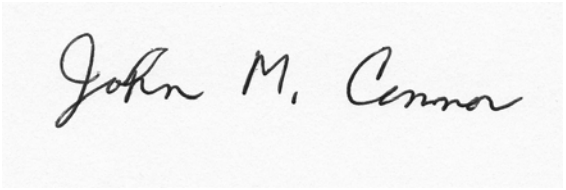
For these reasons the American Antitrust Institute urges the U.S. Sentencing Commission to retain the general approach of employing a specific overcharge presumption when it calculates fines for price fixing, but to double the 10% overcharge presumption contained in Section 2R1.1 of the Guidelines.

[24] *See* Connor & Lande, *supra* note 3, at 551-55. For a discussion of settlement in this context, and why settlement amounts are likely to be an extremely unreliable guide as to the size of the underlying cases' overcharges, *see id.*
[25] *Id*. at 556.
[26] There is evidence that the post World-War-II years up to the mid 1970s were years during which overcharges were at historic lows – 40% below average (*See* Connor & Lande, *supra* note 3, at 513, Table 4, row 4). Therefore, the 10% average overcharges calculated by the DOJ in the 1980s could have been accurate for the time, but the period observed was atypical.
[27] *See Antitrust Division Workload Statistics FY 2004-2013*, U.S. DEPARTMENT OF JUSTICE, *available at* http://www.justice.gov/atr/public/workload-statistics.html.
[28] For a more detailed analysis of the issue of the optimal deterrence of cartels, *see* Connor & Lande, *supra* note 3, *passim*. The authors suggest, inter alia, adjusting fine levels based upon cartel overcharges to present value to compensate for the effects of inflation.

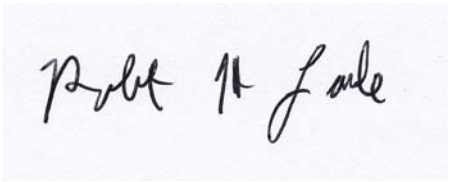
Respectfully submitted,



Albert A. Foer
President
American Antitrust Institute



John M. Connor
Senior Fellow, American Antitrust Institute
and Professor Emeritus
Purdue University



Robert H. Lande
Director, American Antitrust Institute
and Venable Professor of Law
University of Baltimore School of Law

Appendix 1

Mean Average Cartel Overcharges by Overcharge Size Category				
Percentage Range [a]	Number of Observations	Mean Average	Distribution of Observations	
			Total	Non-Zero
	Number	*Percent*		
Zero or less [b]	92	0	6.0	0
0.1-9.9 [c]	239	5.4	15.5	16.5
10.0-19.9	345	14.5	22.4	23.8
20.0-29.9	250	24.4	16.2	17.3
30.0-39.9	181	34.2	11.8	12,5
40.0-59.9	192	48.4	12.5	13.3
60.0-79.9	81	67.9	5.3	5.6
80.0-99.9	27	88.8	1.8	1.9
100.0-199.9	72	136.6	4.7	5.0
200 plus	50	563.9	3.3	3.5
Total	1540	48.7 [d]	100	100

Source: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

[a] Point estimates or midpoints of ranges.

[b] Undercharges are converted to positive numbers.

[c] Four estimates of "weak cartels" are assumed to be 1% overcharges.

[d] For effective cartels (those with positive overcharges) the mean average is 58.9%.

Source: adapted from John M. Connor, "Cartel Overcharges," 29 Research In Law & Economics 249 (2014), Table 6.

Appendix 2

John M Connor & Robert H. Lande, "Cartels as Rational Business Strategy: Crime pays," 34 Cardozo L. Rev. 427 (2012), which is also available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1917657.

CARTELS AS RATIONAL BUSINESS STRATEGY: CRIME PAYS

John M. Connor & Robert H. Lande†

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† The authors are, respectively, Professor Emeritus at Purdue University, and Senior Research Fellow, American Antitrust Institute; and Venable Professor of Law at the University of Baltimore School of Law, and Director, American Antitrust Institute. The authors are grateful to Joshua Davis, Albert Foer, Jay Himes, John Kirkwood, Dionne Koller, Christopher Sagers, Daniel Sokol, Andreas Stephan, Robert Steiner, Maurice Stucke and the participants at the Loyola Antitrust Colloquium for extremely helpful suggestions, and to James Denvil, Gary Stapleton, and Thomas Weaver for valuable research assistance.

INTRODUCTION

Cartels have always been the highest concern of antitrust. They overcharge consumers many billions of dollars every year[29] and there is a strong consensus that they should be sanctioned heavily.[30] Yet, until now no one has ever seriously attempted to analyze whether cartel sanctions are at the optimal level. This Article is the first to undertake this formidable task. Surprisingly, it demonstrates that the combined level of U.S. cartel sanctions has been only 9% to 21% as large as it should be to protect potential victims of cartelization optimally. This means that the average level of U.S. anti-cartel sanctions should be quintupled.[31]

Until now, no comprehensive empirical study has attempted to analyze whether cartels have been sanctioned optimally because of data constraints and the complexity and number of factors involved. The United States imposes a wide variety of sanctions against those who collude. These include criminal fines for the firms involved, prison, house arrest, and fines for the corporate officials involved.[32] Victims can sue for mandatory treble damages and attorney's fees.[33] Judge Posner called this combination of sanctions the equivalent of dropping "cluster bombs" on defendants.[34] This multiplicity has led to the common—but unsupported—belief that the current level of sanctions is adequate[35] or excessive.[36]

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29 *See infra* Part III.A.

30 Strong anti-cartel policies are not only on the agenda of progressives; most conservatives advocate sanctioning cartels heavily. *See, e.g.*, Frank A. Easterbrook, *Treble What?*, 55 ANTITRUST L.J. 95, 95 (1986). In 2004, the Bush Administration proposed and helped enact significant increases in the criminal fines against cartels. *See* Antitrust Criminal Penalty Enhancement and Reform Act of 2004, Pub. L. No. 108-237, 118 Stat. 661, 665–68 (substituting a $100 million maximum corporate fine for the existing $10 million maximum; a maximum $1 million individual fine for the existing $350,000 maximum; and a maximum ten year prison sentence for the existing maximum three year sentence).

31 Another option would be to implement ways to vastly improve the cartel detection rate. For an analysis of a number of alternatives, see *infra* Conclusions, Section A.

32 *Id.* There also are such relatively unusual or minor sanctions as disgorgement actions by the Federal Trade Commission (FTC) or the Department of Justice (DOJ). Although individual disgorgement cases can be important, they are relatively rare. *See* Einer Elhauge, *Disgorgement as an Antitrust Remedy*, 76 ANTITRUST L.J. 79, 79 (2009).

33 *See* 15 U.S.C. § 15 (2000). Prevailing plaintiffs also receive filing fees and expert witness fees. *Id.*

34 Richard A. Posner, *Antitrust in the New Economy*, 68 ANTITRUST L.J. 925, 940 (2001) [hereinafter Posner, *Antitrust*]. *See generally* Spencer Weber Waller, *The Incoherence of Punishment in Antitrust*, 78 CHI.-KENT L. REV. 207 (2003).

35 The ABA Antitrust Section, for example, recently opposed increasing the Sherman Act's criminal penalties: "Some also believe that combined criminal and civil penalties provide too much deterrence that will chill the businessperson in his decision making . . . . Whether increased criminal penalties will provide an appropriate level of deterrence . . . should be the subject of hearings and public briefings to reach the proper deterrence balance." SECTION OF ANTITRUST LAW, AM. BAR ASS'N, COMMENTS OF THE ABA SECTION OF ANTITRUST LAW ON H.R. 1086: INCREASED CRIMINAL PENALTIES, LENIENCY DETREBLING AND THE TUNNEY ACT AMENDMENT 11–12 (2004), *available at* http://www.americanbar.org/content/dam/aba/administrative/antitrust_law/comments_increasedcriminalpenalties.authcheckdam.pdf.

36 This view was eloquently articulated by Professors Lopatka & Page even before the criminal fine levels were significantly increased in 2004: "Even setting imprisonment aside, the federal criminal penalties are substantial. . . . [and] today may well be high enough that the optimal penalty can be imposed through criminal

This Article employs a unique database to determine whether the United States' anti-cartel sanctions are optimal overall. It does this by analyzing the total, combined impact of every measurable anti-cartel sanction using the standard optimal deterrence approach.[37] This assumes corporations and individuals contemplating illegal collusion will be deterred only if the expected rewards are less than the expected costs[38] divided by the probability the illegal activity will be detected and sanctioned.[39]

Our analysis begins with calculations of the rewards from collusion in a sample of seventy-five cartel cases. We then survey the literature to ascertain the probability that cartels are detected and sanctioned. We further assemble data on the size of the sanctions involved in each case in our sample. These include the corporate fines, individual fines, and payouts in private damage actions for these cartels. Finally, we determine the opportunity cost (or disvalue) of imprisonment or house arrest for the individuals convicted in these seventy-five cases.[40]

Our optimal deterrence analysis[41] concludes that the combined level of U.S. cartel sanctions has

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sanctions alone. . . . It seems likely that the combination of federal penalties is adequate." John E. Lopatka & William H. Page, *Indirect Purchaser Suits and the Consumer Interest*, 48 ANTITRUST BULL. 531, 568 (2003) (footnote omitted); *see also* ABBOTT B. LIPSKY, LATHAM & WATKINS, LLP, PRIVATE DAMAGE REMEDIES: TREBLE DAMAGES, FEE SHIFTING, PREJUDGMENT INTEREST 4–5 (2005), *available at* http://govinfo.library.unt.edu/amc/commission_hearings/pdf/Lipsky.pdf (statement to the Antitrust Modernization Commission) ("[S]o long as Section 1 and Section 2 violations can be—and in the case of cartel violations, typically are—prosecuted criminally and punished with actual incarceration for individuals and criminal fines. . . . [i]t is possible that the treble-damage claims unintentionally assume some of the characteristics of a wealth-transfer program . . . [similar to] the retributive and unwise legal methods that produced or at least inflamed the Salem Witch Trials . . . ."); *Criminal Remedies: Public Hearing Before the Antitrust Modernization Comm'n*, at 83, Nov. 3, 2005, *available at* http://govinfo.library.unt.edu/amc/commission_hearings/pdf/051103_Transcript_Criminal_Remedies.pdf (statement of Anthony V. Nanni, former Chief of the National Criminal Enforcement Section in the Antitrust Division, U.S. Department of Justice) ("[W]hen you have such large corporate fines combined with the other framework—i.e., civil treble damages—you really run the risk of pushing corporations to the brink of bankruptcy.").

37 See *infra* notes 43–50 for an explanation of the standard optimal deterrence approach. As explained throughout this paper, including in notes 28 and 32 *infra*, we believe this Article's analysis is best carried out in relatively traditional, non-behavioralist terms. Some of the remedies we propose, however, fairly might be termed "behavioralist." *See infra* Part V.A.

38 Optimal deterrence depends upon the rational conjectures or expectations of potential cartelists as to a number of factors when a cartel is being formed. Ideally, one would like to know how much would-be cartel managers or their employers expect to gain from their collusion, how likely it is they think they will be apprehended, and how large a corporate fine and how long a prison term they believe the managers and their employers will receive should they be caught. Managers may be carrying out a corporate decision, or they may be rogues. What goes on in the minds of potential cartelists is largely unexplored in the cartel literature (but for insights on this issue, see Michael O'Kane, *Does Prison Work for Cartelists?: The View from Behind Bars*, 56 ANTITRUST BULL. 483 (2011)). We only can estimate how much discovered cartels have gained in the past, what the historical rate of discovery and conviction likely has been, and how heavily corporate participants and their employees have been sanctioned. We then assume the historical outcomes match the cartelists' expectations—an admittedly rough approximation. See *infra* Part I.A for a more thorough discussion.

39 In other words, a sanction slightly larger than $300 would be necessary if a cartel expects total overcharges to reach $100 and believes there is a 1/3 chance its activities will be detected and condemned. In operational terms, the optimal penalty will be assumed to be equal to (the cartel's overcharges) ÷ (the probability the cartel will be detected × the probability the detected collusion will be sanctioned).

40 It is of course impossible to equate incarceration and monetary sanctions in an objective manner since this would mean computing the "value" or "cost" of time spent in prison or under house arrest. Nevertheless, this Article will examine several social science approximations of the disutility of prison time and house arrest, ascertaining and combining many different estimates in a conservative manner. *See infra* Part I.B. Consequently, the Article's overall assessment of the impact of incarceration will be both as accurate and non-controversial as possible.

41 As explained throughout this Article, we use the best available data for each part of the optimal deterrence

been only 9% to 21% as large as it should be to protect potential victims of cartelization optimally. Hence, despite all the existing sanctions, collusion remains a rational business strategy. Cartels are a crime that, on average, pays. In fact, it pays very well.

This Article proceeds in six Parts. Part I analyzes the optimal deterrence of cartels, including separate discussions of the necessary individual, as well as corporate perspectives and incentives. Part II analyzes the sizes of cartel sanctions in our sample of seventy-five cases: payments made in private damages actions, corporate fines, individual fines, restitution payments, and the monetary equivalents of imprisonment and house arrest for corporate officers engaged in collusion. Part III summarizes the field's empirical knowledge about the harms to society from collusion. Part IV ascertains the probability a cartel will be discovered and sanctioned. Part V combines the previously calculated figures, for our sample of seventy-five cartel cases, to produce our results.

This Article's results should be of paramount importance to anyone interested in protecting the public against collusion. Accordingly a sixth, concluding section will discuss the implications of our research for public policies towards cartels. Because current cartel sanctions are far too low, we suggest specific ways they could be increased to become more nearly optimal. Doing so would save consumers billions of dollars each year.

I. OPTIMAL DETERRENCE: INDIVIDUAL VS. CORPORATE PERSPECTIVES[42]

How can cartels best be deterred? Should sanctions focus upon corporations, individuals, or both? How large should each category of sanctions be relative to the harms from collusion?

A. *Overall Framework for Analysis*

The generally accepted overall approach to the optimal deterrence of antitrust violations was developed by Professor William Landes.[43] He showed that to achieve optimal[44] deterrence[45] the

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calculation. Some information is known with certainty, but some of the required information is not available with as much precision or the degree of confidence we would like. In recognition of these imprecisions, we undertake a sensitivity analysis: We determine the highest and lowest likely values for each relevant factor and combine them into appropriate low and high estimates of the overall optimal deterrence tradeoff.

42 This Part relies heavily upon and significantly extends some of the authors' earlier joint work. *See* John M. Connor & Robert H. Lande, *How High Do Cartels Raise Prices? Implications for Reform of the Antitrust Sentencing Guidelines*, 80 TULANE L. REV. 513 (2005), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=787907. This Part also relies upon John M. Connor, *Problems with Prison in International Cartel Cases*, 56 ANTITRUST BULL. 311 (2011), and Robert H. Lande & Joshua P. Davis, *Comparative Deterrence from Private Enforcement and Criminal Enforcement of the U.S. Antitrust Laws*, 2011 BYU L. REV. 315, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1565693.

43 William M. Landes, *Optimal Sanctions for Antitrust Violations*, 50 U. CHI. L. REV. 652, 656 (1983) (adapting Gary Becker's well known "theory of crime" to examine price-fixing violations that are nearly always prosecuted as felony crimes by the DOJ; for that reason, the ex ante approach to analyzing crimes is dubbed "Beckerian"). By the early 1990s, the Beckerian formulation of the problem of policies designed to deter hard-core price-fixing violations had been adopted universally by legal-economic scholars. *See* Richard A. Posner, *Optimal Sentences for White-Collar Criminals*, 17 AM. CRIM. L. REV. 409 (1979–1980) [hereinafter Posner, *Optimal Sentences*]. In addition, an alternative analysis of optimal anti-cartel policies has grown during the last decade. *See, e.g.*, Paulo Buccirossi & Giancarlo Spagnolo, *Optimal Fines in the Era of Whistleblowers: Should Price Fixers Still Go to Prison?*, *in* THE POLITICAL ECONOMY OF ANTITRUST 81 (Vivek Ghosal & Johan Stennek 2007). This newer perspective on enforcement focuses on policies like corporate or individual leniency programs that may destabilize cartels that are already formed. Thus, we view policy prescriptions arising from this body of scholarship as ex post and, far from being contradictory, as supplementary to the ex ante policies we examine in the present Article.

damages from an antitrust violation should be equal to the violation's expected "net harm to others"[46] divided by the probability of detection and proof of the violation.[47] All figures should, of course, be expressed in constant dollars. Most analysts of both the Chicago and post-Chicago schools of antitrust have accepted these principles.[48] The "net harm to others" from collusion, of course,

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[44] One might quite reasonably reason that, unlike the case for conduct that might violate the prohibitions against illegal monopolization, because price fixing is never in the public interest, we should attempt to design a regime that prevents all price fixing, not a regime that permits some "optimal" amount of price fixing. One might argue that we should not worry about imposing excessive penalties against cartels.

Our quest should not be complete deterrence, however, because enforcement aggressive enough to deter all cartels almost certainly would penalize and therefore discourage some honest business conduct. As with any legal system, there is some uncertainty at the margin of cartel illegality. Beneficial horizontal conduct near this line, conduct that results in efficiency gains for society, sometimes could be mistaken for illegal collusion. For this and other reasons sanctions should not be excessive; they should only be as large as necessary to deter most of the undesirable conduct. To give an extreme example, a mandatory death penalty for price fixing, if regularly imposed, surely would chill a significant amount of procompetitive behavior because most people quite understandably would avoid doing anything that could give rise to even a small probability of being mistaken for price fixing.

[45] Professor Landes was not concerned with the compensation of victims. Landes, *supra* note 43. For an analysis that takes compensation into account, see Robert H. Lande, *Are Antitrust "Treble" Damages Really Single Damages*, 54 OHIO ST. L.J. 115, 161–68 (1993), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1134822.

[46] The logic underlying the "net harm to others" standard was explained clearly by Professors Breit and Elzinga. Their example is that of a horizontal cartel. However, in their example, the activity also produces a significant efficiency gain. Sometimes horizontal activity that produces a significant efficiency gain is labeled a "joint venture" rather than a "cartel." Other times "cartel" is simply a shorthand for horizontal activity that produces more losses than gains.

> The trick to discovering the optimal sanction is to find a rule that will force the potential cartelist to compare any cost saving from his activity with the deadweight loss triangle. If the cost saving were larger than the deadweight loss, it would be in his (and society's) interest to undertake the illegal activity. So after he deducts the monopoly profit rectangle . . . the cartelist will examine the deadweight loss (the remainder of the fine to be paid) and compare it with the value of the cost saving. The fine that is the sum of the deadweight triangle plus the profit rectangle is the correct sanction since it will encourage the "right" amount of illegal antitrust activity. Damages larger than this could lead to over-deterrence . . . .
>
> A numerical example may help to clarify the concept of the optimal antitrust sanction. Assume that a potential cartelist calculates that joining a horizontal price-fixing conspiracy will increase his profits by $100 million. He also is aware that the deadweight loss imposed on society by his activity is $50 million. If the expected value of the fine imposed is the entire amount of consumers' surplus ($150 million) would he enter the cartel? He would do so if he believed that the cartel would be accompanied by cost reductions to him greater than $50 million. If the cost saving were, say, $60 million, he would still enter the price-fixing conspiracy because he would know that his fine would be $100 million (his cartel profits) plus $50 million (the deadweight loss) leaving him $10 million more revenue than would be the case if he did not enter the cartel. In this case the cartel is accompanied by cost reductions greater than the deadweight loss it imposes on society. On efficiency grounds, it should be permitted.

WILLIAM BREIT & KENNETH G. ELZINGA, ANTITRUST PENALTY REFORM: AN ECONOMIC ANALYSIS 11–12 (1986).

[47] *See* Landes, *supra* note 43, at 666–68. Thus, if the harm were 10 and the probability of detection and proof were .33, since 10/.33 = 30, the optimal penalty for this violation would be 30. This assumes risk neutrality and other common assumptions. *Id.*

[48] See the discussion in Lande, *supra* note 45, at 161–68. Despite the general acknowledgement of the superiority of the Landes approach, however, many respected scholars and enforcers instead focus upon the gain to the lawbreakers, perhaps because it is simpler to observe or calculate. For a recent example see Gregory J. Werden, *Sanctioning Cartel Activity: Let the Punishment Fit the Crime*, 5 EUR. COMPETITION J. 19, 28–31 (2009). For an insightful analysis see Wouter P.J. Wils, *Optimal Antitrust Fines: Theory and Practice*, 29 WORLD COMPETITION 183, 190–93 (2006). For this Article's purposes, however, the precise optimal deterrence standard used is not

includes the overcharges that result from cartel pricing.[49] They include many other—perhaps less obvious—factors, as well.[50]

Moreover, since not every cartel is detected or successfully proven, the "net harm to others" should be multiplied by the inverse of the probability of detection and proof.[51] The Antitrust Division's amnesty program has resulted in a significantly larger percentage of cartels detected and proven in recent years.[52] Nevertheless, there is continuing evidence that, despite the enforcers' superb efforts, many cartels still operate,[53] so there is significantly less than a 100% probability that a cartel

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crucial. Similar results would arise if this Article instead used a "gross harm to others" or a "net gain to the offenders" standard.

[49] *See* Landes, *supra* note 43.

[50] First, cartel market power produces allocative inefficiency—the deadweight loss welfare triangle. *See* EDWIN MANSFIELD, MICROECONOMICS: THEORY AND APPLICATIONS 277–92 (4th ed. 1982) (defining allocative inefficiency and providing a proof that it is created by monopoly pricing). Allocative inefficiency often is significant empirically. *See* discussion *infra* Part III.B. Nevertheless, it apparently has never been awarded in an antitrust case. *See, e.g.*, David C. Hjelmfelt & Channing D. Strother, Jr., *Antitrust Damages for Consumer Welfare Loss*, 39 CLEV. ST. L. REV. 505 (1991).

Second, market power can produce "umbrella" effects, the name given to higher prices charged by non-violating members that were permitted or caused by the violation's supracompetitive prices. *See* PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW ¶ 337.3 (Supp. 1992). This factor also is never or virtually never awarded. *Id.*

Moreover, there are several additional types of harms that often are caused by cartels. These include: (1) uncompensated plaintiffs' attorneys' fees and costs; (2) the uncompensated value of plaintiffs' time spent pursuing the case; and (3) the costs of the judicial system. *See* Lande, *supra* note 45, at 129–58.

In addition, cartels may have less incentive to innovate or to offer as wide an array of non-price variety or quality options. Alternatively, one could argue that cartel members will have more funds to use for socially desirable innovation. We know of no evidence, however, that these innovation effects are significant empirically.

The price fixers' own legal costs, the disruption in their own efficiency as a result of sanctions litigation, and any harm to their corporate reputation, by contrast, are not "harms to others" from collusion, and therefore should not be included in the optimal deterrence analysis.

[51] "Multiplication is essential to create optimal incentives for would-be violators when unlawful acts are not certain to be prosecuted successfully. Indeed, some multiplication is necessary even when most of the liability-creating acts are open and notorious. The defendants may be able to conceal facts that are essential to liability." *See* Frank Easterbrook, *Detrebling Antitrust Damages*, 28 J.L. & ECON. 445, 455 (1985).

[52] *See* Nathan H. Miller, *Strategic Leniency and Cartel Enforcement*, 99 AM. ECON. REV. 750 (2009).

[53] *See generally* Douglas H. Ginsburg & Joshua D. Wright, *Antitrust Sanctions*, 6 COMPETITION POL'Y INT'L 3 (2010). The continued high number of DOJ grand juries and the recent DOJ success rate in the courts also suggests that many cartels still exist. As of the close of fiscal year 2010 the DOJ had approximately 124 pending grand jury investigations. U.S. DEP'T OF JUSTICE, ANTITRUST DIVISION WORKLOAD STATISTICS FY 2002–2011, at 4, [hereinafter WORKLOAD STATISTICS 2002–2011] *available at* http://www.justice.gov/atr/public/workload-statistics.html. Between 2001 and 2010, the DOJ filed from forty-four to sixty criminal cases per year, most of which resulted in convictions. *Id.* at 4. The following table, extracted from this data, shows DOJ's success in prosecuting antitrust violations:

Total Criminal Cases	**'01**	**'02**	**'03**	**'04**	**'05**	**'06**	**'07**	**'08**	**'09**	**'10**
Filed	44	33	41	42	32	34	40	54	72	60
Won	38	37	32	35	36	31	31	47	67	41

will be detected and convicted. From an optimal deterrence perspective, sanctions should be more than a cartel's "net harms to others" to account for the probability that the conduct will go unpunished. As noted earlier, if a cartel that expected to overcharge by $100 only faced a 33% chance it would be detected and proven to be illegal, the sanctions should slightly exceed $300. Without this multiplier firms would be simply undeterred from committing antitrust violations.

Ideally, optimal deterrence should be based upon the expectations of potential price fixers, not the results of others' past price fixing or the sanctions imposed on similar cartels.[54] The required expectation knowledge, however, is impossible to obtain.[55] Guessing what goes on in the minds of would-be cartelists is hazardous. Nor do we know how often potential price fixers consult with their

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Lost	2	1	1	1	1	–	1	4	2	1
Pending	39	34	42	48	43	44	54	57	60	55
Appeal Decisions	5	1	2	7	4	5	1	4	2	7
Grand Juries Initiated	26	26	48	21	38	38	34	32	38	12

In the opinions of a large number of judges, grand juries, and juries, the DOJ Antitrust Division has been bringing a large number of meritorious anti-cartel cases in recent years. Note that in some years the DOJ won more cases than it filed because the cases the DOJ won in any given year were often filed in an earlier year.

[54] It would be extremely useful to know potential price fixers' perceptions of the probability that they will be caught and convicted of price fixing, and their belief as to how much they will be forced to pay. Moreover, as one distinguished cartel scholar noted, "[b]ecause of overconfidence bias, prospective offenders are likely to overestimate the gain and underestimate the probability of detection and punishment." *See* Wils, *supra* note 48, at 183.

We know of no reliable information on this issue, however. Their expectations will, to some degree, be informed by their discussions with their antitrust lawyers, but there still could well be systematic differences between their expectations and reality. In addition, potential price fixers probably are likely to be risk seekers, and have other relevant psychological traits on the average. Moreover, there could be a difference between how much potential price fixers think they would be likely to earn from price fixing, and the amount a court or an economist measures after the fact. Similarly, there could be a difference between reality and their estimate, at the time of the price fixing, of the probability they will get caught and convicted, and their expectation as to how much the negotiated fine will be. In addition, optimal deterrence theory is based on the balance between the present value of expected future corporate profits from the conduct and the present value of expected future monetary sanctions.

[55] To ascertain this, one would have to interview a random sample of potential price fixers and discern their expectations. In reality, however, it would be impossible to assemble a proper random sample or to get them to respond candidly. A different way to frame the optimal deterrence issue is in terms of whether cartels usually know in advance of litigation roughly how much they will be found to have overcharged. Can most firms that are members of cartels predict in advance of litigation, for example, that a court will find that it overcharged 5%, as opposed to 15%?

In light of the probability that lengthy, protracted litigation could result in a high, or low, sanction result, another issue is how risk seeking or averse a particular corporation is.

More generally, one might argue that our use of the standard optimal deterrence model (which assumes risk neutrality) for entire cartels is inappropriate. After all, if the most risk-averse member of a cartel decides to turn in the cartel, the entire cartel will end. (This idea is not applicable at the decision to participate stage, however, because a cartel need not contain every firm within an industry to be largely successful.) For this reason the optimal deterrence target need only be the most risk-averse member of a cartel. It seems likely, however, that most cartelists are by nature risk seekers. Accordingly, the appropriate focus of an optimal deterrence calculation actually should be on the most risk-averse member of a group of risk seeking cartelists. Is this person/corporation net risk-neutral, net a risk avoider, or still a net risk seeker? We do not know. Experimental economics offer some promise of modeling choices of participants in cartel settings. However, to our knowledge no relevant experiments have been published on this issue.

attorneys about the likely range of outcomes.[56] The best we can do is to ascertain how much overall (in terms of a median or a mean) cartels have raised prices in the past, and how often and how much they have been sanctioned, and assume these are close proxies for the expectations relevant to the decision whether to collude.[57] In effect, we are using a general deterrence approach because a specific deterrence approach is infeasible.

B. *Corporate vs. Individual Sanctions*

Even though the preceding analysis is accepted by most of the antitrust field with relatively little controversy, it does not answer the question posed at the start of this Section: Is optimal deterrence best achieved by focusing only on the corporations involved?[58] On the individuals involved? And if so, should this be done by fines or through incarceration? Or through some combination of corporate and individual sanctions?[59]

Consideration of optimal sanctions for price fixing can be traced to Richard Posner's analysis of optimal cartel penalties.[60] According to this work, hard-core price fixing is optimally punished almost exclusively through corporate fines.[61] Only when a company is unable to pay an optimal fine should imprisonment be imposed as a last resort, and only if the individuals are unable to pay optimal fines.[62]

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[56] *See generally* D. Daniel Sokol, *Cartels, Corporate Compliance, and What Practitioners Really Think About Enforcement*, 78 ANTITRUST L.J. 201 (2012).

[57] For this reason, we readily acknowledge that we are administering an imperfect test using a surrogate for what we really would like to measure.

[58] This Section draws heavily upon material in Connor, *supra* note 42, and in Lande & Davis, *supra* note 42.

[59] One could attempt to analyze whether sanctions should be imposed on individuals and/or on corporations, and other issues examined in this Article, using a more explicitly behavioral approach. For an excellent behavioral analysis of related issues concerning collusion, see generally Maurice Stucke, *Am I a Price Fixer? A Behavioral Economics Analysis of Cartels*, *in* CRIMINALISING CARTELS: A CRITICAL INTERDISCIPLINARY STUDY OF AN INTERNATIONAL REGULATORY MOVEMENT 263 (Caron Beaton-Wells & Ariel Ezrachi eds., 2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1535720.

In light of this Article's conclusion that current cartel sanctions are significantly suboptimal, however, a more explicitly behavioral approach would not significantly enhance our analysis. Our analysis shows that current sanctions are much less than they should be to deter cartels optimally, so it is unsurprising that firms contemplating collusion do so rationally and knowingly. It is in their self interest to collude, so the explanation as to why they attempt to form cartels is relatively simple and straightforward.

On the other hand, behavioral issues would be extremely important if the overall level of sanctions were optimal or super-optimal. Under these conditions one would have to explain why corporations continue to engage in the seemingly irrational behavior of illegal collusion. Under these circumstances, one should analyze, for example, issues such as whether managers who are worried about getting fired for poor performance have an incentive to defy top management's instruction not to engage in collusion by entering into a cartel with their competitors. If sanctions were optimal or super-optimal, a behavioral analysis could help decide how to stop this from happening. In light of this Article's conclusions that sanctions currently are too low, however, no such analysis is necessary.

By contrast, many of our proposed solutions could be termed "behavioral." *See infra* Part V.A.

[60] Posner, *Optimal Sentences*, *supra* note 43.

[61] *Id.* The conventional wisdom in the field was well summarized in V.S. Khanna, *Corporate Criminal Liability: What Purpose Does It Serve?*, 109 HARV. L. REV. 1477 (1996) ("Thus, some justification for corporate criminal liability might have existed in the past, when civil enforcement techniques were not well developed, but from a deterrence perspective, very little now supports the continued imposition of criminal rather than civil liability on corporations.").

[62] Posner, *Optimal Sentences*, *supra* note 43. Posner argued for "the substitution, whenever possible, of the fine (or civil penalty) for the prison sentence as the punishment for crime." *Id.* at 409. Posner also acknowledged that he

There are many arguments in favor of the criminalization of price-fixing offenses.[63] For example, publicity about severe sentences for price fixing may help educate other corporate executives about the true individual and corporate legal risks of being caught.[64] Publicity may also contribute to the effectiveness and costs of corporate antitrust compliance programs. Imprisonment could improve the operation of public antitrust leniency programs because, by shifting corporate officers' expectations toward high personal penalties, top executives of cartel participants are more likely to seek the immunity from prosecution that accompanies awards of corporate amnesty. In addition, public fines on employees can be socially optimal if principal-agent problems exist such that employees fail to take enough care to avoid legal risks for the corporation and the employer is unable to impose a financial penalty as high as the required public fine.

Indeed, one could argue in the extreme that sanctions should focus mainly or exclusively upon individuals. Officials at the U.S. Department of Justice (DOJ) Antitrust Division have been moving in this direction in recent years,[65] as have some of the most respected members of the antitrust community, such as Judge Douglas Ginsburg and Professor Joshua Wright, who advocates lengthy debarment for negligent corporate officers and directors of publicly traded companies that fix

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has made "an argument . . . in the antitrust context for confining criminal (or civil-penalty) liability to the corporation, on the theory that if it is liable it will find adequate ways of imposing on its employees the costs to it of violating the law." *Id.* at 417–18. He observed: "The fine [or civil liability] for a white-collar crime can be set at whatever level imposes the same disutility on the defendant, and thus yield the same deterrence, as the prison sentence that would have been imposed instead." *Id.* at 410. Yet the fines would save the cost to society of incarcerating the lawbreakers, and also, the opportunity cost to society of the time they spend in prison instead of working productively. Posner is familiar with resistance to this claim—indeed, his Article responds in part to a criticism that contends that the threat of imprisonment is inherently greater than that of a fine. *Id.* at 413.

63 See the sources cited in Connor, *supra* note 42, for a summary of the legal-economic arguments for and against individual criminal penalties for antitrust violations, including the available game theory arguments.

64 *See infra* note 73 (the example of Alfred Taubman).

65 For example, a 2006 speech by Scott Hammond contains a statement about the Division's belief that the threat of imprisonment overshadows all other sanctions as a cause of corporate leniency applications:

> It is indisputable that the most effective deterrent to cartel offenses is to impose jail sentences on the individuals who commit them. Corporations only commit cartel offenses through individuals, so executives as well as their employers need to be deterred from engaging in such conduct. Hard-core cartel offenses are premeditated offenses committed by highly educated executives. Before deciding whether to commit the offense, those executives weigh the risk and consequences of detection against the potential financial rewards of colluding. When an executive believes that incarceration is a possible consequence of engaging in cartel activity, he is far more likely to be deterred from committing the violation than if there is no individual exposure. This conclusion is not simply based on theories of human behavior or common sense. We have first-hand accounts from cartel members of how the presence or absence of individual sanctions has directly resulted in actual deterrence and continued competition in the U.S. market and failed deterrence, collusion, and great financial harm in foreign markets.
>
> We have uncovered international cartels that operated profitably and illegally in Europe, Asia, and elsewhere around the world, but did not expand their collusion to the United States solely because the executives decided it was not worth the risk of going to jail. I am referring to cartels that had every opportunity to target U.S. consumers. The cartel members sold in the U.S. market, and they were already getting together and fixing prices everywhere else they sold. Indeed, in some cases, the U.S. market was the largest and potentially most profitable, but the collusive conduct still ceased at the border. Why? The answer, from the mouths of the cartel members and verified by our investigators, is that the executives did not want to risk getting caught and going to jail in the United States.

Scott D. Hammond, Deputy Assistant Att'y Gen. for Criminal Enforcement, Antitrust Div., U.S. Dep't of Justice, Charting New Waters in International Cartel Prosecutions, Remarks at the National Institute on White Collar Crime (Mar. 2, 2006), *available at* http://www.justice.gov/atr/public/speeches/214861.htm.

prices.[66]

The extreme form of this argument specifically rejects the logic of optimal deterrence principles. The dominant law-and-economics model of crime posits that rational choices drive corporate decisions (including the decisions of the individuals involved) to commit crimes—a "cost/benefit analysis" of the decision. Consequently, there exists a bundle of sanctions that the legal system can (at least in theory) calculate that optimally will deter the crime. Unless there are principal-agent problems,[67] the monetary values of these individual sanctions are, in principle, perfect substitutes for one another. [68]

There certainly are counter-arguments to the desire for vastly higher individual penalties for cartelization (indeed, the United States is the only nation, among the roughly 200 countries with anti-cartel laws, that incarcerates significant numbers of cartel managers).[69] Some have expressed skepticism about the effectiveness of individual sanctions in deterring antitrust crimes. An executive summary of a Policy Roundtable on this topic sponsored by the Oraganisation for Economic Co-operation and Development (OECD) asserted: "There is no systematic evidence proving the deterrent effects of sanctions on individuals, and/or assessing whether such sanctions can be justified."[70]

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[66] *See* Ginsburg & Wright, *supra* note 53. Judge Ginsburg and Professor Wright certainly do not propose repealing corporate fines for price fixing. They do, however, advocate putting much more emphasis on individual sanctions. In particular, they propose lengthy debarment for negligent corporate officers and directors of publicly traded companies. Part of their preference for individual sanctions follows from their premise that the ever increasing levels of fines for price fixing have not sufficiently deterred collusion.

We certainly agree with Ginsburg and Wright that even though corporate fines have risen significantly in recently years, there still is significant under-deterrence of collusion. Ginsburg and Wright do not, however, analyze the possibility that even the current levels of corporate fines are insufficient to deter price fixing optimally. Despite the higher fines of recent years, if corporations still expect to make a profit from collusion, still higher corporate sanctions might lead to optimal deterrence.

[67] If the firm is a proprietorship, it does not matter whether the sanctions fall upon the individuals or the corporation. But if there is a separation between ownership and management, the personal motives of managers must be considered in evaluating the effectiveness of sanctions. The simpler versions of optimal deterrence theory assume that there are no principal-agent divergences and that the managers are risk-neutral. However, it sometimes is true that the reward structures of traditional executive compensation contracts typically give short-term, personal enrichment a greater weight than the long-run interests of stockholders.

If the profits generated by price fixing generate immediate personal rewards for such managers, but long-term losses for shareholders (incurred only after years of litigation, when the managers may no longer be with the corporation) then the optimal ratio of sanctions to illegal profits must be higher than for a proprietorship. Similarly, a higher ratio will be required if managers are risk-seeking in their corporate decision making rather than risk-averse. For these reasons, our focus on corporate-level performance in the present paper is, at best, a rather imperfect surrogate for stockholder control, managerial risk aversion, and other factors that, if we were able to derive the necessary parameters, we would otherwise incorporate.

[68] "The Division does *say* that it is focused on both hammering corporations with big fines and sending their price-fixing executives to jail. But the reality is that, despite vehement Division protestations to the contrary, a key element of the Division's enforcement approach appears to be a willingness to trade people (particularly senior executives) for money." TEFFT W. SMITH, KIRKLAND & ELLIS LLP, COMMENTS FOR THE ANTITRUST MODERNIZATION COMMISSION HEARING ON CRIMINAL ANTITRUST REMEDIES 5 (2005), *available at* http://govinfo.library.unt.edu/amc/commission_hearings/pdf/Smith_Statement.pdf.

[69] The only other nations we know of that have imprisoned antitrust violators at least once are Great Britain, Israel, Germany, Japan, and Ireland, but they have only done so on relatively rare occasions. Canada and other jurisdictions impose prison sentences but convert them to non-custodial sanctions. *See* Connor, *supra* note 42. However, the international trend is towards greater use of incarceration for cartelists. *Id.*

[70] ORG. FOR ECON. CO-OPERATION & DEV., *Overview to* POLICY ROUNDTABLES: CARTEL SANCTIONS AGAINST INDIVIDUALS, 2003, at 1 (2005) [hereinafter CARTEL SANCTIONS], *available at* http://www.oecd.org/daf/competition/cartelsandanti-competitiveagreements/34306028.pdf.

Moreover, an interesting set of criticisms was leveled at the DOJ's imprisonment policies at a hearing of the Antitrust Modernization Commission. Tefft Smith, a prominent U.S. antitrust lawyer who often represents defendants, testified that, in his experience, imprisonment is the DOJ's "biggest (and most effective) stick" in cartel enforcement.[71] Nevertheless, he criticized the DOJ for offering unduly short sentences[72] and because—with exceptions[73]—the DOJ tends to prosecute mid-level sales or marketing executives rather than the most senior responsible officers of the company.[74] To the extent this is true,[75] it seriously undermines the overall effectiveness of prison as a way to prevent cartelization. Therefore, we attempted to track down the past and present positions of executives imprisoned for criminal price fixing.

Of the 152 known individuals who received a fine or prison sentence in cartel cases between 1990 and 2008, we[76] were able to determine the position held during the cartel's existence for 151 of

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71 Smith, *supra* note 68, at 7–10.

72 *Id.*

73 For example, Alfred Taubman, the billionaire Chairman of Sotheby's, was sentenced to a year and a day in prison in conjunction with the auction houses bid rigging case. *See The World's Billionaires, #655 A. Alfred Taubman*, FORBES.COM (Mar. 10, 2010), http://www.forbes.com/lists/2010/10/billionaires-2010_A-Alfred-Taubman_LWZ4.html. Taubman "entered a low-security medical prison in Rochester, Minnesota, on August 1, 2002 and, after having his sentence reduced for good behavior, was released on May 15 2003." Jill Treanor, *Taubmans Lose Hold on Sotheby's: Auction House Ends Family's Grip on 62% of Voting Rights*, GUARDIAN, Sept. 9, 2005, at 18.

As of February 2011, Taubman was alive and doing well. The day after Taubman was sentenced, the Board of Directors of Sotheby's Holdings Inc. at a "thinly attended annual meeting" elected Taubman to be a member of the Board, and his son Robert replaced him as Chairman. *A Taubman Continues to Sit on Sotheby's Board*, NAT'L POST (CANADA), Apr. 25, 2002, at FP2. In addition to positions on other corporate boards, as of 2010 he was a Trustee of the Urban Land Institute. *Profile Detail—A. Alfred Taubman*, MARQUIS WHO'S WHO 2010, http://search.marquiswhoswho.com/profile/100004075742 (last visited Oct. 30, 2012) (registration required).

His re-emergence into society may have begun in Detroit in 2005, when he accepted the first lifetime achievement award from the Detroit chapter of the Urban Land Institute. *Taubman to be Honored*, CRAIN'S DETROIT BUS., Apr. 4, 2005, at 8. Moreover, his social life has revived. "Today we are living at the dawn of the ultra-mega-uber-monster book party, celebrations so huge and elaborate that you might think you were at a wedding . . . . In April, 400 guests celebrated Alfred Taubman's book, *Threshold Resistance: The Extraordinary Career of a Luxury Retailing Pioneer* . . . at the Four Seasons." Alex Kuczynski, *Comped Lit*, N.Y. TIMES, Aug. 26, 2007, § 6 (T: Women's Fashion Magazine), at 226. Louis Auchincloss, novelist and chronicler of New York City mores, was quoted as saying "in amazement" that Taubman "comes out of jail and he's just as popular and giving as many parties as he ever did! There's no disgrace in going to jail anymore unless it's for some disgusting, disgusting crime." Larissa MacFarquhar, *East Side Story: How Louis Auchincloss Came to Terms with His World*, NEW YORKER, Feb. 25, 2008, at 54. In addition, Taubman's name will remain forever on several buildings on the campuses of Harvard, Brown, and the University of Michigan. Ariana Eunjung Cha, *Corporate Scandals Tainting Donations*, WASH. POST, Sept. 15, 2002, at A1.

74 Tefft Smith wrote:

> *First*, the individuals typically carved-out in the corporate plea agreements (which give a pass on prosecution, assuming cooperation with any Division investigative requests, to all but the "carve-outs") tend to be mid-level sales and marketing executives with "direct participation" or "knowledge" and "an ability to stop" the price-fixing. They tend *not* to be the senior executives, even when sometimes (in the Division's view) the senior executives are said by the Division to have been "willfully ignorant" of the misconduct.

Smith, *supra* note 68, at 9.

75 "And so it has always been true, and I am sure it is still true, that at the end of the day you're not going to get—it is very rare to get—the big multinational or national large corporation CEO or top guy as your antitrust defendant." Nanni, *supra* note 36, at 39.

76 W. James Denvil, *What Happens to Executives Who Are Sanctioned for Their Involvement in Cartels?* (on file

them.[77] Of those, 40 appear to have been one of the heads of the companies for which they worked;[78] 24 appear to have occupied a corporate position that was very high, but below the level of those in the former group;[79] 77 appear to have been mid-level employees; 3 were co-owners or sole-proprietors of a business; 3 were stamp dealers; and 4 were consultants.[80] Thirty-five of the mid-level employees were clearly involved in sales or marketing.[81]

Still, another problem arises from the fact that some of the corporations involved forgive or even reward their price-fixing employees—directly or indirectly, legally or not—after they "take a bullet for the team" by going to prison.[82] Although it is difficult to determine when or whether it would be legal,[83] the authors would not be surprised if it were common for the corporations involved to pay their executives' fines directly or indirectly in the form of bonuses or promotions.[84]

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with the author) *available at* http://www.cardozolawreview.com/content/34-2/Connor.Lande.34.2/DenvilStudy.pdf. This research was conducted by W. James Denvil while he was a student at the University of Baltimore School of Law. He is not a trained private investigator. He conducted his searches between July 15, 2010, and March 26, 2011, using Google, Bing, LinkedIn, Facebook, corporate websites, and the Federal Bureau of Prisons Inmate Locator. He searched for the individuals by using their full names, variants of those names, the names of their employers, descriptions of their cartels, the dates of their convictions, and the recent years (i.e., 2007–2010) as search terms. Because he could only rely upon public data, much of which could be unreliable, this survey should be regarded as extremely tentative, and only suggestive of what the actual results are likely to be. We urge others to conduct a more rigorous analysis of this issue.

77 However, job titles can be misleading and may not accurately reflect an individual's true position in the company.

78 *See* Denvil, *supra* note 76. This group is comprised of individuals with the title of Chairperson, President, Owner, Co-owner, Managing Director (of a European company), CEO, or COO.

79 *See id*. This group is comprised of individuals with the title of Commercial General Manager, Operations Manager, Director, Executive Vice President, President (of a division within the company), Managing Director (of a division within the company), Vice President of Operations, Commercial Director, CFO, or Co-Managing Director.

80 *See id.* This group consists of the individuals not included in the former two groups.

81 *See id.* These individuals have the words "sales," "marketing," or "development" in their titles.

82 *See* Dan Levine, *Antitrust Convictions Don't Mean End of Job for Some Executives*, RECORDER, Apr. 12, 2010, http://www.law.com/jsp/article.jsp?id=1202447903832&rss=newswire (describing an executive who was sent to prison for six months for price fixing, and when released, was made a senior vice president "with more responsibility than he had before he entered prison . . . ."). One reason for this may be that "since the executives are not perceived to have ripped off shareholders for personal gain, companies often have no problem welcoming them back into their corporate suites. . . . [S]ome corporate honchos believe executives that pleaded guilty took a bullet for the team, according to white-collar lawyers and industry observers." *Id.* Indeed, they have in all likelihood enriched the stockholders because the penalty their conduct led to probably was too low.

There are also reports that some companies continue to pay employees while they are in prison. *Id.* In the opinion of Tefft Smith the Antitrust Division does not get involved in employment decisions:

> [I]n my experience, the Division appears indifferent as to what the companies do with even the carved-out individuals (let alone the other executives who may have been identified as having been directly involved in the price-fixing). They need not be fired, disciplined or even re-assigned to non-sales and marketing-oriented jobs.

See Smith, *supra* note 68, at 10.

83 *See* 1 ROGER MAGNUSON, SHAREHOLDER LITIGATION § 9:37 (2010); *see also* Pamela H. Bucey, *Indemnification of Corporate Executives Who Have Been Convicted of Crimes: An Assessment and Proposal*, 24 IND. L. REV. 279 (1991); Note, *Indemnification of Directors: The Problems Posed by Federal Securities and Antitrust Legislation*, 76 HARV. L. REV. 1403 (1963).

84 JOHN M. CONNOR, GLOBAL PRICE FIXING 419–20 (2001) (describing how during cross-examination at the famous 1998 trial of three top executives of ADM for price fixing, the lead (immunized) witness for the prosecution was made to admit that his employer had paid his entire fine and promoted him to president of one of its largest subsidiaries).

We attempted to discover how often convicted corporations forgive, and even reward, employees who violate the antitrust laws, and believe the results show that it may be common. We were able to determine the present whereabouts of 35 (34%) out of 103 managers[85] known to have received a prison sentence in cartel cases between 1995 and 2010.[86] Of those 35, 9 (26%) are currently employed by the company for which they worked during the cartel, and another 9 (26%) seem to be working at a different company within the same industry.[87] The remaining 17 are either in prison, unemployed, employed in different industries, or deceased.[88] Because we were unable to discover the whereabouts of 68 of the 103 who received a prison sentence, these results might not be statistically significant. Nevertheless, if the employment statistics of the out-of-sample price fixers resembles those of the known ones, approximately half of those who served a prison sentence for their crime currently are working for their previous employers or in the same industry.[89]

We were also able to discover the current whereabouts of four people who received fines, but no prison sentence during the period between 1995 and 2009.[90] Two of them are employed by the same company for which they worked during the cartel, one appears to be working in the same industry, and the other is working in another industry.[91]

Indeed, for executives who went to prison, our figure of 52% almost certainly significantly underestimates the percentage of price fixers who went back to the same firm or industry. Some individuals may have reached retirement age, or returned to a firm or industry without notice of this fact being published in a source that is easily web-accessible, or the notice of some individuals' re-employment may have been deleted from the Internet prior to July 15, 2010.[92] Our survey may have erroneously counted such people as not having returned to their firm or industry.

The fact that some—perhaps most—corporations do not punish, and even reward, the individuals responsible for antitrust violations is only one reason why we are not persuaded by the argument that only individual sanctions matter. First of all, the financial well-being of the affected corporations often do matter to the individuals involved, as evidenced by corporate executives who, by fixing prices, often knowingly risk imprisonment largely for the financial benefit of their employers. Moreover, the literature on antitrust law generally assumes that corporations maximize profits, which means it also assumes the interests of corporate representatives and corporations generally align.[93] A corporation that truly does not want to break the laws against price-fixing because of the sanctions involved has any number of means to ensure that its employees follow company policy.[94]

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85 In several cases, individuals were sanctioned but not their very small businesses. Thus, we excluded individuals who were stamp dealers, consultants, sole proprietors, or co-owners during the cartel. Many of the 152 defendants' sentencing details are not posted on the Antitrust Division's Web site. We thank the Division for providing the missing sentencing documents.

86 *See* Denvil, *supra* note 76.

87 *See id.*

88 *See id.*

89 *See id.*

90 *See id.*

91 *See id.*

92 *See generally id.* (noting that the research was conducted between July 15, 2010, and September 27, 2010).

93 *See, e.g.*, RICHARD A. POSNER, ANTITRUST LAW, at ix (2d ed. 2001) (arguing there is in the antitrust field a consensus that "business firms should be assumed to be rational profit maximizers, so that the issue in evaluating the antitrust significance of a particular business practice should be whether it is a means by which a rational profits maximizer can increase its profits at the expense of efficiency" (citing Matsushita Elec. Indus. Co. v. Zenith Radio Corp., 475 U.S. 574 (1986))).

94 *See* Posner, *Optimal Sentences*, *supra* note 43, at 418 ("[I]f [the corporation] is liable it will find adequate

There are, moreover, a number of practical problems with exclusively or heavily relying on prison sentences as a means of deterring cartels, particularly international ones. First, it is more difficult to persuade managers of cartels who reside abroad to submit to U.S. jurisdiction. While indictments of foreign residents have increased, improvements in the ability of U.S. authorities to extradite individuals for price-fixing crimes have not kept pace.[95] There are large numbers of indicted cartel managers who are fugitives residing abroad.[96] Second, obtaining convictions of cartel managers who exercise their rights to a jury trial and who are within U.S. jurisdiction has proven challenging for the DOJ. Prosecutorial losses at trial are frequent.[97] Third, the demonstration effect of imprisonment requires adequate publicity about prison sentences. As the number and length of antitrust prison sentences have increased and they have become more routine, the "shock and awe" effect may decline. To offset such a trend, the DOJ has announced ever tougher standards for incarceration. It is unclear, however, whether these have been implemented to a significant extent or are mostly bluster. Fourth, coordination among those few antitrust authorities who incarcerate executives guilty of global price fixing is rare and likely to remain so in the future.[98] Where a cartel's injuries are multi-jurisdictional, multiple corporate fines have become common. However, there are no treaties on multiple incarcerations of cartel managers, so double-jeopardy concerns may well undermine the chances that the overall level of individual sanctions could be optimal.

The following matrix illustrates some of the issues involving the public policy issues underlying decisions to impose individual or corporate responsibility:

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ways of imposing on its employees the costs to it of violating the law."). Judge Posner noted: "A corporation has effective methods of preventing its employees from committing acts that impose huge [antitrust] liabilities on it. A sales manager whose unauthorized participation in a paltry price-fixing scheme resulted in the imposition of a $1 million fine on his employer would thereafter, I predict, have great difficulty finding responsible employment, and this prospect should be sufficient to deter." POSNER, *supra* note 93, at 271. Posner first published this in 1976, when antitrust fines were very low. Since he believed corporations had an adequate incentive and means to control its employees when faced with prospects of a $1 million fine, a fortiori they would do so when faced with a possible $100 million fine.

95 *See* Julian M. Joshua, Peter D. Camesaca & Youngjin Jung, *Extradition and Mutual Legal Assistance Treaties: Cartel Enforcement's Global Reach*, 75 ANTITRUST L.J. 353 (2008).

96 *See infra* Part IV.B.

97 *See* Connor, *supra* note 42.

98 *See* CARTEL SANCTIONS, *supra* note 70.

Table 1
Optimal Cartel Deterrence:
Corporate v. Individual Sanctions Matrix

Individual Executives' View of Incentives	**Corporate Perspective**		
	Corporation has little incentive to create right climate or control employees	Optimal Corporate Incentive Level	Corporation has excessive incentive to control employees and create a climate that rewards honesty
Too Low on Average	**1**	**2**	**3** Wastes corporate resources, unfair to stockholders
Optimal	**4**	**5** Ideal Balance	**6**
Too High on Average	**7** Unless risk-loving, executives have little incentive to break law	**8**	**9** Additional negative—unfair to honest employees. But firm can ameliorate by paying fines, payments, or post-conviction employment

One way to analyze these possibilities is in terms of error analysis. Type I error involves problems arising from over-deterrence (this arises most in cell 9). Since collusion is judged under a criminal "beyond a reasonable doubt" standard, these errors are likely to be rare and mostly theoretical. Nevertheless, from the corporate perspective honest behavior can be mistaken for collusion, and this could be costly to society because it would cause corporations to refrain from procompetitive practices. The resulting fines would be unfair to stockholders and cause over-investment in collusion prevention (although the actual costs of compliance programs are likely to be very small). From an employee perspective: They face prison and fines for honest behavior. But firms can ameliorate this by paying these fines for them (legally or illegally,[99] directly or indirectly,

[99] It is difficult to determine whether the antitrust fines imposed on corporate employees are ultimately paid by the employees, or are often or usually directly or indirectly paid by their employers. *See supra* note 54 and accompanying text. It also is difficult to determine whether it would be legal for the corporation to pay these fines.

perhaps through direct payments through foreign banks, and/or post-conviction employment). Such behavior, to the extent it is not merely theoretical, is inefficient.

Type II error involves problems from under-deterrence (this arises most in cell 1). Inadequate sanctions will fail to deter collusion optimally. From a corporate perspective: The corporation is unjustly enriched from the illegal overcharges. Untold billions of dollars will be stolen from U.S. consumers and businesses, often by foreign lawbreakers. One study covering just forty private U.S. antitrust cases from 1990–2007 documented returned overcharges of more than $18 billion.[100] From an employee perspective: Employee activity that should go into productive and competitive behavior, instead, often will be directed towards establishing or maintaining collusion, or preventing its discovery. Moreover, as noted earlier, collusion also results in allocative inefficiency and other inefficiencies.[101]

In addition to Types I and II error, a system of cartel sanctions also should consider a third type of error. Type III error occurs when the system created to decide the issues leads to increased costs to businesses, consumers, enforcers, or decision-makers.[102] In the cartel context, these costs include litigation expenses by the enforcers, plaintiffs, and defendants, and their expert witness costs. It includes the costs arising from delays, and also the value of corporate time spent on these issues. It also includes the undesirable effects on society arising from any increased business uncertainty, and the increased cost to the judicial system, which imposes additional costs on taxpayers. Quantitatively, Type III error can be significant,[103] and any policy that ignores it runs a substantial risk of departing from an optimal result.

We know of no way to secure the information necessary to quantify and minimize these errors. Nevertheless, we believe it is likely that optimal deterrence only can be secured by a mix of corporate and individual sanctions.[104] If violations only were subject to corporate penalties, individuals might be unduly tempted to form cartels because success would benefit them tremendously and, as has been suggested by anecdotes[105] and some research,[106] they often do not face significant internal sanctions for their illegal behavior[107] and might well even be rewarded for their

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This area of law is exceedingly complex and, of course, even if indemnification is illegal, this does not mean it does not occur regularly. *See* ROGER MAGNUSON, SHAREHOLDER LITIGATION § 9:37 (2010); Bucey, *supra* note 83; Note, *supra* note 83.

100 Robert H. Lande & Joshua P. Davis, *Benefits from Private Antitrust Enforcement: An Analysis of Forty Cases*, 42. U.S.F. L. REV. 879 (2008), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1090661.

101 *See supra* note 50; *infra* Part III.B.

102 *See* Alan A. Fisher & Robert H. Lande, *Efficiency Considerations in Merger Enforcement*, 71 CALIF. L. REV. 1580, 1670–71 (1983), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1684227 (introducing the concept of Type III error; defining and using these terms in a related antitrust context: merger enforcement).

103 *Id.*

104 In addition, it is important for a society to create a cultural norm that cartel behavior, like stealing, is something that is strongly condemned across that society. It is important that the prohibition against price fixing become a moral or social standard that is internalized within the business community. Many people refrain from stealing because they think it is the right thing to do, not because of the threat of fine or incarceration. Attaching social stigma to the act is an important aspect of optimal deterrence. *See generally* John M. Connor, Albert A. Foer & Simcha Udwin, *Criminalizing Cartels: An American Perspective*, 2010 NEW J. EUR. CRIM. LAW 199, *available at* http://www.antitrustinstitute.org/sites/default/files/NJECL%202010.pdf; Andreas Stephan, *"The Battle for Hearts and Minds": The Role of the Media in Treating Cartels as Criminal*, *in* CRIMINALISING CARTELS: A CRITICAL INTERDISCIPLINARY STUDY OF AN INTERNATIONAL REGULATORY MOVEMENT, *supra* note 59, at 381, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1866285.

105 *See supra* notes 84–95.

106 Khanna, *supra* note 61, at 1485–86; *supra* notes 84–95.

107 Greg Werden suggests additional reasons: "This can occur as a result of defects in the design of compensation

suffering in prison. On the other hand, if only individual penalties existed, it could be in the interests of some corporations to establish internal incentives that failed to discourage, rewarded, or even coerced employees into engaging in illegal behavior.[108] Some corporations might prefer to offer up a few executives for multi-year prison terms rather than pay $100 million or more as a criminal fine or payout in private litigation.[109] The employees could be incentivized to risk prison by multi-million dollar bonuses, perhaps paid to foreign bank accounts or in the form of future employment. Even though these payments might be quite large for individuals, they easily could be dwarfed by the prospective fine that could be imposed under a regime oriented towards corporate fines.[110]

We certainly do not know how to devise a formula to compare alternative cartel sanctions. Nevertheless, it is our judgment that a financial penalty against an individual has more of an impact on deterrence than a similar penalty against a corporation, and that prison time or the loss of one's corporate position[111] often is the equivalent of a very large financial penalty. We make accommodations for these assumptions in our analysis in Part III by tripling the disvalue or deterrence effects of individual sanctions relative to corporate sanctions.

II. THE OVERALL LEVELS OF CURRENT CARTEL SANCTIONS

Violations of the U.S. antitrust laws can result in a diverse array of criminal sanctions. These include corporate fines and restitution payments, as well as prison, house arrest, and fines for the corporate officials involved. During the 1990 to 2010 period the total amount of corporate fines imposed in every DOJ criminal antitrust case was $6.174 billion.[112] The total of the individual antitrust fines imposed was $74 million.[113] The Antitrust Division also secured the restitution of $165

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schemes, especially if the executives have short time horizons or are more willing than business enterprises to take risks. Consequently, business enterprises can incur substantial costs in monitoring their executives and complying with the law." *See* Werden, *supra* note 48, at 31–32 (footnotes omitted).

108 *Id.* at 32.

109 Suppose that instead of a corporate fine or payout in private cases a corporation could offer up to the DOJ five executives who would each be sentenced to two years in prison or under house arrest. Suppose the corporation could pay each of the individuals involved $6 million per year by depositing the appropriate sums in Swiss bank accounts, and also guarantee they would return to their position in the company upon release. This would only cost the corporation $60 million, far less than many of the larger fines that have been imposed in recent years, and far less than many of the private payouts of recent years.

110 Perhaps in part because corporations often would be able to compensate the punished individuals who "took one for the team," the "rogue manager" defense rarely has been accepted by the Antitrust Division or by the courts.

111 Donald Klawiter, an extremely experienced practitioner and former Chair of the ABA Antitrust Section, at the American Antitrust Institute's Annual Conference, held on June 23, 2011, in Washington, D.C., noted during the session on international cartels:

> From my experience in representing corporations and their executives in these cases, two things terrify executives. The first is the possibility that they will go to jail, if even for a week. And the second is that they will . . . lose their high level positions in corporations. Indeed, I've had some confess that taking them out of the CEO job or the head of sales job is much more traumatic to them than spending a year and a half in jail. That's sort of an interesting rationale and I think an interesting fact that we should look at.

Donald Klawiter, Partner, Sheppard Mullin Richter & Hampton LLP, International Cartels Presentation at American Antitrust Institute Annual Conference (June 23, 2011) (audio available at http://www.antitrustinstitute.org/content/international-cartels-presentation-and-audio-aai-annual-conference).

112 See WORKLOAD STATISTICS 2002–2011, *supra* note 53, at 11. The yearly figures are reproduced and summed in Lande & Davis, *supra* note 42, at 33 tbl.1.

113 *Id.* The yearly figures are reproduced and summed in Lande & Davis, *supra* note 42, at 34 tbl.2.

million in conjunction with criminal antitrust cases[114] (which largely or totally consisted of restitution to the federal government for overcharges it paid).[115] Its enforcement also resulted in sentences against 367 individuals[116] that total 186,393 days (510 years) in prison.[117] Antitrust enforcement also led to another 112 years of "house arrest or confinement to a halfway house or community treatment center" for 262 individuals.[118]

Now, we turn to civil sanctions secured by private plaintiffs. Cartel victims receive mandatory treble damages and attorneys' fees.[119] Final verdicts in cartel cases are exceptionally rare, however. Our 2004 search for every final verdict in a U.S. cartel case since 1890 found only twenty-five examples.[120] Nevertheless, many private cases have resulted in significant settlements. An analysis of well over 100 international cartels prosecuted between 1990 and 2008 found a total of $29 billion in announced private settlements in U.S. cases.[121] The only other estimate we have found was for a very limited sample of twenty-five large private cases filed against cartels between 1990 and 2007, which documented between $9.2 billion and $10.6 billion in cash payments (not including the value of products, coupons, or discounts).[122]

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114 *Id.* at 12. The yearly figures are reproduced and summed in Lande & Davis, *supra* note 42, at 35 tbl.3.

115 As the Division's Workload Statistics notes with considerable understatement, "Frequently restitution is not sought in criminal antitrust cases, as damages are obtained through treble damage actions filed by the victims." *Id.* at 12 n.15.

116 *Id.* at 12.

117 *Id.*

118 *See* U.S. DEP'T OF JUSTICE, ANTITRUST DIVISION WORKLOAD STATISTICS FY 1990–1999, at 7 (2009) [hereinafter WORKLOAD STATISTICS 1990–1999], *available at* http://www.justice.gov/atr/public/246419.pdf; U.S. DEP'T OF JUSTICE., ANTITRUST DIVISION WORKLOAD STATISTICS FY 2000–2009, at 8 (2012) [hereinafter WORKLOAD STATISTICS 2000–2009], *available at* http://www.justice.gov/atr/public/281484.pdf. However, these figures might be too high for the purposes at hand, for two reasons. First, these figures are for time sentenced, not time served. We were unable to determine how much of this time actually was served or how often sentences were reduced. For example, A. Alfred Taubman was sentenced to prison for a cartel offense for twelve months, but only served nine-and-a-half months. *See* note 73 *supra*.

Second, sometimes an investigation by the Antitrust Division results in a sentence for another crime regardless of whether an antitrust violation was uncovered. Non-price-fixing crimes can include perjury, mail fraud, contempt, obstruction of justice, and false statements. WORKLOAD STATISTICS 2002–2011, *supra* note 53, at 8 (listing these crimes under the header "Other Criminal Cases"). Since the Antitrust Division uncovered these crimes, often Antitrust Division investigators are in the best position to pursue these non-antitrust issues. Most often, these other crimes are related to an antitrust offense—such as when a cartel bribes a federal purchasing agent. Other times they are not related, and quite often, they are very difficult to classify. According to the Antitrust Division, "Other Federal Crimes such as Perjury, Mail Fraud, Contempt, Obstruction of Justice, or False Statements" apparently constituted 36% of their criminal convictions since 1990 (53% during 2008–2009).

We do not, however, know how many of the 186,393 days of prison secured by Antitrust Division enforcement were imposed for crimes that were not antitrust related. Ideally, we would subtract these before we conduct our optimal deterrence analysis. For lack of data, and to be conservative, we are ignoring these issues. The figures reported above for prison time and house arrest, therefore, will be used in our subsequent analysis even though they include some individuals serving time in whole or in part for non-antitrust offenses. And, as noted, these are time sentenced, not time served statistics. Because these statistics are larger than they should be for our purposes, their use will overestimate the probable deterrence effect of the DOJ's anti-cartel program.

119 Prevailing plaintiffs also receive filing fees and expert witness fees. *See supra* note 33.

120 *See* Connor & Lande, *supra* note 42.

121 John M. Connor, Cartels & Antitrust Portrayed: Private International Cartels from 1990 to 2008, at 51 (American Antitrust Institute Working Paper No. 09-062009), *available at* http://ssrn.com/abstract=1467310.

122 Since almost all these cases were settlements, "alleged victims" would usually be a more accurate description. *See* Lande & Davis, *supra* note 42. These figures have not been adjusted for inflation. These cartel payouts constituted a part of a larger study of forty private cases that documented a total of $18–19.6 billion returned to

We have aggregated all of these types of cartel sanctions and we now analyze them according to the standard optimal deterrence model. First, we have assembled the financial penalties imposed on corporations, including the amounts they pay in corporate fines, restitution actions, and private treble damages actions.[123] Second, we have assembled the fines imposed on the individual corporate actors who were held personally responsible for cartel violations. Third, we developed monetary equivalents of time in prison (or time spent under house arrest) by approximating the disvalue, cost, deterrent value, or opportunity cost of incarceration time.[124] Admittedly, establishing the likely disincentive effect of prison in an objective, accurate, and non-controversial manner is impossible. Because our attempt to monetize incarceration is a relatively novel feature of this Article, we allocate the major part of this Section to this topic.

Some might contend that, because no corporate officer wants to spend any time in prison or under house arrest, they would be willing to pay virtually any amount of money to avoid the risk of prison. This is equivalent to placing an infinite (negative) value on prison time, and it implies that even a small probability of spending any time in prison or under house arrest has an infinite deterrence value. However, people do not *act* as if they infinitely disvalue the risk of getting put into prison or placed under house arrest for an antitrust offense. If they did, they would never try to form a cartel because this would put them at risk of going to prison. Rather, potential offenders act as if they tolerate the risk of prison to some extent. Perhaps they calculate, implicitly, on the basis of legal

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victims or alleged victims of antitrust violations. *Id.*

123 There are three additional types of monetary costs that we have not been able to quantify. First, antitrust suits are costly to defend. The amounts antitrust defendants pay in attorneys' fees usually are confidential, however, and we know of no way to systematically estimate them. One could assume they are equal in size to the plaintiffs' attorneys' fees, which are matters of public record in class action cases, and then include them in the calculations. We do not know, however, whether this would be a close approximation. Second, antitrust suits cause corporate disruption and wasted time for the corporate executives involved. We know of no method to evaluate this type of corporate loss. Third, an antitrust conviction could harm a company's reputation and cost it business, and could decrease an individual's future income and lower their reputation and social status. We know of no way, however, to quantify such losses. In addition, society must pay to incarcerate people. We believe this cost is relatively small.

Regardless, our decision to triple the $2 million "cost" of a year in prison should more than cover adjustments that should be made for these factors.

124 Note the important difference in these two baselines: corporate actors might demand a different sum to risk prison than they would be willing to pay to avoid the risk of prison. For example, suppose someone would rather pay a $6 million fine than be imprisoned for a year. How would that person react to the question of whether they would accept $6 million in return to going to prison for a year? They might not agree to this deal. Part of the difference is the relative wealth of the actor in the two situations. A corporate actor could in theory demand an unlimited amount to accept the risk of prison, and any such payment increases his or her wealth. But the same person cannot pay an unlimited amount to avoid the risk of prison; she can only spend as much money as she has or can borrow. *See* David Cohen & Jack L. Knetsch, *Judicial Choice and Disparities Between Measures of Economic Values*, *in* CHOICES, VALUES, AND FRAMES 424, 428 (Daniel Kahneman & Amos Tversky eds., 2000).

But there is another element at play here as well. Empirical evidence shows that people's attitude toward costs and benefits depend on their perception of the status quo. *Id.* at 428–29. A person who accepts prison as the status quo may be willing to pay less to avoid it than a person who sees prison as a deviation from the status quo. A corollary is that, depending on the odds and stakes, people value avoiding losses—and are willing to take risks to do so—far more than they value gains, which they generally will not take risks to do (although, oddly, this principle may vary depending on the odds of the risk and the size of the gain or loss). *See* Daniel Kahneman & Amos Tversky, *Choices, Values, and Frames*, *in* CHOICES, VALUES, AND FRAMES, *supra* at 1, 35–36. This psychological phenomenon—and others—greatly complicates an economic analysis of behavior. So, for example, a corporate actor who perceives herself as taking steps that violate the antitrust law to return to the status quo (perhaps because she thinks her corporation is suffering from unfair competition) may be far more tolerant of risk than the same corporate actor who contemplates the same measure as a means of obtaining a perceived economic advantage. Even for a single corporate actor, then, there may be no single correct amount that represents her willingness to trade off between gain for her corporation and the risk of prison for herself.

advice and what they have heard from other executives, their apparent chances of getting caught and convicted, and the prison sentence, house arrest, or fine they are likely to face, at least to some very rough degree.[125] They then balance this chance of a penalty and its likely size, again in an extremely rough way, against the rewards of cartelization. In any case, we know that often they decide to form cartels. We know they often make this decision because cartelists surely know cartels are illegal, yet the number of cartels caught in recent years has been quite significant and does not seem to be decreasing.[126]

Since the disutility of prison time is not infinite, in theory we can approximate its value, though to do so in practice is, of course, difficult and speculative. There is no one objective way to compare the deterrence effect of time spent in prison to the deterrence effect of a criminal fine because different people would trade off prison versus fines in different ways. Any "average" figure used to equate the two is necessarily imprecise and arbitrary.

The valuation of custodial time is similar to one that, regrettably, society often must undertake for any number of public policy purposes. Sometimes even a life must be valued finitely. For example, our nation cannot afford perfect safety, nor would we want every automobile to be built as safely as technically possible.[127] Similarly, even though a life is beyond value and society does not want people to drive negligently, courts do not award infinite damages for the loss of life in car crashes.

We present five different approaches to the issue of how to evaluate the cost or value of time in prison.[128] We expect that considering the use of multiple approaches will increase the reliability of our results.

The first approach is to ascertain the valuations of lives and years of life used for various regulatory, public policy purposes.[129] In the United States, lives typically are valued at between $3 million and $10 million by federal government agencies when they set, for example, transportation or environmental policy.[130] Some of these studies are especially appropriate for our purposes because they place average values on a year of life. They generally calculate figures of $300,000 to $500,000 per person per year of life (depending upon a number of variables).[131]

Second, lower figures on average, from $1.4 million to $3.8 million for a life, are awarded under tort law, in wrongful death cases.[132]

Third, following the September 11th tragedy, Congress created the September 11th Victim

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125 As noted earlier, direct or indirect payments of fines or rewards for imprisonment by their employers might sometimes also be a factor. *See supra* note 99 and accompanying text.

126 *See supra* note 54.

127 If society did this, it would be forced to accept increased risks from other sources (i.e., society cannot afford perfect safety).

128 These presented approaches have been adapted from Lande & Davis, *supra* note 42, at 14–19.

129 For a concise essay on economic methods for evaluating "statistical lives," see Thomas C. Schelling, *Value of Life*, *in* 4 THE NEW PALGRAVE: A DICTIONARY OF ECONOMICS 793–96 (John Eatwell et al. eds., 1987).

130 *See* Joseph E. Aldy & W. Kip Viscusi, *Adjusting the Value of a Statistical Life for Age and Cohort Effects*, 90 REV. OF ECON. & STAT. 573 (2008). Recently, the Department of Transportation has used $5.8 million for the value of a life. Memorandum from Tyler D. Duvall, Assistant Sec'y for Transp. Policy, and D. J. Gribbin, Gen. Counsel, to Secretarial Officers & Modal Adm'rs (Feb. 5, 2008), *available at* http://ostpxweb.ost.dot.gov/policy/reports/080205.htm. The Environmental Protection Agency currently uses $6.9 million. *All Things Considered: Value on Life 11 Percent Lower Than 5 Years Ago* (NPR radio broadcast July 11, 2008), *available at* http://www.npr.org/templates/story/story.php?storyId=92470116.

131 *See* Aldy & Viscusi, *supra* note 130. For example, values typically decline with age, and we note that most price fixers are mature businessmen. *Id.*

132 *See* Mark A. Cohen & Ted R. Miller, *"Willingness to Award" Nonmonetary Damages and the Implied Value of Life from Jury Awards*, 23 INT'L REV. L. & ECON. 165, 166, 179 (2003) (calculations made in 1995 dollars).

Compensation Fund to award compensation to victims' families.[133] The Fund's payments constitute a prominent recent reflection of the monetary value our society places on innocent human life, even though these payouts were made under unique circumstances. The Fund's average award for a life was $2,937,861, the median award was $1,677,632, the maximum award was $7,100,000, and the minimum award was $250,000.[134] Significantly for our purposes, many of the September 11 victims had been quite affluent. Eighty-nine of the victims had annual incomes between $500,000 and $1,000,000 per year (their estates were given average awards of $4,749,654), and eight victims' annual income exceeded $4,000,000 per year (their estates were given average awards of $6,379,287).[135] Although we do not know the average or typical pre-conviction annual incomes of imprisoned price fixers, we would not be surprised if the latter income levels are comparable.

A disadvantage of these first three approaches is that they address the cost or disutility of lost lives, not time spent in prison. It is likely that most people would view the prospect of spending a year in prison as not as bad as losing a year of life; after all, many prisoners with no chance at parole still resist the death penalty. Thus, the first three approaches may be regarded as an upper bound on the disutility of a year in prison.

A fourth method for approximating the disvalue of incarceration comes from examining the compensation provided to defendants who have been wrongly imprisoned. Sometimes people are wrongly imprisoned by, for example, perjured government testimony.[136] The victims potentially can recover for a variety of torts depending upon the jurisdiction.[137] Often no award will be given for imprisonment due to a simple, albeit tragic, error; some type of intentional act, malice, or malfeasance typically is required.[138] The highest payment we found for a case involving at least a year of prison was $1.164 million per year, for three years of wrongful confinement for a false conviction.[139] However, when shorter imprisonments are annualized, significantly higher awards sometimes have been made.[140]

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133 *See* Air Transportation Safety and System Stabilization Act of 2001, Pub. L. No. 107-42, 115 Stat. 230 (codified at 49 U.S.C. § 40101 (2006)) [hereinafter "the Act"]. We are grateful to Thomas Weaver for his research involving the September 11th Victim Compensation Fund.

134 1 KENNETH R. FEINBERG ET AL., FINAL REPORT OF THE SPECIAL MASTER FOR THE SEPTEMBER 11TH VICTIMS COMPENSATION FUND OF 2001, at 110 tbl.12 (2001), *available at* http://www.justice.gov/final_report.pdf.

135 *Id.* at 97 tbl.6.

136 *See* Limone v. United States, 497 F. Supp. 2d 143, 152 (D. Mass. 2007) (stating the FBI was aware chief witness would perjure himself); *see also* Newsome v. McCabe 319 F.3d 301, 304–05 (7th Cir. 2003) (stating the officers induced eyewitnesses to falsely identify plaintiff); Bravo v. Giblin, No. B125242, 2002 WL 31547001 (Cal. Ct. App. Dec. 18, 2002) (unpublished) (stating the investigating officer fabricated evidence).

The authors are grateful to Thomas Weaver for locating and analyzing these cases, and for performing research on this subject. *See* Thomas Weaver, *The Part That Counts: Wrongful Incarceration Awards and the Value of Human Life* (May 1, 2011) (unpublished manuscript) (on file with the authors).

137 These torts include wrongful imprisonment, wrongful conviction, wrongful confinement, malicious prosecution, abuse of process, intentional or negligent infliction of emotional distress, false arrest, or an unconstitutional depravation of their civil rights. *See* Weaver, *supra* note 136.

138 *See, e.g.*, cases cited *supra* note 108.

139 *Bravo*, 2002 WL 31547001, at *24. The suit, filed under 42 U.S.C. § 1983, yielded "damages in the amount of $221,976 for his economic losses, $3,537,000 to compensate him for 1179 days of incarceration at the rate of $3000 per day, and $1 million to compensate him for emotional distress suffered between the date of the incident and the date of his sentencing." *Id.* We arrived at the award per year of imprisonment of $1,164,515.62 in this case by the following steps (1) multiplying $3,000 a day by 365.25 days to arrive at $1,095,750; (2) the lost earnings of $221,976, divided by 1179 days in prison comes to $188.27 per day, and when multiplied by 365.25 days, adds another $68,765.62 per year. The total award per year of imprisonment thus comes to $1,164,515.62.

140 The extreme case was *Ramirez v. County of Los Angeles*, 397 F. Supp. 2d 1208, 1215 (C.D. Cal. 2005) (noting

We should note that we have not been able to ascertain any of the falsely imprisoned defendants' incomes, but we suspect most had relatively low incomes, and none appears to have been a corporate executive or upper class professional.[141] It is possible that a jury or judge would award a corporate executive wrongfully imprisoned for price fixing a larger-than-average amount for their suffering. Alternatively, a jury might react in the opposite direction. A jury might be less sympathetic to imprisoned upper class corporate executives. Still, these results do tend to show that compensation in the neighborhood of $1 million per year appears generally to be the practical maximum that society is willing to award for a year wrongfully spent in prison.

Our fifth and final approach is to examine estimates of the disvalue of prison time made by reputable scholars. We have been able to find only two estimates for an antitrust offense that seem plausible in this context.[142] First, an Article by Professors Howard P. Marvel and others equated a year in prison for price fixing to approximately $600,000 in 2010 dollars.[143] Second, a study by Professor Kenneth Glenn Dau-Schmidt and others equated a year in prison for price fixing with a fine of approximately $1.5 million in 2010 dollars.[144] These figures are higher than the national average valuations for a year of life noted earlier, perhaps because price fixers are wealthier on average and can afford to disvalue prison time much more than most people can, or perhaps because price fixers' time is more valuable on average.[145]

These five approaches yield estimates that are broadly consistent with one another. To be

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that the investigating officer fabricated evidence). *See* Rob McKay, *Verdict of the Week: US Dist. Ct., Los Angeles*, VERDICTSEARCH, Mar. 13, 2006, at 21, *available at* http://www.kkcomcon.com/doc/Ramirez%20v%20LAPD.VS.pdf (reporting that a ten month sentence led to a $9 million settlement, or an annual rate of $10,800,000). Because the emotional stress and discomfort could be disproportionately high for the very fact of the government malfeasance, or greater for the beginning of a prison sentence, it is unclear whether the award would have been increased proportionately if the victim had been imprisoned for a year, or for multiple years. As noted, in these cases, moreover, it is difficult to segregate the amounts awarded for false imprisonment from the amounts awarded for one-time events or other torts. "Where the period of incarceration is shorter (e.g., less than one year), proportionately larger awards (measured by annualizing the award) have been rendered, presumably reflecting Limone's observation that the injury from incarceration may be more intense towards the beginning." Smith v. City of Oakland, 538 F. Supp. 2d 1217, 1242 (N.D. Cal. 2008); *see also* John Collins Coffee, Jr., *Corporate Crime and Punishment: A Non-Chicago View of the Economics of Criminal Sanctions*, 17 AM. CRIM. L. REV. 419, 431 (1980) ("[T]he declining marginal utility of imprisonment means that each increment of incarceration increases the perceived penalty by a less than proportionate amount. Or, reduced to its simplest terms, a two-year prison term is not twice as bad as a one-year term.").

141 *See* Lande & Davis, *supra* note 42.

142 We have found one other estimate, but it seems to value prison time at a level too low to apply to white-collar criminals. *See* Tonja Jacobi & Gwendolyn Carroll, *Acknowledging Guilt: Forcing Self-Identification in Post-Conviction DNA Testing*, 102 NW. U. L. REV. 263, 283 & n.52 (2008) (estimating value of prison at approximately $200 per day, which amounts to slightly more than $70,000 per year).

143 *See* Howard P. Marvel et al., *Price Fixing and Civil Damages: An Economic Analysis*, 40 STAN. L. REV. 561, 573 (1988). The authors equated a year in prison with a $373,000 fine. The Article appeared in the February 1988 issue, so we assume they were using 1987 dollars. The Bureau of Labor Statistics Consumer Price Index inflation calculator equates $373,000 in 1987 to approximately $677,000 in 2011. *See CPI Inflation Calculator*, BUREAU OF LABOR STATISTICS, http://www.bls.gov/data/inflation_calculator.htm (last visited Sept. 2, 2012).

144 Joseph C. Gallo et al., *Criminal Penalties Under the Sherman Act: A Study of Law and Economics*, *in* 16 RESEARCH IN LAW AND ECONOMICS 25 (Richard O. Zerbe, Jr. ed., 1994). Gallo's Article equated a year in jail with a fine of $1 million. The Bureau of Labor Statistics Consumer Price Index inflation calculator equates $1 million in 1994 with $1,486,000 in 2011. *CPI Inflation Calculator*, *supra* note 143. The authors, however, used 1982 data for much of their paper's analysis. If they meant their valuation of a year in jail to be expressed in 1982 dollars, their $1 million estimate would be the equivalent of approximately $2,282,000 in 2011. *Id.*

145 Whether the time or the life of a price fixer is more, or less, valuable than that of an average person is an interesting philosophical question this Article will not explore.

conservative, we have taken the highest of these estimates, $1.5 million per year, and increased it to $2 million (in 2010 dollars). We note that $2 million is as much as the lower estimates for the value of an entire human life that were discussed earlier, and is much higher than the average annual national values of life.

As discussed earlier, penalties directed against individuals might well have more deterrence effect than penalties directed against the corporations. To attempt to take this into account, and in an attempt to be conservative in our analysis,[146] we have trebled the deterrence effect of every individual penalty before adding them to the corporate penalties. This means we will use $6 million (in 2010 dollars) for the deterrence value of a year in prison.[147] We also will treble the individual fines paid in antitrust cases before we add these figures to the corporate fines, restitution payments, and payouts in private damages cases.[148] And, although we believe we should use a much lower value for house arrest than for prison time (such as $1 million or $3 million per year) for simplicity of calculations and to be conservative we will value a year of house arrest at $6 million, as well.

III. CARTEL HARMS: THE "NET HARMS TO OTHERS" FROM CARTELS

The standard optimal deterrence formula shows that the total amount of cartel sanctions should equal the cartel's "net harm to others" divided by the probability of detection and proof of the violation.[149] The "net harm to others" from a cartel includes not only its overcharges, but also the allocative inefficiency[150] produced by its exercise of market power. The allocative inefficiency from cartel pricing should be added to their overcharges to get a true measure of cartels' "net harms to others."

In theory, each of these parameters should be an expectation that has been individualized for the cartel in question. For each potential cartelist we would ascertain what each thought their expected profits from cartelization were likely to be,[151] what their chances of getting caught and convicted were, and the total disvalue to them of the sanctions they thought would be imposed. This calculus would be made with due regard for how much each prospective cartel manager was risk-averse or risk-seeking.[152] As a practical matter, of course, ascertaining these required figures is impossible. The

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146 See also the factors listed in notes 124–125, *supra*. The incremental $4 million per year should more than compensate for these factors as well.

147 We note that valuing a year's worth of life at $6 million would mean that a twenty year prison sentence would be disvalued at $120 million, a figure far in excess of the amount society places on an individual's life.

We will use the $6 million valuation, in 2011 dollars, for the deterrence produced by a year spent in prison for price fixing even if that imprisonment occurred years ago.

We recomputed our analysis using different values for time spent in prison, such as $12 million per year, but this made no significant difference in our results. See *infra* note 278, which shows that only valuing a year in prison in the range of $1 billion would make a significant difference in our results.

148 This assumes that price fixers actually pay their own fines. It is, however, difficult to determine whether antitrust fines imposed on corporate employees ultimately are paid by the employees, or are often or usually directly or indirectly paid by their employer. *See supra* note 99.

149 *See supra* notes 42–50 and accompanying text.

150 *See supra* note 50 and accompanying text. Ideally the overcharges also should be adjusted upwards for the umbrella effects of market power. *Id.* Ideally the costs imposed on taxpayers for the government to investigate and prosecute and for courts to try cartels, and the costs to the public of incarceration, also would be included since they, too, are "net harms to others" from cartels. We do not, however, have information as to how large these omitted factors are.

151 Their expected cartel profits, moreover, would be a distribution of outcomes with assigned probabilities.

152 Another factor would be the opinion of each cartel manager as to their co-conspirators. Do they believe their

best we can do is to calculate what each figure actually has been on average in the past, and to assume that this figure is likely to be close to what the managers of potential cartels believe is likely to happen in the future. This is, of course, a highly imperfect exercise. Nevertheless, it is more likely to allow us to calculate whether cartel penalties have been set at the optimal level than any other approach we can devise.

A. *Cartel Overcharges*

In an earlier Article, we developed and presented a very different survey approach. We comprehensively and systematically examined cartel overcharges by assembling two data sets. The first consisted of scholarly publications containing cartel overcharges. With very few exceptions, we attempted to analyze every scholarly study that contained quantitative information on the price effects of private cartels.[153] We separately categorized domestic and international cartels from different time periods to determine whether the increased penalties of recent years have been having significant effects. Our second data source was obtained by examining every final verdict in U.S. collusion cases that we were able to find.[154] We searched for antitrust cases in which a neutral finder of fact reported collusive overcharges in percentage terms or presented conclusions that could be converted into an overcharge percentage.

Our most recent compilation from scholarly publications found 1,517 useful estimates of cartel overcharges or undercharges in more than 200 publications that analyzed cartels that operated in 381 markets.[155] Table 2 displays the medians of all average overcharges reported over time.[156] The median cartel overcharge for all types and time periods (in a data set that includes a significant number of zeros) is 23.3%.[157] There is no strong trend in the cartel markups for all types over time. Indeed, the median since 2000 is virtually the same, 22.5%. But if one examines the international cartels separately, it is noteworthy that the median over time has been higher than for national cartels (30.0% and 17.2%, respectively), but thanks to a downward trend the international and national medians since 2000 have been similar (25.8% and 20.0%, respectively).[158] The mean overcharge figures have averaged 49%, much higher than the median figures due to the presence of some extremely large overcharges in the sample.

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co-conspirators are likely to turn them in under various circumstances?

153 *See* Connor & Lande, *supra* note 42.

154 *Id.* at 555–57.

155 *See* JOHN M. CONNOR, GLOBAL PRICE FIXING (2d ed. 2007).

156 *See infra* Appendix tbl.2. We choose to show the median overcharge percentages rather than the mean overcharge percentages because a few very high overcharges in any particular category can overwhelm a mean calculated using the larger number of low-to-medium percentage overcharges.

Another interesting statistic concerns the low number of overcharges by unsuccessful cartels. Only about 7% of the data we collected indicated that a cartel episode was unsuccessful in controlling prices significantly. We did, of course, include these observations in the median calculations that appear in Table 3, *infra*.

157 Cartel overcharges might not be passed on to the next level of distribution at the same percentage rate. An overcharge of 23.3% by a manufacturer cartel could pass through several levels in the distribution chain and result in a final consumer overcharge of more than, or less than, 23.3%.

158 It is difficult to know what to make of the downward trends in profitability for most types of cartels. The influence of the spread of, and increase in, effective anticartel enforcement is perhaps the most obvious explanation. The downward trend in overcharges among cartels that were caught by antitrust authorities tends to support the idea that cartelists find it increasingly difficult to hide their activities. Alternatively, the greater antitrust scrutiny in the United States from the 1940s and from Europe since the 1960s could prompt cartelists to refrain from full monopoly pricing increases so as to reduce their chances of detection.

Our search for verdicts in cartel cases proved to be extremely difficult,[159] however, because overcharges are not calculated in criminal enforcement against cartels[160] and because almost every private antitrust suit for damages settles[161] or is dismissed before an overcharge can be calculated by a neutral observer and made part of the public record of the case.

As a consequence, final verdicts involving cartels where a judge, jury, or commission[162] calculated an overcharge[163] are rare, and we found a disappointingly small sample size of cases—twenty-five—to analyze. However, our sample is roughly as large as the sizes of the prior surveys we report in Table 1 (which were 5–7, 12, 12, 13, 22, and 38 in number, respectively). Nevertheless, due to its small size, its results should be interpreted with caution. The results of this verdict analysis are that the twenty-five collusion episodes had a median average overcharge of 22%, and a mean overcharge of 31%.[164]

Thus, our two data sets yield median cartel overcharges of approximately 25% and 22% overall. The mean results were 49% for the economic studies and 31% for the verdicts.[165] For the economic studies' post-2000 sample, the national and international cartel median overcharges averaged 20% and 25.8%.[166] These figures will prove extremely useful when we formulate our policy recommendations in this Article's Conclusion. Part V of this Article, however, which will carry out the optimal deterrence calculations according to the standard approach, will use the actual amount overcharged by each individual cartel.

B. *The Allocative Inefficiency Effects of Market Power*

The "net harms to others" from cartels also include their allocative inefficiency effects (oftentimes called the deadweight welfare loss, or DWL).[167] Unfortunately, we do not know for very many cartels either how large their allocative inefficiency harms are or the relative size of a cartel's allocative inefficiency compared to its overcharges. We instead will select a representative ratio or range that is based on economic theory and constants derived from the empirical literature on cartels and monopolies. Then, we will add the DWL to the cartel's overcharges when we implement the optimal deterrence calculations.

As an example of how adding this factor into the optimal deterrence calculations could make a difference, Judge Easterbrook, in an early paper on this topic, assumed that allocative inefficiency

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159 We looked for cases by the use of computer-assisted searches of databases, searching through a large number of articles and treatises on cartels and on antitrust damages, and asking groups of knowledgeable antitrust professionals for any examples they knew of that might contain useful information. *See* Connor & Lande, *supra* note 42, at 555–56.

160 Price fixing is illegal regardless whether, or the extent to which, defendant affected prices, because the agreement to fix prices is illegal. For this reason the amount that prices changed, or even whether prices were affected at all, is not calculated in a criminal antitrust case. *Id.* at 551.

161 *Id.* For a discussion of settlement in this context, and why settlement amounts are likely to be an extremely unreliable guide as to the size of the underlying cases' overcharges, see *id*.

162 Connor & Lande, *supra* note 42, at 551–52.

163 Moreover, many verdicts were only expressed in dollar amounts which we were unable to translate into percentages, so we reluctantly had to omit these cases. *Id.* at 556.

164 *Id.*

165 *See id.* at 561. The mean figures are significantly higher than the median figures due to the effects of extremely high overcharges.

166 *Id.* at 541.

167 For a definition of the allocative inefficiency effects of market power, see *supra* note 50.

effects are 50% as large as overcharges on average.[168] If Judge Easterbrook was correct, this would mean that under the "net harm to others" standard, every $100 in overcharges would be presumed to be accompanied by another $50 in allocative inefficiency harm.

We located a modest number of technically impressive empirical studies specifically about cartels that provide both overcharges and DWL estimates. Sølgard computes a DWL/overcharge range of from 37% to 48% for a Norwegian cement cartel,[169] and Monke et al. find a 25% ratio for a Portuguese flour cartel.[170] Gallo et al. provide a comprehensive analysis of U.S. DOJ cartel cases; they illustrate the DWL issue using a 5.3% ratio, but their choice of parameters is not well explained.[171] Needless to say, these studies form too small a sample from which to generalize. In addition, there are many empirical studies of this issue that are concerned with market power in general, not specifically with market power resulting from cartels,[172] and one very interesting ratio calculated by the Canadian enforcement authorities in a merger case.[173]

Another way to determine the ratio is through the use of economic theory and logic. Many textbooks do what Judge Easterbrook did and draw diagrams that imply a ratio of 50%, but these

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168 *See* Easterbrook, *supra* note 51, at 455. From a theoretical standpoint, 50% is in fact the *maximum* possible percentage given a linear demand curve.

169 Lars Sølgard, Chief Economist, Norwegian Competition Authority, Speech at Seminar Hosted by the Norwegian Competition Authority: Cartel Investigations in Norway (Feb. 22, 2007), *available at* http://www.konkurransetilsynet.no/iKnowBase/Content/425749/070222_LARS_SORGARD.PDF. Four companies were convicted and heavily fined in Norway for fixing the prices of corrugated cardboard paper from 1983 to 1990. *Id.* The decision was sustained on appeal to the Supreme Court of Norway. *Id.* The chief economist of the Competition Authority favorably cites an expert opinion (apparently relied upon by the Court) that the overcharge was 70–80 million NOK and the deadweight loss was 30–40 million NOK. *Id.* Thus, the ratio was from 1.75:1 to 2.67:1.

170 Erik A. Monke et al., *Welfare Effects of a Processing Cartel: Flour Milling in Portugal*, 35 ECON. DEV. & CULTURAL CHANGE 393, 406 (1987). A careful study of total welfare effects of a government-supported cartel found that the ratio of transfer to deadweight losses was 3.6:1. *Id.* at 405 (18,456 million PTE in consumer transfers and 5150 million PTE in deadweight losses).

171 Gallo et al., *supra* note 144, at 25–71.

172 *See* John M. Connor & Everett E. Peterson, *New Estimates of Welfare Losses Due to Imperfect Competition in U.S. Food Manufacturing*, *in* AGRICULTURAL MARKETS: MECHANISMS, FAILURES, REGULATIONS 205 (David Martimort ed., 1996). The authors conclude that ten published empirical studies of the food manufacturing industries—employing a variety of data sets and methods of analysis—found that the DWL/transfer ratio was 2.5% on average but varied from 0.7% to 36%. *Id.* at 226 tbl.4. Retail food demand elasticities tend to be lower (−0.3 to −0.7) than elasticities seen in cartelized industries. *Id.* Five models based on price-leadership behavior averaged a relatively low 11% ratio. *Id.* However, these studies mostly include industries with implicit collusion and some unilateral market power. *Id.*

F. M. SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 667–78 (3d ed.1990), evaluates several empirical estimates of the relative sizes of the deadweight loss (0.5 to 2.0% of GNP) and transfer effects (probably at the lower end of the range of 3 to 12%) due to the exercise of market power in the whole U.S. economy in the 1950s to 1970s. Economy-wide analyses tend to produce lower welfare losses than do disaggregated industry studies, but the effect on the ratio of interest is uncertain. *Id.* at 664. Despite the many caveats expressed by Scherer and Ross about these numbers, we interpret the average DWL/transfer ratio to be roughly 28%. The lowest ratio is perhaps about 8% and the highest 36%. However, these studies include many industries with implicit collusion and some unilateral market power. *See id.*

173 *See* Alan A. Fisher, Robert H. Lande & Stephen F. Ross, *Legalizing Merger to Monopoly and Higher Prices: The Canadian Competition Tribunal Gets It Wrong*, 15 ANTITRUST MAG., no. 1, Fall 2000, at 71, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1358448. The Canadian Competition Tribunal predicted that a proposed propane merger would raise prices by 8%, which came to $43 million, and also produce another $3 million in allocative inefficiency losses (a 7% ratio).

usually are heuristic illustrations not intended to be realistic representations of markets.[174] However, economic theory produces a formula for calculating this ratio. The DWL/transfer ratio is the long-run, own-price elasticity of demand (at the collusive price) multiplied by the overcharge ratio, all of which is divided by two.[175] That is, DWL is a high share of the income transfer when the overcharge is high, and the elasticity is an absolutely large number.

Theory provides some rough guides to appropriate elasticities. We know that the elasticity of demand for products that have been cartelized is generally elastic (less than −1).[176] Following Posner's lead, a good range to consider initially is −1.0 to −2.0.[177] But we can do better by considering cartel and monopoly studies analyzing good data with the most advanced techniques.[178] We will highlight one monopoly and five cartel studies.

In the first cartel example, Posner calculates the DWL ratio for the first episode (1929–1931) of the global nitrogen fertilizer cartel to be 31%.[179] Second, the heavily studied Joint Economic Committee Eastern U.S. railway cartel yields DWL ratios of 26%.[180] Third, a well regarded study of the U.S. cane sugar cartel of 1890–1914 implies a DWL ratio of 12% to 13%.[181] Fourth, a 1923–1968 Norwegian cement cartel has a DWL ratio of 19%.[182] Fifth, an excellent dynamic simulation model of the U.S. lysine cartel suggests a DWL ratio of 21% to 27%.[183] In sum, five leading studies of effective cartels find that the elasticities are between −0.95 and −1.64 for effective cartels, as expected, and that the DWL ratios of 12% to 31% are strongly positively related to the overcharge rate. Finally, an impressive examination of the Alcoa U.S. aluminum monopoly during 1923–1940 concludes that demand elasticity was −2.1 and that the DWL was 62% to 66% of the income

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174 *See, e.g.*, SCHERER & ROSS, *supra* note 172, at 662.

175 *See* Richard A. Posner, *The Social Costs of Monopoly and Regulation*, 83 J. POLIT. ECON. 807, 816 (1975) [hereinafter Posner, *Social Costs*]. The overcharge ratio is the change in market price due to an increase in market power divided by a benchmark or but-for price. *Id.* Posner considers two types of price elasticities, one for linear demand and one for constant demand (a concave demand curve). *Id.* Constant-demand curves are most appropriate for highly differentiated products, not for the typical homogeneous products that are cartelized. Thus, we adopt the linear-demand-elasticity assumption herein. We also assume that unit costs are constant over the relevant range of output.

176 James L. Smith, *Inscrutable OPEC? Behavioral Tests of the Cartel Hypothesis*, 26 ENERGY J. 51, 53 (2005) ("[E]stimated demand elasticities numerically below −1 would constitute evidence not inconsistent with the cartel hypothesis.").

177 Posner, *Social Costs*, *supra* note 175.

178 Economists have generated thousands of empirical estimates of demand that have reliable demand elasticities. *See, e.g.*, Craig A. Gallet, *The Demand for Alcohol: A Meta-Analysis of Elasticities*, 51 AUSTRAL. J. AGRIC. & RES. ECON. 121 (2007) (compiling 132 high-quality published studies of the demand for alcoholic beverages). However, there are very few papers that contain both calculated overcharges and elasticities.

179 Posner, *Social Costs*, *supra* note 175, at 820. The overcharge was 75% and the elasticity was 1.45. *Id.*

180 Glenn Ellison, *Theories of Cartel Stability and the Joint Economic Committee*, 25 RAND J. ECON. 37, 51 tbl.7 (1994) (finding an overcharge of 50.8% and elasticity of −1.59 using Model 3).

181 David Genesove & Wallace P. Mullin, *Testing Static Oligopoly Models: Conduct and Cost in the Sugar Industry, 1890–1914*, 29 RAND J. ECON. 355, 367 (1998) (computing an average annual overcharge of 13.4% and elasticity of −2.03 to −2.24 during high season; during the five most effective years, 1893–1897, the overcharge was 31.0%, implying a DWL ratio of 24% to 27%).

182 Lars-Hendrik Röller & Frode Steen, *On the Workings of a Cartel: Evidence from the Norwegian Cement Industry*, 96 AM. ECON. REV. 321, 322 (2006) (finding an overcharge of 34.5% and an elasticity of −1.47).

183 Nicolas de Roos, *Examining Models of Collusion: The Market for Lysine*, 24 INT'L. J. INDUS. ORG. 1083, 1103 (2006) (estimating an overcharge of 61.5%, and the author favors a manager's subjective notion of elasticity of −1.1 to −1.4).

transfer.[184] The aluminum example illustrates a general finding of the cartel literature: cartels aim at achieving true monopoly power, but typically, they must settle for a weaker degree of market power.

To arrive at a reasonable DWL ratio for contemporary private cartels, we will use a 45% mean average overcharge[185] and combine it with the aforementioned −0.95 and −1.64 elasticity of demand range.[186] These parameters result in a DWL ratio of 6% to 20%.[187] Using the median overcharge of 22%[188] instead, the DWL ratio range is reduced to 3% to 10%. Combined, these alternative calculations produce range extremes from 3% to 20%.[189] That is, the allocative inefficiency associated with cartelization is between $3 and $20 for every $100 in cartel overcharges, and the "net harm to others" will be $103 to $120. Therefore, we will assume that for every $100 in cartel overcharges, there is between $3 and $20 in accompanying allocative inefficiency effects.

C. *Umbrella Effects of Supracompetitive Pricing*

When a cartel raises prices, the relevant market sometimes contains a non-colluding fringe of smaller firms that are able to raise prices due to the higher overall market price set by the cartel. Since the fringe firms did not participate in the collusion, they did not violate any law and so cannot be fined or sued successfully in a private case. Nevertheless, these "umbrella effects" are another "net harm to others" from the cartel. If a cartel raised prices by $90 million, for example, and caused the non-colluding fringe to raise prices by $10 million, the "net harm to others" from the cartel should rise to $100 million. Where this data is available, our optimal deterrence calculation takes this into account.

However, this factor might not be significant empirically, and it is likely to be difficult to ascertain, even approximately. There certainly have been powerful, if short-lived, cartels with significantly less than a 100% market share. For example, the citric acid cartel only had 60% of global production; for vitamin B1 the increase in Chinese production led to a cartel market share decline from 70% to 52%; for European industrial tubes the cartel had 75% to 85% of the market.[190] We believe, however, that effective cartels with low market shares for long periods are not common.

Including this factor explicitly in the optimal deterrence calculations could also lead to other complications. First, we cannot be sure the fringe raised prices to the same extent as the cartel. Perhaps some or all of the fringe firms decided to price somewhat lower than the cartel and thereby gain market share. Second, sometimes reports about cartel cases are not careful about market definition, and many—perhaps most—cartel cases do not contain precise market definition findings by a court. This applies both to consent orders in criminal cases and to private settlements. For this

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184 Valerie Y. Suslow, *Estimating Monopoly Behavior with Competitive Recycling: An Application to Alcoa*, 17 RAND J. ECON. 389 (1986) (computing an overcharge of 150% and an elasticity of −2.0 to −2.1).

185 In addition to the material in this Section, this figure is based upon Connor and Lande, *supra* note 42, at 559. The literature studies' mean was 49% and the mean of verdicts was 31%. The mean for the seventy-five cartels in our study was 60.3%. *Id.*

186 *See* John M. Connor, *Price Fixing Overcharges: Revised 2nd Edition* (Working Paper Apr. 27, 2010) *available at* http://ssrn.com/abstract=1610262 (expanding and updating the study in Connor & Lande, *supra* note 42; Table 7 shows that the mean overcharge for all cartels is 46%, including many with zero price effects).

187 Applying the formula, we have $1/2 \times 0.45$, which is then multiplied by 1.0 or 1.65.

188 In addition to the material in this section, this overcharge percentage is based upon Connor and Lande, *supra* note 42, at 515. The literature studies' mean was 25%, and the mean of verdicts was 22%. The median for the seventy-five cartels in our study was 20%. *Id.*

189 This is a conservative resolution of the issues.

190 Iwan Bos & Joseph E. Harrington, Jr., *Endogenous Cartel Formation with Heterogeneous Firms*, 41 RAND J. ECON. 92, 92–93 (2010).

reason it can be difficult to be sure which sales of non-colluding firms truly were in the same product and geographic market as the cartel. Moreover, as a practical matter almost every parameter in a consent order or private case, including market definition, is subject to a negotiation and potential compromise. No doubt, many reported cartel market shares are accurate, but there surely are other times where the size of reported relevant markets have been negotiated down or misdefined.

Although we are tempted to consider this factor in the optimal deterrence calculations through the use of an especially broad range of possible values, instead we will simply take note of this issue. We will not attempt to estimate how large cartels' umbrella effects are empirically or to take them into account in our optimal deterrence calculations.

IV. THE PROBABILITY OF CARTEL DETECTION AND PROOF OF COLLUSION

Optimal deterrence theory is concerned with the expectations of the founders of cartels as to whether any cartel they are considering forming will be detected and, if detected, proven in court to have violated the antitrust laws.[191] These individuals' predictions are formed by a variety of factors, including the perceptions and historical experience of the individuals themselves, their firms, their legal and financial advisors, and their observations of others in comparable potential price-fixing situations.[192] Since it is impossible to know the actual expectations of the "average" would-be cartelist, we instead use the closest approximations we can find: the actual record of how often cartels are detected and, once detected, proven in court to be illegal.

A. *Cartel Detection*

The first question—how likely is it that a cartel will be discovered—has been answered by researchers using three basic types of methodologies. The first is based upon quantitative economic studies. The original and most famous of these was by Bryant and Eckard.[193] They estimated the confidence interval for cartels' probability of detection (*p*) to be 13% to 17%. Their data set consists of companies convicted for domestic U.S. price fixing during 1961–1988. This study is widely cited by scholars[194] and is approvingly cited by at least eight subsequent writers on antitrust enforcement who made their own detection estimates.[195]

Two subsequent empirical studies replicated Bryant and Eckard's approach.[196] Golub et al. sampled convicted U.S. price fixers for a period after 1988; their estimated range for *p* is identical

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191 This subsection is based upon John M. Connor, Deterrence Power of Penalties on International Cartels (Aug. 6, 2009) (unpublished study) (on file with authors).

192 Case evidence supports the view that potential conspirators are adept at predicting the quarterly or annual profits from an effective cartel, though they might have uncertainty about the scheme's longevity. *Id.* at 9.

193 Peter G. Bryant & E. Woodrow Eckard Jr., *Price Fixing: The Probability of Getting Caught*, 73 REV. ECON. & STAT. 531 (1991). Like all similar studies, *p* is computed from samples of discovered cartels. Founders of never-discovered cartels might rationally conjecture a lower *p*. Thus, computed sizes of *p* may well overstate the actual average *p* for all cartels.

194 A Google Scholar search on February 9, 2011, found fifty citations.

195 *See infra* Appendix tbl.3.

196 All three use essentially the same method—an event study of stock market prices—to estimate a statistically calculated 90% confidence interval of the probability of cartel detection (*p*). However, the three apply that method to three different samples from two jurisdictions.

with that of Bryant and Eckard.[197] Their sample includes some international cartels and a period that overlaps with the revised DOJ leniency program. Combe et al. also apply the Bryant and Eckard method of analysis to a sample of firms that were fined for infringing E.U. price-fixing prohibitions.[198] All of these convictions involved international cartels (some of them intra-E.U.), but only a small share of these infringements occurred during the time that the European Commission (EC) had adopted a formal leniency program.[199] In sum, all three studies—using different data sets—point to a probability of detection in the 13% to 17% range. The stability of *p* across differing time periods and jurisdictions is impressive.

Bryant and Eckard published their study in 1991, prior to the 1993 advent of the DOJ's wildly successful cartel leniency/amnesty programs which have in some form been adopted by more than twenty jurisdictions, including the European Union (EU).[200] The vast increase in *numbers* of cartels detected since 1993 could be due to an increase in the probability that cartels are detected. In a highly original paper, Miller provided an economic estimate of the post-1993 increase in the probability that cartels will be detected by the DOJ.[201] His sample consisted of all cartels discovered and convicted by the DOJ between January 1985 and March 2005. Comparing the pattern of pre-1993 cartel enforcement with the post-1993 period, he estimates that there was an increase of about 60% in the detection of existing cartels and a reduction of about 60% in the rate of cartel formation.[202] A possible limitation of Miller's study is that, in his sample, only 9% of the observations were international cartels.[203] Nevertheless, if one applies Miller's findings to the earlier three detection-probability studies, the post-1993 range for the probability of cartel detection becomes 20.8% to 27.2%.

A completely different method of estimating the probability that cartels are detected relies on the opinions of cartel scholars. Most have legal training or write in legal-economic publications.[204] Many have prosecutorial experience; others have worked extensively with alleged cartel defendants.[205] Those who have provided specific estimates are listed in Table 3.[206] The opinions and conclusions of these twenty-five authors predominantly suggest a 10% to 25% chance of detection,

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197 Alla Golub et al., *The Profitability of Price Fixing: Have Stronger Antitrust Sanctions Deterred?*, (2005) (presented before the International Industrial Organization Conference 3, Atlanta, Ga. (Apr. 8–9, 2005)), *available at* http://ssrn.com/abstract=1188515.

198 Emmanuel Combe et al., *Cartels: The Probability of Getting Caught in the European Union* (Bruges Eur. Econ. Res. Papers, Working Paper No. 12, 2008), *available at* http://ssrn.com/abstract=1015061.

199 Their point estimate of *p* is close to 13%.

200 *See* Scott D. Hammond, Deputy Assistant Att'y Gen. for Criminal Enforcement, Antitrust Div., U.S. Dep't of Justice, Address Before the 24th Annual National Institute on White Collar Crime: The Evolution of Criminal Antitrust Enforcement over the Last Twenty Years (Feb. 25, 2010), *available at* http://www.justice.gov/atr/public/speeches/255515.htm.

201 Nathan H. Miller, *Strategic Leniency and Cartel Enforcement*, 99 AM. ECON. REV. 750 (2009).

202 *Id.* at 760–61.

203 As we understand these results, both changes are simultaneous after 1993. To illustrate, suppose that there are 100 cartels being formed that affect the U.S. economy each year in the years before 1993. With a known median life of seven years and no enforcement, the total stock of prosecutable cartels would reach a steady state of 700 cartels. With discovery of 15%, then a net formation of 85 lasting seven years would imply discoveries of 15 per year and a stock of 600 hidden cartels. Then, using Miller's results, with amnesty the number formations drops to 40 per year or 280 total cartels, of which about 70 are discovered per year and 210 are hidden in any given year. Thus, deterrence improves (fewer net formation and fewer hidden cartels), and detection rates per year also rise.

204 *See infra* Appendix tbl.3.

205 *See id.*

206 *See infra* Appendix tbl.3.

although some go as high as 33%.[207]

It is clear that some of these estimates are meant to be purely illustrative,[208] while others are from surveys or are intended to be true depictions of reality.[209] The three writings that are clearly illustrative average 29%.[210] If one takes the non-illustrative estimates and eliminates those that depend on Bryant and Eckard, the remainder are independent estimates. For the ten independent estimates that are not purely illustrative, the upper-end estimates average 25.6%, which is comfortably close to the economists' 27% high estimate.[211]

There is yet another way to estimate the average detection probability—opinion surveys. Although these surveys might not ask precisely the questions that are best for our purposes, they too suggest low cartel detection rates. For example, in the survey by Feinberg of antitrust lawyers working in Brussels, only 5% disagreed with the statement, "[t]he [EC] fails to detect most [price-fixing] violations," whereas 62% agreed with the statement.[212] A large-scale 2006 survey of competition lawyers working in the United Kingdom (UK) and Brussels asked how many times one of their clients had, upon seeking legal advice, abandoned or changed a possible cartel practice because the clients feared an antitrust investigation, and how many of their clients had been the subjects of an adverse cartel ruling by the UK's Office of Fair Trade. The result was that 22% were said to have been in violation of cartel laws.[213] This is, of course, a minimal indicator of detection because some participants in secret cartels do not seek legal advice.

Professor Daniel Sokol recently conducted another very interesting survey.[214] He asked a sample of 234 antitrust lawyers,

> In the past 2 years, by total number of matters, how often have clients come to you with hard-core cartel issues that to your and/or their knowledge never got investigated by U.S. government (federal and state) enforcers as opposed to situations where the underlying behavior ultimately led to U.S. investigation of your client?

If the "Not Applicable" responses are eliminated, 52% of the lawyers said this had happened to them at least once.[215]

All told the above methods yield estimates for *p*: 1) 20.8% to 27.2%, 2) 25.6%, and 3) non-quantifiable but low estimates that are roughly consistent with the first two estimates. In the interest of being conservative, for the remainder of this Article we adopt a relatively high 25% to 30% probability that cartels will be detected.[216]

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207 *See id.*

208 *See* Landes, *supra* note 43, at 656.

209 *E.g.*, Alan R. Beckenstein & H. Landis Gabel, *Antitrust Compliance: Results of a Survey of Legal Opinion*, 51 ANTITRUST L.J. 459 (1982).

210 *See* POSNER, *supra* note 93, at 47; Landes, *supra* note 43; Werden, *supra* note 48, at 27–29.

211 *See infra* Appendix tbl.3.

212 Robert M. Feinberg, *The Enforcement and Effects of European Antitrust Policy: A Survey of Legal Opinion*, 23 J. COMMON MKT. STUD. 373 (1985). Other interesting results were: 1) 95% agreed that price fixing was intentional and for profit gain, and 2) 100% agreed that the greatest deterrents are a high probability of detection and high EU fines. *Id.*

213 DELOITTE & TOUCHE LLP, THE DETERRENT EFFECT OF COMPETITION ENFORCEMENT BY THE OFT (2007), *available at* http://www.oft.gov.uk/shared_oft/reports/Evaluating-OFTs-work/oft962.pdf.

214 *See* Sokol, *supra* note 56.

215 *See id.* at 239 tbl.14.

216 We believe our methodology has been overly conservative and that the actual chances a cartel will be detected are lower than 25–30%. As an indication of how conservative our methodology is, Ginsburg and Wright recently performed an analysis very similar to ours, including analyzing both the Bryant and Eckard, as well as the Miller

B. *Probability a Detected Cartel Will Be Convicted*

Even if a cartel is detected, its chances of being convicted are less than 100%. The DOJ asserts that in 95% of its cases, indictments end in convictions.[217] Indeed, the evidence is so damning in most cases that nearly all defendants negotiate a guilty plea.[218] On the other hand, when accused individual price fixers choose to litigate a criminal price-fixing case, the government wins only approximately half the time.[219] Thus, discovered cartelists that are able to afford the best legal defense team and are adept at hiding or obfuscating the most incriminating evidence might well judge their chances of conviction to be less than the DOJ's 95% figure.[220]

From 2005 to 2009, of the 87 individuals charged with international price fixing, 64 pled guilty and 4 were found guilty.[221] On the other hand, 7 were acquitted, 11 became fugitives, and 1 indictment was dismissed.[222] Therefore, in total, from 2005–2009, 68 of 87 (78%) were convicted. For the entire 1990–2009 period the corresponding figure is 158 of 222 (71%).[223] Therefore, a high estimate of how often detected cartelists escape conviction would be the 22% to 28% who were not convicted in DOJ proceedings.

However, some or all of the non-convicted defendants could have been innocent. Others could have been guilty, but perhaps the DOJ simply could not prove their guilt sufficiently to meet the high standards for felony convictions. There is no way to know how many of those who were not convicted actually formed a cartel, and that this cartel was detected, but they nevertheless got away with their crime. At a minimum, however, we believe we can fairly make a presumption concerning the fugitives from prosecution. A total of 11 of the 87 defendants from 2005–2009, and 47 of the 222 from 1990–2009, were fugitives.[224] We believe it is reasonable to presume that it is more likely that a fugitive is a price fixer who fled, rather than an innocent person who could not prove their innocence.[225] Therefore, on this basis there is (using data from the two time periods) a 47/222 = 21%, or 11/87 = 13%, chance that detected price fixers will get away with their crime.[226]

By contrast, the DOJ reports that from 2005–2009 they won 124 cases against corporate and individual defendants, mostly through plea agreements, and lost seven.[227] This is a 95% success rate;

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studies, and concluded that 25% was their best estimate as to the rate of cartel detection. *See* Ginsburg & Wright, *supra* note 53, at 8.

217 *See* WORKLOAD STATISTICS 1990–1999, *supra* note 118, at 13; WORKLOAD STATISTICS 2000–2009, *supra* note 118, at 13.

218 Connor, *supra* note 42, at 328.

219 *Id.* (finding that only fifteen of twenty-eight indicted individuals were convicted).

220 *See id.*

221 *See* Connor, *supra* note 42, at 539 tbl. 3. The Antitrust Division's official statistics, reported *supra* note 53, cannot, however, be used to derive comparable won/lost ratios for domestic cases. For the 1990–2009 federal fiscal years, we can determine that there were 929 individuals indicted for Sherman Act section 1 criminal offenses; of those, 57% were fined, 38% were imprisoned, and 28% were subject to other forms of confinement. But these three types of sanctions are not additive. While nearly all those who were imprisoned were also fined, we cannot determine what proportion of those fined were also imprisoned or otherwise confined. Therefore, the DOJ does not trumpet the number of fugitives.

222 *Id.*

223 *Id.*

224 *Id.*

225 Innocent people sometimes flee. This is why one can only presume that fugitives actually fixed prices.

226 These figures and ratios are for individuals, not for corporations, and most of our sanctions are corporate, not individual. We will, however, assume that the conviction rates for individuals apply to corporations, as well.

227 *Id.*

much higher than their 77% success rate for the same period when prosecuting individuals. Does this mean that the corporations are significantly more likely to be convicted than individuals? Yes, if one counts any corporate fine at all as a government "success." However, we cannot help but wonder whether every DOJ "win" is truly a win. Almost all of the DOJ "wins" are plea agreements or consent orders. No doubt, many corporate or individual defendants simply agree to a "slap on the wrist" consent order rather than endure the significant legal expenses and corporate disruption involved in taking the DOJ to court. No doubt many of the token DOJ "wins," which secured only minimal fines and no prison time, were really defendant victories. Ideally we would find and use in our calculations the percentage of detected cartels that not only were convicted, but that also received significant sanctions. Unfortunately, there is no way to tell which of DOJ's alleged "wins" are truly wins, and which ones mostly, in reality, should instead be categorized as being DOJ losses.[228]

It seems likely, however, that individuals are less likely to plead guilty even to a token fine than are corporations. Corporations might readily agree to a "slap on the wrist" fine as part of a settlement with the DOJ because to them small fines are almost like parking tickets, and some large corporations receive similar "costs of doing business" frequently.[229] Moreover, corporate managers are paying fines with other people's (i.e., the stockholders') money. As a matter of ethics they would deny this makes a difference, but unless the corporate officer owns a large share of a company's stock, the principle/agent literature suggests he or she is more likely to let personal motives affect what is best for the owners.[230] By contrast, an individual has more to lose and may be more risk-averse. If an individual admits to a felony, even one resulting only in a small fine, their personal record has been stained, perhaps with dramatic results for the person involved. For these reasons, individuals are, on average, more likely to resist than a large corporation. If we are correct, the DOJ's conviction rate for individuals is a better reflection of the DOJ's real won/lost record than the corporate statistics.

We also believe that the DOJ's 95% conviction rate indicates that the Antitrust Division is risk-averse, and usually indicts only when it has a relatively large chance of conviction in the event an alleged price fixer insists on a trial. There are a number of times, for example, when the DOJ began a cartel investigation, but never filed an indictment, yet private plaintiffs secured a significant settlement against these same corporations.[231]

To be conservative, however, we will base our final conviction estimate on the statistics for individual convictions, and assume that 23% to 28% (high estimate) or 20% to 23% (low estimate) of detected cartels are not convicted. In our final calculations we will round these numbers slightly downwards, to 20%.[232] Note that the probability of a cartel being detected (25% to 30%) *and*

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228 Perhaps one should draw a very low arbitrary line, such as making the assumption that any DOJ fine (and private settlement, as well) for less than 1% of the volume of commerce involved was "really" a defendant victory. Or perhaps one should classify these settlements into groups, such as 0–1% of affected commerce, 1–3%, 3–6%, etc., and then we could argue over the point at which the settlements are likely to be genuine victories.

229 There are exceptions, of course. Corporate felony convictions can bar a firm from bidding for federal contracts for a number of years, and this could be a major blow to firms that depend on such sales for a significant portion of their revenues.

230 This topic, also studied under the titles "managerial capitalism" or "managerial utility," is reviewed by Alan Hughes, *Managerial Capitalism*, *in* 3 THE NEW PALGRAVE: A DICTIONARY OF ECONOMICS 293–95 (John Eatwell et al. eds., 1987).

231 *See, e.g.*, *In re* Automotive Refinishing Paint Antitrust Litig., 177 F. Supp. 2d 1378 (E.D. Pa. 2001); Robert H. Lande & Joshua P. Davis, *Benefits from Antitrust Private Antitrust Enforcement: An Analysis of Forty Cases*, 42 U.S.F. L. Rev. 879 (2008), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1090661 (noting government investigation, but no government case filed; private recovery of $106 million in cash).

232 We believe that the 20% estimate (which means that 80% of detected price fixers are convicted) substantially understates the probability that detected individuals or corporations will escape conviction. However, the only

convicted (80%) then becomes 20% to 24% (depending on whether low or high estimates are used).

V. THE OPTIMAL DETERRENCE CALCULATIONS

As noted in Part I, under the optimal deterrence approach, cartel sanctions should be equal to:

Net harms to others ÷ (Probability of detection × Probability of conviction)

We have been able to ascertain approximations for each of the required quantities for seventy-five cartels that have been sanctioned in the United States since 1990.[233] We illustrate how we carried out the optimal deterrence analysis and calculations using the lysine cartel as an example.

A. *The Lysine Cartel as an Example*

1. Background on the Lysine Cartel

The lysine cartel was one of the earliest large international cartels to be heavily sanctioned in multiple ways.[234] It dated back to mid-1992. The U.S. Department of Justice began an investigation in late 1992 that culminated in a June 27, 1995 raid, where more than seventy FBI agents simultaneously raided the headquarters of Archer-Daniels-Midland Company (ADM) and a number of ADM officers' homes.[235] Within a very short time, investigators had also raided the offices of four other companies that manufactured or imported lysine.

During this cartel's existence the average manufacturers' delivered price of lysine in the United States rose from $0.68 per pound to a plateau of $0.98 (October to December 1992), fell again to $0.65 (May 1993), and rose quickly again to above $1.00 for most of the remainder of the conspiracy period.[236] Early in this cartel's existence an ADM Vice President was caught on tape saying that their recently concluded agreement would generate $200 million in joint profits annually in a global market for lysine that generated from $500–700 million in annual sales.[237] His prediction turned out

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reliable data on this point we have been able to find concerns the fugitives, so we do not feel comfortable assuming, for example, that only 50% of detected cartels are convicted.

We also note that DOJ's risk aversion and the fact that many of their wins are only token victories probably mean that the 20% figure we selected probably underestimates the percentage of detected cartels that truly escape punishment for their crime.

233 Although we started with a larger universe of cartels, we were forced to eliminate many from our sample because the necessary data was not available, was insufficiently reliable, or some legal actions were unresolved. Every one of our final group is an international cartel. Although we are unable to state with certainty that all of the assembled data on these seventy-five cartels are perfect and complete in every respect, we believe all of it to be generally reliable and accurate. As an example of its potential inadequacy, although we looked diligently for settlements in private cases and believe we found every significant settlement, there surely have been settlements that we missed, especially secret settlements and opt-out settlements too small to have made the legal, general or trade press. By contrast, class action settlements usually cannot be secret and almost always are reported in the legal, general, or trade press.

234 *See* Connor, *supra* note 84. As will be apparent from the Conclusions, *infra*, the lysine cartel was one for which actual sanctions were relatively close to the optimum.

235 This Article's analysis of the lysine case is based upon John M. Connor, *Global Cartels Redux: The Lysine Antitrust Litigation*, *in* THE ANTITRUST REVOLUTION 300, 300 (John E. Kwoka, Jr. & Lawrence J. White eds., 5th ed. 2009).

236 *Id.* at 12.

237 *Id.* at 13.

to be astonishingly accurate.[238]

Ultimately the lysine cartelists pled guilty, and in late 1996 incurred U.S. fines that totaled $95.55 million.[239] The DOJ also prosecuted four lysine executives in a highly publicized jury trial held in Chicago in the summer of 1998.[240] Three of the four were found guilty and were heavily sentenced, to a total of ninety-nine months in prison.[241] The fourth defendant, a managing director of Ajinomoto of Japan, remains a fugitive.[242]

Within a year of the FBI raids, more than forty civil antitrust suits were filed in U.S. federal courts.[243] Approximately 400 plaintiffs were certified as a single federal class of direct purchasers, and in July 1996, the federal class in *Amino Acid Lysine Antitrust Litigation* settled with the three largest defendants for $45 million.[244] The two other defendants settled for almost $5 million about a year later.[245] There also were significant numbers of indirect purchaser suits and opt-out suits which have been very difficult to trace, but these payments have been estimated to total more than $25 million, and to produce total payments in the U.S. private suits of approximately $82.5 million.[246]

2. Optimal Fine Calculations for the Lysine Cartel

What should the overall level of sanctions have been, ex-ante, for the Lysine cartel?[247] Before one could calculate this using the "net harm to others" approach, however, it is necessary to account for inflation or the time value (opportunity cost[248]) of money.[249] Because we are attempting to determine how much purchasers were harmed by paying supra-competitive prices for their products or services, we should analyze the opportunity cost issue from the victims' perspective and attempt to place the victims in the position in which they would have been had no violation occurred. Adjusting

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238 *Id.*

239 *Id.* This includes $94.3 million in corporate fines and $1.25 million in individual fines, which we tripled to give more weight to individual sanctions relative to corporate sanctions. For a discussion of this tripling, see *supra* Part II.

240 Connor, *supra* note 235, at 1.

241 *Id.* The cartel also was fined by the antitrust authorities of Canada, Mexico, and the European Union a total of at least another $121.5 million. *Id.* at 2.

242 *Id.* at 2.

243 *Id.*

244 *Id.* The settlement was approved in late 1996, before the federal fines were announced, which is very unusual. *Id.*

245 *Id.*

246 *Id.*

247 This number is only illustrative because society must as a practical matter focus upon general deterrence, not specific deterrence. We could never hope to know the mindsets of particular corporate executives well enough to calculate the penalty that optimally would prevent those individuals from cartelizing, the most we can do is to calculate a good overall, general deterrence penalty and then implement it generally. For an analysis of these issues, see *supra* Part I.

248 "Opportunity cost" is a fundamental economic concept positing that the value of any economic choice actually made is approximately equal to the next best alternative course of action not taken. For example, the value of an afternoon's leisure to an individual might be approximated by the income foregone in employment. Similarly, the cost of consuming for a household today might be the future income from investing the same amount in some financial instrument.

249 Neither fines nor payments made in private cases contain prejudgment interest. However, once a private case results in a verdict or a court-approved settlement, post-judgment interest begins to accrue. *See* Lande, *supra* note 45.

for the time value of money can raise the amounts involved significantly, especially when there is a long lag between the collusive period and fine or the court approval of a settlement.

It is impossible to know what would have happened to the overcharges had the violation not occurred. Consumer-victims or business-victims might have invested the overcharges they were forced to pay to the cartel in, for example, Treasury bills. Alternatively, suppose a victim had been harmed and believed it would recover from defendant in *X* years. A reasonable course of action for that victim might be to obtain an *X* year loan for the amount of the damages at the prevailing consumer loan or business loan interest rates, both of which would exceed the prime interest rate. Moreover, since the overcharges were involuntary (and illegal!), it would be fair to resolve doubts over the correct adjustment rate in favor of the victims. The members of the cartel, by contrast, might have invested the overcharges instead.

A conservative approach to these issues consistent with principles of financial economics is to approximate the opportunity cost to the victims of being deprived of their money for a period of time by using the prime rate of interest plus one percent.[250] For simplicity, we will use as our initial year the midpoint year of the cartel,[251] and as the fine year the year in which the first corporate defendant plead guilty.[252] The terminal year for settlements in private suits is the year in which the federal class settlement or other private case receives preliminary judicial approval.[253] Although this approach is perhaps too low and thus too conservative from the "net harm to others" perspective, it does have the advantage of approximating the value of the overcharges to the cartelists, who of course continue to have use of the victims' money interest-free until they pay their fines or damages in private suits. After the net present value of the fines or settlements is calculated, we adjust the value of money, due to general inflation, to the year 2010, employing the annual Producer Price Index calculated by the U.S. Bureau of Labor.[254] Expressing all penalties in 2010 dollars permits us to make meaningful comparisons across conspiracies and punishments that took place at different times.

If we restrict all data and calculations to the United States, for the lysine cartel the optimal penalty ((net harms to others) ÷ (probability of detection × probability of proof)) can be calculated as follows:

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250 The prime rate of interest includes a component that anticipates what lenders expect inflation to be over the loan period. Another portion of the prime rate is an average low-risk rate of return to be earned by borrowers. The one percent is added to account for the fact that borrowers expect to earn profits on the investment above a low-risk investment rate of return.

251 This approximates the mean date that buyers' funds were transferred to the owners of the cartels. If we had the data we would instead assess the magnitude of the cartel overcharges on a yearly basis, and would separately take into account the date of each of the imposed fines and settlements with each cartelist, and make the adjustments accordingly. This would be slightly more accurate because cartels do not overcharge the same percentage every year, and because some fines and some settlements—particularly opt-out settlements—take place years later. As a practical matter, however, we rarely have the necessary information. We do, however, have good information concerning the starting and ending dates for all seventy-five cartels in our sample.

Normally, overt collusion stops on the date subpoenas are served or inspections are carried out by an antitrust authority. In some cases collusion may have stopped years earlier. Other times the firms continue implicit collusion even after the explicit collusion is uncovered and the formal (proven) collusion ends.

252 This too is conservative, for two reasons. In some cartel cases the late-pleading participants take a year or two to plead after the first defendant does so. Second, defendants increasingly pay their fines in up to six installments spread over five years. Thus, by using the initial fine date we are over-inflating the effect of fines to some extent. But this assumption makes the calculations simpler.

253 This date is conservative because in many instances there are opt-outs from the primary class, and opt-out suits typically take months or years to negotiate beyond the class approval date.

254 *See CPI Inflation Calculator*, *supra* note 143. We use the Producer Price Index for intermediate materials, rather than the Consumer Price Index, because most cartelized products are inputs sold to manufacturers. If we had used the Consumer Price Index, however, the results would be similar.

- The net harms to U.S. direct purchasers were $80 million, expressed in 1993–1995 dollars.[255] To apply the "net harm" or investment-opportunity-cost adjustment, we use Federal Reserve Bank prime rates of interest for the years 1995 and 1996, plus 1%, or 12.22%. Thus, the damages were $80 million,[256] which is the sum that the victims ought to have received when the cartel operated, and is equivalent to $119.8 million in 2010 dollars.
- These overcharge figures should be multiplied by 1.03 to 1.20 to account for the additional allocative inefficiency harms (deadweight loss) of market power.[257]
- The average probability of cartel detection, the evidence shows, is 25% to 30%.[258]
- The average probability the enforcers will be able to prove that the cartel violated the law has been estimated to be 80%.[259]

Therefore, for the Lysine cartel, the optimal U.S. penalty (in millions of 2010 dollars) was:

($119.8 × 1.03) ÷ (0.30 × 0.80) (low estimate)
or
($119.8 × 1.20) ÷ (0.25 × 0.80) (high estimate)

= $514–719

The optimal penalty should be compared to the actual U.S. sanctions that were imposed on the Lysine cartel. When expressed in terms of millions of 2010 dollars they were:

$114	Fines (converting $98.55 million in fines in 1996–2010 dollars)
+ 99	Private Suits (converting $82.5 million in recoveries in 1996–2010 dollars)[260]
+ 50	Prison-Equivalent for ninety-nine months of U.S. prison time at $500,000 per month[261]
$263	Total Sanctions

Thus, even though the lysine cartel was heavily sanctioned in the United States in three ways (by

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255 *See* Connor, *supra* note 235, at 302.

256 The actual overcharge amount is $80 million. To this should be added foregone profit of $9.8 million which should have accrued between the dates of the actual overcharges and 1996. Another way of looking at the $9.8 million is that it represents income to the cartelists on the $80 million in illegal monopoly profits held in the companies' treasuries. By rights, this income belonged to the victims all along. This total of $89.8 million is the figure that we convert to 2010 dollars.

257 For an explanation of the allocative inefficiency adjustment, see *supra* Part III.B.

258 *See supra* Part IV.A.

259 *See supra* Part IV.B. Another issue concerns the distinction between "technical" convictions and "real" convictions. Some of DOJ's reported convictions may be technical convictions that amounted only to "slaps on the wrist" and produced only token fines. Perhaps, we should have attempted to find and use in our calculations the percentage of detected cartels that not only were convicted, but that also received significant sanctions. Because of the subjectivity of classifying fines this way, we did not, however, attempt to make this distinction.

260 Only the first settlement was in 1996, but to be conservative we assumed that all of the payments in every private case were made in 1996.

We of course can only count settlements known to us through our searches of the legal and general media. We readily acknowledge the existence of secret settlements, especially involving opt-out cases. However, every class action must be approved by a court, so no class action settlement can be secret. Publicly traded corporations often are required to report significant income or losses on their balance sheets and cannot, for example, simply state in its annual report that it paid or received a significant, but secret, sum in an antitrust case. Still, we surely missed some settlements.

261 For the analysis of the monetary equivalent of prison sentences, see *supra* Part II.

fines, prison for top executives, and by private litigation), the combination of the sanctions that were imposed is only 37% to 51%[262] as large as the overall amount of sanctions that should have been imposed from the perspective of optimal deterrence.

B. *Calculating Overall Optimal Deterrence Using Every Cartel in Our Sample*

We have undertaken the same analysis for all seventy-five cartels for which we have been able to ascertain the necessary data.[263] The overall results show that, on average, the value of the imposed U.S. sanctions has been much less than they should have been for society to obtain optimal deterrence against cartelization. If mean average figures are used, the total value of the imposed sanctions were only 15.8% to 20.8% of their optimal level. If median figures are used, the imposed sanctions averaged only 9.2% to 12.1% of optimality.[264]

One outlier, E-Rate Federal Internet Program, may have been sanctioned more than the optimal amount (our results show 125% to 175% of optimality).[265] A second cartel, PVC Windows Coverings, was probably optimally sanctioned (we estimate 88% to 124%). The other seventy-three were sanctioned much less than optimally. Moreover, half of the seventy-five were sanctioned less than 10% of the optimal amount. It certainly is possible that some of the individual firms in the seventy-five cartels were optimally or excessively sanctioned due to circumstances unique to those firms.[266] From a deterrence perspective, however, would-be cartelists are unlikely to focus upon

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[262] Depending upon when and how the figures involved are rounded, this range could also be expressed as 37% to 49%.

[263] Data employed and calculations are available at http://www.cardozolawreview.com/content/34-2/Connor.Lande.34.2/AntitrustStudyRawData.pdf.

[264] These results might, moreover, be too high for a methodological reason we have not yet discussed: for a variety of reasons, many of our sales figures might be overly small. The correct sales data would tend to lower the calculated ratios. This is because affected sales figures derived from seemingly reliable sources often are larger than the sum of the affected sales employed by the DOJ in sentencing the members of cartels. There may be quite defensible reasons for this. For example, because of the high degree of reliability of evidence needed to convict corporations for crimes, the DOJ may reduce the time periods, geographic region, or scope of products employed for calculating sales during collusion to that which can be proven "beyond a reasonable doubt." On the other hand, prosecutors sometimes may uncritically accept arguments made by defendants that diminish the scope of the affected market because of time pressures in settling guilty plea agreements, or because the government lacks the resources necessary to disprove defendant assertions.

An example is the *Central Indiana Ready-Mix Concrete* case. *In re* Ready-Mixed Concrete Antitrust Litig., 261 F.R.D. 154 (S.D. Ind. 2009). Concrete for pouring is a relatively simple product; the counties involved and the time period were not issues in the case. A sales figure of $680 million for all seven firms involved in the cartel was reported in the local press; all seven paid civil settlements. The sales information purportedly came from transcripts of a jury trial of two executives (they were convicted) and from the testimony of the plaintiffs' class expert in fairness hearings (plaintiffs prevailed). Sales according to DOJ documents were much less. One participant was granted amnesty; two others were not charged, most likely because of cooperation agreements. The DOJ used a smaller geographic market definition than for civil plaintiffs. When one adds up the affected sales from the DOJ sentencing memoranda for the four companies that were criminally convicted of price fixing through plea agreements, the total is $391 million. Taking into account the fact that two of the smallest cartel members were not convicted because of bankruptcies, the DOJ's total market affected sales is as much as 40% lower than the affected sales proven by the private litigants. *See* E-mail from John Connor to Scott Gilchrist, Attorney, Cohen & Malad, LLP (Aug. 24, 2011, 10:25 AM) (on file with author).

[265] This cartel was unusual for many reasons, including its record-breaking number of incarcerations. Moreover, because the affected sales of several school-district bids are unavailable, we believe that the total affected sales is significantly underestimated.

[266] Even if individual firms appear to have been sanctioned more than the amount calculated under the overall

outliers rather than the norm. They are much more likely to be guided by what happened on average to the vast majority of cartels that affected the roughly $1 trillion in affected sales (about $2 trillion in 2010 dollars) in the cases covered by our study.[267]

Our analysis is confined to effects within the United States. For each cartel, only United States overcharges, sales, corporate and individual fines, restitution payments, prison and house arrest time, and payouts in private cases were considered. For some of these cartels, particularly the more recent ones, the European Commission's fines have been as large as or larger than those in the United States.[268] If managers were assessing whether to form an international cartel, their probable overcharges in Europe, as well as the E.U.'s sanctions, should, of course, have been considered in addition to those imposed by the United States. It is indeed unfortunate that, regardless what they might conclude about the expected profitability of operating in Europe or elsewhere, the combined level of U.S. sanctions are woefully inadequate to deter them from operating in the United States.

Recent developments have not negated the policy import of our results. For example, criminal fines and prison sentences have risen since the mid-2004 Antitrust Criminal Penalty Enhancement and Reform Act (ACPERA) amendment went into effect.[269] A GAO report on ACPERA shows that total criminal fines have risen by 51%, on average, and total jail time by 56% since ACPERA went into effect.[270] But these increases could well be explained by higher affected sales of cartels that colluded after 2004. Moreover, the GAO data refers to fines corrected for inflation on all cartels, both international and domestic, with fiscal years 2005–2010 being compared to 1994–2003. However, for international cartels over a comparable period we find that even though real fines did increase, real settlements and the value of prison declined so much that penalties per cartel declined by 38%.[271]

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optimal deterrence approach, this could have been due to a number of factors that make the sanctions not excessive. Fundamentally, every firm in a cartel is jointly responsible for entirety of the cartel's overcharges. For this reason, it would be reasonable to attribute the entirety of a cartel's overcharges to an individual cartel member before carrying out the optimal deterrence calculations (although we have not done this in this Article). Only if this were done and the optimal deterrence calculations showed that the sanctions were excessive could there be true over-deterrence.

Moreover, the alleged over-deterrence could result from a cartel not producing profits as high as its instigators had hoped. Perhaps if the cartel had been as profitable as its planners had hoped, the overall penalty level might have been too low. Further, we used reported or provable affected sales in our calculations. As noted *supra*, note 262, reported or provable sales often are lower than the true amounts.

As we noted in Part I, the overall level of sanctions cannot be set, in advance, for particular individuals or corporations. The best we can do is to set the overall sanctions level for mean or median cartels, not for the outliers.

267 One interesting factor that helped drive these conclusions is the relatively small effect of prison sentences. Their mean value per case was a relatively modest $13.6 million, or 17% of the average fine (the median is zero because for the majority of the cartels in the sample (forty-eight out of seventy-five) there was no imprisonment). *See supra* note 259. Even though we valued the deterrence from a three-year sentence at $18 million (which is more than most estimates of the value of an entire life), this pales in comparison to the possible rewards from cartelization. *See supra* note 147. Nevertheless, the absence of a criminal sanction correlates with an exceedingly small overall sanction. Almost all of the fifteen cartels with actual sanctions that were less than 2% of optimal penalties had no criminal sanctions imposed. *See supra* Part IV.B. The absence of a criminal conviction means that the private sanctions cannot come close to providing optimal sanctions. By contrast, the E-Rate cartel case involved 626 months worth of prison, which constituted 85% of the sanctions in that case. For this data, see the online appendix, *Antitrust Study Raw Data*, at http://www.cardozolawreview.com/content/34-2/Connor.Lande.34.2/AntitrustStudyRawData.pdf.

268 *See* John M. Connor, *Has the European Commission Become More Severe in Punishing Cartels? Effects of the 2006 Guidelines*, 32 EUR. COMPETITION. L. REV. 27 (2011).

269 *See supra* note 30.

270 *See* U.S. GOV'T ACCOUNTABILITY OFFICE, CRIMINAL CARTEL ENFORCEMENT: STAKEHOLDER VIEWS ON IMPACT OF 2004 ANTITRUST REFORM ARE MIXED, BUT SUPPORT WHISTLEBLOWER PROTECTION 21–22, 24 (2011), *available at* http://www.gao.gov/products/GAO-11-619.

271 *See id.* at 59–62.

The explanation for this overall decline is that private settlements are, on average, the largest sanction in terms of the magnitude of their deterrence effects.

CONCLUSIONS

> If three is the wrong number, it is too small.
>
> – *Judge Frank Easterbrook*[272]

The primary goal of this Article has been to determine whether the overall level of U.S. anti-cartel sanctions is optimal. This Article demonstrates that when the deterrence effects of every measurable sanction are considered (including corporate and individual fines, payments in private cases, restitution payments, and an allowance for incarceration), the overall level of anti-cartel sanctions is far too low. To protect victims optimally, the collective level of existing sanctions should be multiplied by a factor of five. Specifically, we find that on average the total value of imposed sanctions have been only 9% to 21% as large as they should have been.[273] In other words, only if, on average, cartel sanctions were approximately five times as large as they are today, and if these higher amounts were imposed by the courts on price fixers,[274] would consumers be optimally protected from becoming cartel victims.

To arrive at this conclusion we made many assumptions and estimates. As noted throughout this Article, we believe that every time we made necessary assumptions and estimates we chose alternatives that were conservative (i.e., they would tend to increase the relative size of the imposed sanctions relative to their optimal level).[275] Similarly, as noted, we have attempted to ascertain every relevant piece of data for every cartel in our study as accurately as possible.[276] Nevertheless, even if some of our assumptions or estimates are off, or if some of our cartel data is inaccurate, our conclusion that sanctions should be increased at least fivefold is quite robust. It is unlikely to be wrong by very much. It is very unlikely that the overall existing level of sanctions only should be doubled.[277]

One of our controversial assumptions was to value the deterrence effects of a year in prison or under house arrest as the equivalent of a $6 million sanction. We readily admit this figure is arbitrary and that reasonable people could select a different amount. Although we believe $6 million is more

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272 *See* Easterbrook, *supra* note 30, at 95.

273 If mean figures are used, the total value of the imposed sanctions has been only 15% to 21% of the optimal level. If median figures are used, the imposed sanctions averaged only 9% to 12% of optimality.

274 It is possible, however, that some courts might find ways to avoid imposing dramatically higher sanctions. For example, courts might not want to impose prison sentences five times as high as the current ten-year maximum sentence for price fixing. As a practical matter courts might be able to find ways not to do so.

275 Similarly, to conservatively assess whether the current overall levels of sanctions are optimal, we used full or high estimates of the sizes of existing sanctions at every opportunity. By contrast, an Article dealing with related topics, Lande & Davis, *supra* note 42, made low assumptions about the recoveries from private cases, a methodology that tended to understate the magnitude of the benefits from private litigation.

276 Complications include the fact that many of the cartels at issue cover more territory than the United States, and that it is difficult to disentangle U.S. effects from transnational effects.

277 An additional factor must, moreover, be considered whenever a cartel is international in scope: Fines and private damages actions brought under the U.S. antitrust laws reflect only purchases made by buyers in the United States. *See* F. Hoffmann LaRoche Ltd. v Empigran S.A., 542 U.S. 155 (2004). If a significant percentage of the cartel's sales and profits are generated outside the United States, sanctions based solely upon what happens in the United States will result in significant under-deterrence.

than the average that a year of confinement should be valued at, one could argue that in light of how hard people try to avoid prison, how much defendants spend in legal fees to avoid prison, how wealthy many price fixers are, and how time spent in prison might lower individuals' future income and social status, we should be using a significantly higher figure.

However, even assuming a year in confinement produced the deterrence equivalent of $12 million or $24 million would not change our conclusions significantly. Even the assumption that a year of confinement produced $365 million in deterrence would not mean that existing sanctions are adequate. Only if a year of confinement were assumed to have the same deterrence value as an outlandish $4.4 billion to $6.3 billion fine would our overall conclusion change.[278] Only under this fantastic assumption could we fairly conclude that the current level of sanctions is sufficient. Under any reasonable assumption about the deterrence value of prison and house arrest, the current level of sanctions is far too low.

For our sample of seventy-five recent cartels that operated in the United States and internationally, their median overcharge was approximately 19% of their sales. We also found that they were sanctioned almost the exact same amount—a median sanction of approximately 17% of their sales. If they had been certain they would be caught, forming most cartels would have been a close call, because the benefits (19%) would have been only slightly larger than the costs (17%).

Unfortunately, the best evidence is that, historically, cartels in the United States have faced only a 20% to 24% chance of being discovered and convicted. Thus the "costs" of being punished are reduced to an expected 4% of sales, not 17%. This is an important reason why U.S. sanctions imposed on cartels would have had to have been on average five times higher to truly discourage most firms from colluding.

We found only one unusual cartel (out of seventy-five for which we could assemble the necessary information) for which the totality of sanctions was approximately optimal, and possibly somewhat supra-optimal.[279] A second cartel was probably optimally sanctioned.[280] The other seventy-three cartels, however, were suboptimally sanctioned, many substantially.

Concerns about over-deterrence are simply inappropriate. We believe that one reason there currently are so many cartels operating in the United States (and, indeed, the world) is that even though firms do not have all the specific data or analysis presented in this Article, prospective cartelists do have a rough appreciation that their chances of getting caught and convicted are relatively small, and that the penalties they would be likely to face if this happened would probably be modest. Coupling these low and uncertain probabilities with the relatively high prospects of significantly higher prices over a substantial period, many prospective cartel managers conclude that the risk is well worth taking. In other words, we believe that many or most prospective cartelists share the intuition behind the opinion voiced by Judge Easterbrook at the beginning of this section that crime pays. In the spirit of Judge Posner's battlefield imagery, the "cluster bombs" that

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278 Calculated as follows (in 2010 dollars): Total U.S. overcharges in our sample of seventy-five cases were $182 billion. To account for the allocative inefficiency effects of market power we multiplied this by 1.03 to 1.20. *See supra* Part III.B. This result ($187–218 billion) was divided by 20% to 24% (the chances of a cartel being detected and convicted). *See supra* Part IV.B. This means that our optimal sanctions goal is $779–$1090 billion.

The actual sanctions (in 2010 dollars) were $20.5 billion in settlements, plus $5.1 billion in fines, which totals approximately $26 billion. The prison and house arrest total was 2031.8 months, or 169.32 years.

The current amount of sanctions for these seventy-five cartels could be sufficient to deter collusion optimally only if the sum of $26 billion and 169.32 years in prison and under house arrest equals between $779 billion and $1090 billion in sanctions. This would occur only if each year of prison or house arrest has the sanction equivalent of $4.45–$6.28 billion.

This analysis assumes that fines and private recoveries remain unchanged.

279 *See* discussion of the E-Rate Federal Internet Program cartel *supra* Part V.B.

280 *See* discussion of the PVC Window coverings cartel *supra* Part V.B.

constitute the current anti-cartel sanctions have been duds.

A. *Effects of Results on Cartel Sanctions and Detection*

There are two general strategies for improving the deterrence power of antitrust enforcement against cartels. One could increase the sanctions. The other possibility would be to raise the probability of detection and conviction. The proposals that follow do both.[281]

Perhaps the most straightforward policy conclusion that follows from our study would be to quintuple the overall current U.S. cartel sanction levels. A modest, ultra-conservative step in the right direction would be to double the average sanction level. This would almost certainly beneficially deter collusion and thereby save victimized consumers and businesses billions of dollars per year. Nevertheless we recognize that even a decision to double existing sanctions[282] is political in nature and is almost certain to be greeted with strong opposition. This political reality has prompted us to consider alternative policy prescriptions.[283] We instead propose nine steps that perhaps might be perceived as somewhat less controversial by those convinced that the nation's antitrust traditions are wise public policy. Only the last two would require new legislation.

First, the budget of the Antitrust Division should be increased significantly and earmarked for cartel enforcement. If the Division were able to pursue more investigations, it surely would detect and prove more cartels. As part of its use of these funds, the Division would have to commit to bring more cases where they were less than certain of victory.[284]

Second, our modest and very imperfect survey of imprisoned price fixers shows it may not be unusual for a corporation to retain and even reward employees who violate the antitrust laws.[285] We found that approximately half of those who served a prison sentence for their crime subsequently found employment for their previous employer or another employer in the same industry.[286] Too often, the corporate attitude towards price-fixing felons has been that they "took a bullet for the team" and should be rewarded. Such felons ought to be stigmatized, not awarded a badge of honor. The DOJ should re-do our study and, if the problem is in fact a significant one, as part of its settlement negotiations, should require corporations never to hire people who have ever been convicted of an antitrust violation in the same industry.[287] Similarly, convicted price fixers should

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281 Some of the proposals that follow, such as numbers 5, 6, and 8, fit well into the framework of conventional optimal deterrence theory. Others, such as numbers 2, 3, 4, 7, and 9, could perhaps better be termed behavioral in nature.

282 If sanctions were doubled, this study could be re-done after a few years. Perhaps, for example, even doubled levels of sanctions would cause many of the most risk-avoiding cartel members to avoid collusion or turn in existing cartels. If the results of this future optimal deterrence study showed that the overall level of cartel deterrence had not increased to an acceptable level, the sanctions could be increased still further.

283 Some of the proposals that follow fairly could be termed "behavioral," even though this paper's overall approach has been to employ the standard optimal deterrence model. See *supra* note 59 for why this is appropriate.

284 For example, in 2010, the DOJ won forty-one cartel cases and lost only one. *See supra* note 53. The public interest probably would have been better served, however, if their budget had allowed them to bring one hundred cartel cases, even if they lost ten.

285 *See supra* notes 76–92. We repeat our caveat as to the extremely tentative nature of any conclusions based upon this survey, and urge others to perform a more rigorous analysis of this issue.

286 *See supra* note 76.

287 This proposal should be extended to prohibiting future service contracts with the former employer lest the convicted employee become an employee in the guise of a "consultant." For additional compliance related possibilities, see *Competition Law Compliance*, OFFICE OF FAIR TRADING, http://www.oft.gov.uk/OFTwork/competition-act-and-cartels/competition-law-compliance (last

agree, as part of their sentence negotiations, never to work for a firm in the same cartel again. This means that convicted price fixers will lose their jobs and be prevented from direct or indirect future employment with their employer or with other firms in the same industry, a sanction that may be very powerful indeed.[288]

Third, the Department should require convicted corporations to agree not to pay the fines incurred by their employees, directly or indirectly, or to compensate them for time spent in prison or under house arrest, directly or indirectly.[289] It is unclear how often this occurs, but it should never happen.[290]

Fourth, the Antitrust Division already has a "Wall of Shame" on its Web page—a list of every company that has paid more than $10 million in antitrust fines.[291] This should be extended to individuals for several years after their conviction. The DOJ could host, for example, a web page containing the names and photos of people given sentences of at least 6 months in prison.

Fifth, cartel fines are calculated using a formula promulgated by the U.S. Sentencing Commission.[292] The lynchpin of this formula is its estimate "that the average gain from price-fixing is 10 percent of the selling price."[293] However, in Part III.A we presented the results of two sets of data that show average cartel overcharges of 49% and 31%, and median overcharges of 25% and 22%, for the economic study and the verdict data sets, respectively.[294] A conservative, yet quite important, step the U.S. Sentencing Commission could take[295] would be to double its presumption that cartels raise prices by an average of 10%. This could increase fines substantially.

Sixth, the DOJ could change its administrative practice of awarding fine discounts from the *bottom* of the Guideline's range and start instead from the *top* of the range. We expect that this

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visited Sept. 26, 2012).

288 Some believe that the loss of one's job often can be even a more powerful sanction than imprisonment. *See supra* note 112. The DOJ should conduct its own survey as to what happens to convicted price fixers after they leave prison, a survey that would be much more rigorous than the preliminary one we were able to carry out and report in Part I.B.

289 Making this condition a standard clause in plea agreements is quite feasible and places the burden of monitoring on the employer. Corporations rarely, if ever, violate their plea agreements and, presumably, would be subject to penalties if they did so.

290 An analogous proposal that goes much further was made by Judge Ginsburg and Professor Wright. They believe negligent corporate officials should be debarred from working for any publicly traded corporation. *See* Ginsburg & Wright, *supra* note 53. Since their proposal would apply to the negligent corporate officials who should have prevented the antitrust violation, not just to those convicted of the offense, and it would bar them from employment at any publicly traded company, not just the companies that employed them when they violated the antitrust laws, their proposal would go much further than simply preventing these punished executives from returning to their former employers. It would, however, require new legislation. A much milder—and not totally dissimilar—sanction is in effect today. Firms that fix prices can be barred from bidding on contracts with the U.S. government. We believe this does not happen very often, but it could be done more frequently.

291 *Sherman Act Violations Yielding a Corporate Fine of $10 Million or More*, U.S. DEP'T OF JUSTICE, ANTITRUST DIVISION, http://www.justice.gov/atr/public/criminal/sherman10.html (last updated July 31, 2012).

292 U.S. SENTENCING GUIDELINES MANUAL § 2R1.1(d)(1) (2005).

293 *Id.* § 2R1.1 application n.3. For an explanation how this 10% presumption results in the current fine levels, see Connor & Lande, *supra* note 42, at 522–24.

294 *See supra* Part III.A (quoting Connor & Lande, *supra* note 42, at 541). For the most recent years the figures were slightly lower—the thirty post-1990 domestic U.S. observations had a mean overcharge of 26.2% and a median overcharge of 24.5%. *Id.*

295 Technically, Sentencing Commission changes to the Guidelines are subject to Congressional approval, but historically, these resolutions have been approved unanimously.

change also should result in average corporate fines that are much larger than their current levels.[296]

Seventh, the DOJ could require stricter corporate compliance programs. Some, for example, have advocated the use of corporate monitors for convicted defendants.[297] Currently, the DOJ does not require those admitted into the leniency program to have or implement compliance programs, and it certainly is possible that the widespread use of corporate monitors could help deter collusion.

Eighth, legislation could add prejudgment interest to both private treble damage actions and criminal fines.[298] This would increase the effective size of these sanctions substantially, especially for durable cartels or cartelists that use delaying tactics during plea bargaining or litigation. Even though any legislation that increased sanctions is likely to face strong opposition, this change has the advantage of being a change that intuitively should strike many people, including Judges Easterbrook[299] and Posner,[300] as reasonable.

Finally, the United States could implement a whistleblower-reward, or bounty system, for individuals who turn in cartels, and perhaps even for corporations.[301] Bounty proposals have the potential to enhance cartel detection and to destabilize cartels even more than the current leniency and amnesty programs. The bounties could be introduced gradually, and could be limited to individuals.[302] If this approach is not successful, some have advocated that it be introduced on the corporate level.[303] If, for example, the annual discovery rate of cartels does not decline after the other proposals in this section have been in effect for a number of years, a bounty might be awarded to corporations that turn in cartels, even if they had once been a member of the cartel. Perhaps amnesty recipients could be given 10% of all the other cartel participants' fines in egregiously harmful cases (for example, bounties could be limited to cases where affected sales exceeds $1 billion, or where the cartel members were recidivists).[304]

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296 Because fines are almost always a matter of negotiation, the fines might not double simply because the U.S. Sentencing Commission's formula indicates they should double.

297 *See* D. Daniel Sokol, *Behavioral Remedies for Cartels? End to Fines for Leniency Applicants and the Case for Corporate Monitors* (Jan. 15, 2012) (unpublished manuscript) (on file with the authors).

298 The U.S. Sentencing Commission could add prejudgment interest to current cartel penalties without new legislation.

299 As Judge Easterbrook noted in *Fishman v. Estate of Wirtz*, 807 F.2d 520, 583–84 (7th Cir. 1986) (Easterbrook, J., dissenting):

> [T]he time value of money works in defendants' favor. Antitrust cases can be long-lived affairs. This one has lasted 14 years, 2 1/2 of which passed between the finding of liability and the award of damages. During all of the time, the defendants held the stakes and earned interest. . . . To deny prejudgment interest is to allow the defendants to profit from their wrong, and because 14 years is a long time the profit may be substantial.

Virtually the entire profession of financial economists would agree with these principles.

300 See Judge Posner's opinion in *Patton v. Mid-Continent Systems, Inc.*, 841 F.2d 751, 752 (7th Cir. 1988) (discussing the appropriateness of contact damages: "[T]he major inadequacies being that pre- and post-judgment interest rates are frequently below market levels . . . .").

301 The UK's Office of Fair Trading and the Korean Fair Trade Commission already have these policies in place for individuals.

302 *See* William E. Kovacic, *Private Participation in the Enforcement of Public Competition Laws*, *in* 2 CURRENT COMPETITION LAW 167, 173–75 (Mads Andenas et al. eds., 2004); *see also* Cécile Aubert et al., *The Impact of Leniency and Whistleblowing Programs on Cartels*, 24 INT'L J. INDUST. ORG. 1241 (2006).

303 *See* Giancarlo Spagnolo, *Leniency and Whistleblowers in Antitrust*, *in* HANDBOOK OF ANTITRUST ECONOMICS 259 (Paolo Buccirossi ed., 2008).

304 If 10% proves to be an insufficient bounty, it could be increased to 20%, or whatever fine level proved to be optimal. It might even be optimal to give all of the fines collected from a cartel to the amnesty recipient!

B. *Effects on Other Parts of the Antitrust System*

This Article's conclusions should have consequences far beyond the basic issue of whether the current levels of cartel sanctions should be raised. For example, in 1977 the U.S. Supreme Court granted standing only to direct purchasers of supracompetitively priced products, in large part because of its fear that suits by indirect purchasers would lead to "duplicative" payments.[305] The majority of states reacted by enacting "Illinois Brick Repealers" to permit injured indirect purchasers to sue for damages.[306] It often is asserted that these state laws lead to six-fold damages[307] (in addition to possible criminal penalties), and therefore, to over-deterrence. In light of this Article's conclusion that the current overall level of anti-cartel sanctions—a total that includes payments in indirect purchaser cases—should be increased at least five-fold, the Court's fear is unwarranted. On the contrary, indirect purchaser suits and state indirect purchaser laws should lead to more nearly optimal deterrence.

Moreover, as a general matter, many respected scholars believe that judicial fears that the private treble damages remedy is excessive—even before the other cartel sanctions are considered—systematically biases the results of antitrust litigation in defendants' favor.[308] Many believe that a fear of over-deterring or unduly penalizing defendants often causes judges to favor defendants when they formulate substantive antitrust rules, when they measure ambiguous factual situations against these rules, and when they devise appropriate standing rules.[309] Similarly, in otherwise close private

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305 Illinois Brick Co. v. Illinois, 431 U.S. 720 (1977).

306 *See* Robert H. Lande, *New Options for State Indirect Purchaser Legislation: Protecting the Real Victims of Antitrust Violations*, 61 ALA. L. REV. 447, 448 (2010).

307 There have been a number of variations of the argument that the combination of "treble" damages for direct purchasers, plus another "three" for indirect purchasers, plus disgorgement, plus fines of two-fold damages, can lead to six-fold, eight-fold, or more overall damages paid by a cartel or monopoly. *See, e.g.*, Michael L. Denger, *A New Approach to Cartel Enforcement Remedies Is Needed, 2002 ABA Spring Antitrust Meeting* 15 (meeting held Apr. 24–26, 2002) (unpublished draft) (on file with the authors). This fear shaped the ABA's proposal in this area. *See also* Richard M. Steuer, *Report on Remedies*, 2005 A.B.A. SEC. ANTITRUST REP. 3 (One of the "key features" of their proposal is that "[t]here would be no duplicative recovery under the new cause of action . . . . the proposed statute would eliminate the possibility of duplicative recovery.").

308 As former FTC Chairman William E. Kovacic observed,

> [A] court might fear that the US statutory requirement that successful private plaintiffs receive treble damages runs a risk of over-deterrence. A court might seek to correct such perceived infirmities in the anti-trust system by recourse to means directly within its control—namely by modifying doctrine governing liability standards or by devising special doctrinal tests to evaluate the worthiness of private claims . . . . The courts will "equilibrate" the antitrust system in one of three ways. Judges will: Construct doctrinal tests under the rubric of "standing" or "injury" that make it harder for the private party to pursue its case; [a]djust evidentiary requirements that must be satisfied to prove violations; or [a]lter substantive liability rules in ways that make it more difficult for the plaintiff to establish the defendant's liability.

See Kovacic, *supra* note 302, at 173–75.

309 *Id.* See also Stephen Calkins, *Equilibrating Tendencies in the Antitrust System, with Special Attention to Summary Judgment and to Motions to Dismiss*, *in* PRIVATE ANTITRUST LITIGATION 185 (Lawrence White ed., 1988), and the sources cited therein, particularly the reference to a similar analysis by Areeda and Turner, *id.* at 191. Professor Calkins discusses how many areas of antitrust law might have developed more narrowly because of the effects of damages awards that the courts believed were at the threefold level. *Id.* at 191–95. He concludes that "class actions probably would be more easily certified were there no trebling." *Id.* at 197. Professor Calkins also demonstrates why "it seems probable that trebling is a factor in" causing courts to scrutinize "damage claims more rigorously than they once did." *Id.* at 198. "Plaintiffs would find standing rules more hospitable in a single damage world." *Id.*; *see also* Stephen Calkins, *Summary Judgment, Motions to Dismiss, and Other Examples of Equilibrating Tendencies in the Antitrust System*, 74 GEO. L.J. 1065 (1986).

cases judges might unduly resolve ambiguities in defendants' favor when they compute damages because they believe the resulting award—after the mandatory trebling—will be excessive. A fortiori, a remedy system that includes not only "excessive" private damages but also incarceration and corporate fines could cause virtually every area of antitrust to develop unduly in defendants' favor. This result would be desirable only if the sanctions, when considered together, are indeed excessive. However, this Article demonstrates that for cartels, by far the most common and important type of private case, the opposite is true. Courts should resist any temptation to be lenient on lawbreakers out of a fear that they are being sanctioned too heavily.

Although we have cited critics of antitrust who are concerned about over-deterrence, at the same time, there are others who exhibit a great deal of complacency—sometimes tinged with triumphalism – that U.S. enforcement is the oldest, best developed, and most effective in the world. Pride in the antitrust idea, one of our country's most successful peaceful policy export, is understandable. But justified delight in our accomplishments can become prosecutorial hubris tantamount to obliviousness in light of the continuing high rates of cartel detections and the results of this Article's analysis. To truly protect American consumers and businesses from tremendous illegal overcharges, vigilance and increased efforts are crucial.

In short, the inquiry undertaken by this Article is not just relevant to the crucial issue of whether the overall level of cartel sanctions should be changed. Almost every piece of the extraordinarily complex and interconnected antitrust system is affected by the field's belief as to whether the current level of cartel sanctions is optimal. We believe that almost every portion of the antitrust system should be re-examined in light of this Article's analysis and conclusions.

APPENDIX

Table 1
Summary of Economic Surveys of Cartel Overcharges

		No. Cartels	Mean %	Median %
1.	Mark A. Cohen & David T. Scheffman[310]	5–7	7.7–10.8	7.8–14.0
2.	Gregory J. Werden[311]	13	21	18
3.	Richard A. Posner 312	12	49	38
4.	Margaret Levenstein & Valerie Suslow[313]	22	43	44.5
5.	James M. Griffin[314]	38	46	44
6.	OECD (excluding peaks)[315]	12	15.75	12.75
Total (simple average)		**102–104**	**30.7**	**28.1**
Total (weighted average)		**102–104**	**36.7**	**34.6**

310 Mark A. Cohen & David T. Scheffman, *The Antitrust Sentencing Guideline: Is the Punishment Worth the Costs?*, 27 AM. CRIM. L. REV. 331 (1989).

311 Gregory J. Werden, *The Effect of Antitrust Policy on Consumer Welfare: What Crandall and Winston Overlook* 1–9 (Econ. Analysis Group, Antitrust Div., U.S. Dep't of Justice, Discussion Paper EAG 03-2, 2003), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=384100.

312 POSNER, *supra* note 93.

313 Margaret Levenstein & Valerie Suslow, *What Determines Cartel Success?* 16 (Univ. of Mich. Bus. Sch., Working Paper 02-001, 2002).

314 James M. Griffin, *Previous Cartel Experience: Any Lessons for OPEC?*, *in* ECONOMICS IN THEORY AND PRACTICE: AN ECLECTIC APPROACH 179 (L.R. Klein & J. Marquez eds., 1989).

315 ORG. OF ECON. CO-OPERATION & DEV., REPORT ON THE NATURE AND IMPACT OF HARD CORE CARTELS AND SANCTIONS AGAINST CARTELS UNDER NATIONAL COMPETITION LAWS (2002), *available at* http://www.oecd.org/dataoecd/16/20/2081831.pdf.

Table 2
Median Average Episodic Overcharges, by Year and Type

Cartel Episode End Date	Membership		Legal Status		Bid-Rigging	Classic Price Fixing	All Types
	Nat'l	**Int'l**	Found Guilty	**Legal**			
	Median percent [a]						
1780–1890	19.3	**50.8**	16.0	**25.0**	16.2	21.3	20.3
1891–1919	24.5	**57.3**	24.8	**41.5**	39.0	35.0	36.8
1920–1945	4.6	**31.6**	38.9	**27.6**	34.0	30.0	30.0
1946–1973	15.0	**38.9**	14.3	**20.4**	13.3	19.0	15.2
1974–1989	16.8	**37.4**	23.0	**7.5**	21.8	16.9	20.0
1990–1999	14.9	**24.8**	22.8	**11.7**	16.0	23.0	22.2
2000–2009	20.0	**25.8**	23.3	**17.5**	18.5	24.1	22.5
ALL YEARS	**17.2**	**30.0**	**22.8**	**26.0**	**18.6**	**25.0**	**23.3**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated July 2009.

[a] Medians of the point estimates or, where appropriate, of the midpoint of range estimates. Includes many zero estimates. See Table 4 for the numbers of observations in each cell.

Table 3
Studies and Opinions as to the Probability of Cartel Detection

Source	Probability	Comment
Alan R. Beckstein & Gabel H. Landis [316]	Less than 0.50	A large anonymous survey of antitrust lawyers in the ABA, most working in the United States; the mean response was 3.6, where 5=strongly agree, 4=agree, and 3=neither agree nor disagree.
William M. Landes [317]	0.33	Merely an illustration, but a seminal work on optimal deterrence that may influence many adherents of optimal deterrence theory.
R.M. Feinberg [318]	Less than 0.50	An anonymous confidential survey of antitrust lawyers working in Brussels and observing the EC; the mean response was 4.4, where 5=strongly agree and 3=neither agree nor disagree.
United States Sentencing Commission [319]	0.10	Contains the transcript of 1987 testimony of DAAG for Antitrust, Ginsburg; probably refers to domestic cartels of 1970s and 1980s.
Gregory J. Werden & Marilyn J. Simon [320]	Less than 0.10	Appears to be a general, subjective opinion of Antitrust Division professional prosecutors.
Mark A. Cohen & David T.	0.33	No hint as to the source, but may have been influenced by Landes (1983).

316 Alan R. Beckstein & Gabel H. Landis, *Antitrust Compliance: Results of a Survey of Legal Opinion*, 52 ANTITRUST L.J. 459, 487–516 (1982).

317 Landes, *supra* note 43, at 657.

318 Feinberg, *supra* note 212, at 379.

319 *Sentencing Options: Hearing Before the U.S. Sentencing Comm'n* 15 (July 15, 1986), *available at* http://www.src-project.org/wp-content/pdfs/testimony/ussc_testimony_prepared_19860715/0008752.pdf (statement of Douglas H. Ginsburg, Assistant Attorney Gen., Antitrust Division, U.S. Dep't of Justice).

320 Gregory J. Werden & Marilyn J. Simon, *Why Price Fixers Should Go to Prison*, 32 ANTITRUST BULL. 917, 926 (1987).

Scheffman [321]		
Jean-Claude Bosch & E. Woodrow Eckard Jr. [322]	0.13–0.17	A quantitative estimate derived from an event study of U.S.-prosecuted cartels 1961–1988.
Mitchell A. Polinsky & Steven Shavell [323]	0.138–0.165	Refers to U.S. arrest rates for some of the most common felonious property crimes (burglary, auto theft, and arson); may be overstated if victims of such crimes fail to report some occurrences.
Office of Fair Trading [324]	0.30	An anonymous survey of U.S. antitrust lawyers in private practice (with a "low response rate") asked about the increase in cartel activity "if the Division stopped enforcing Section 1 of the Sherman Act." Results were originally summarized in the FY2001 DOJ report to Congress.
Richard A. Posner [325]	0.25	An illustration of an optimal deterrence calculation by a leading antitrust jurist.
Organisation of Economic Co-Operation and Development [326]	0.13–0.17	OECD accepts Bosch and Eckard (1991).
Emmanuel Combe et. al. [327]	0.129–0.133	Replicate Bosch and Eckard's (1991) method using data from EU-prosecuted cartels from 1969 to 2002.

321 Cohen & Scheffman, *supra* note 310.

322 Jean-Claude Bosch & Woodrow E. Eckard Jr., *The Probability of Price Fixing: Evidence from Stock Market Reaction to Federal Indictments*, 73 REV. ECON. & STAT. 309 (1991).

323 Mitchell A. Polinsky & Steven Shavell, *The Economic Theory of Public Enforcement of the Law*, 38 J. ECON. LITERATURE 45, 70 (2000).

324 DELOITTE, THE DETERRENT EFFECT OF COMPETITION ENFORCEMENT BY THE OFT 20 (2007), *available at* http://www.oft.gov.uk/shared_oft/reports/Evaluating-OFTs-work/oft962.pdf (prepared for OFT).

325 POSNER, *supra* note 93, at 47.

326 ORG. OF ECON. CO-OPERATION & DEV., *supra* note 315, at 18–19.

327 Combe et. al., *supra* note 198.

Bush et al. [328]	0.10–0.33	A summary of most of the sources in this table above.
Alla Golub et. al. [329]	0.13–0.17	This paper replicates the Bosch and Eckard (1991) model using U.S. cartels from a later period and finds few differences in deterrence.
Terry Calvani [330]	0.13–0.17	In an Article on cartel enforcement an experienced antitrust official cites Bosch and Eckard (1991) with approval.
Wouter P.J. Wils [331]	Less than 0.33	Cites with approval Bosch and Eckard (1991), but author believes that the U.S. probability has increased since 1961–1988 and that it is lower in the EU than the United States; this is a "conservative" upper limit for the EU.
Maarten Pieter Schinkel [332]	0.15	Cites only Bosch and Eckard (1991), but considers it "controversial as well as dated."
Maurice E. Stucke [333]	Unknown, but possibly 0.13–0.17	"Nobody knows." However, the author also favorably cites USSG (1986), OECD (2002), and Bosch and Eckard (1991).
Paolo Buccirossi & Giancarlo Spagnolo [334]	0.15	The author's "prudent" assumption for their simulation analysis.

328 Brief for Bush et. al. as Amici Curiae Supporting Respondents, F. Hoffman-LaRoche v. Empagran, 542 U.S. 155 (2004) (No. 03-724).

329 Golub et al., *supra* note 197.

330 Terry Calvani, *Enforcement of Cartel Law in Ireland*, *in* 6 CAMBRIDGE YEARBOOK OF EUROPEAN LEGAL STUDIES ch. 4, at 77 (John Bell & Claire Kilpatrick eds., 2005).

331 Wouter P.J. Wils, *Is Criminalization of EU Competition Law the Answer?*, 28 WORLD COMPETITION 117, 130 (2005).

332 Maarten Pieter Schinkel, *Effective Cartel Enforcement in Europe* 25 (Amsterdam Ctr. of Law & Econ. Working Paper No. 2006-14, 2006), *published in* 30 WORLD COMPETITION: LAW & ECON. REV. 539 (2007), *available at* http://www.ssrn.com/paper=948641.

333 Maurice E. Stucke, *Morality and Antitrust*, 2006 COLUM. BUS. L. REV. 443, 457.

334 Buccirossi & Spagnolo, *supra* note 43, at 95.

J. Chen & J.E. Harrington [335]	0.1–0.3	In illustrating the effect of detection probability of cartel formation, the authors chose this range.
Office of Fair Trading [336]	21.7% caught of those seeking advice	Results of a survey of 234 competition-law lawyers in the UK and Brussels for the years 2004–06 asking what proportion of their clients were convicted of illegal cartel conduct (295) by the UK's OFT compared to the 1361 instances where a client abandoned or changed a possible cartel agreement "because of the risk of OFT investigation."
Nathan H. Miller [337]	0.21–27.5	An empirical study of U.S. cartel prosecutions shows that detection rates rose 62% because of the revised 1993 Leniency Program; this increase is applied to Bosch and Eckard's estimate of p.
Renato Nazzini & Ali Nikpay [338]	Less than 0.20	"The authors' own anecdotal observations suggest that the OFT fully investigates less than 20 percent of all cases in which it has a reasonable suspicion that the competition rules have been breached."
Gregory J. Werden [339]	0.25	Part of an illustration of optimal fines for typical EU cartels.
Peter Ormosi [340]	10–20%	Calculations for Europe based on a large number of factors.

335 Joe Chen & Joseph E. Harrington, *The Impact of Corporate Leniency on Cartel Formation and the Cartel Price Path*, *in* THE POLITICAL ECONOMY OF ANTITRUST, *supra* note 43, ch. 3, at 76.

336 DELOITTE, *supra* note 324, at 50–54.

337 Miller, *supra* note 52.

338 Renato Nazzini & Ali Nikpay, *Private Actions in EC Competition Law*, 4 COMPETITION INT'L POL'Y 111, 111 (2008).

339 Gregory J. Werden, *supra* note 48, at 27–29 (2009).

340 Peter L. Ormosi, *How Big Is a Tip of the Iceberg? A Parsimonious Way to Estimate Cartel Detection Rate* (Ctr. for Competition Policy, Working Paper No. 11-6, 2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1851309.

Appendix 3

John M. Connor, "Cartel Overcharges," 29 Research In Law & Economics 249 (2014).

CARTEL OVERCHARGES

John M. Connor*

Purdue University

jconnor@purdue.edu

Abstract

Many jurisdictions fine illegal cartels using penalty guidelines that presume an arbitrary 10% overcharge. This paper surveys more than 700 published economic studies and judicial decisions that contain 2,041 quantitative estimates of overcharges of hard-core cartels. The primary findings are: (1) the *median* average long-run overcharge for all types of cartels over all time periods is 23.0%; (2) the *mean* average is at least 49%; (3) overcharges reached their zenith in 1891-1945 and have trended downward ever since; (4) 6% of the cartel episodes are zero; (5) median overcharges of international-membership cartels are 38% higher than those of domestic cartels; (6) convicted cartels are on average 19% more effective at raising prices as unpunished cartels; (7) bid-rigging conduct displays 25% lower mark-ups than price-fixing cartels; (8) contemporary cartels targeted by class actions have higher overcharges; and (9) when cartels operate at peak effectiveness, price changes are 60% to 80% higher than the whole episode. Historical penalty guidelines aimed at optimally deterring cartels are likely to be too low.

Key words: cartel, collusion, price fixing, overcharge, antitrust, optimal deterrence JEL Classifications: L12, L42, K22, B14, F29

*The author is Professor Emeritus at Purdue University, West Lafayette, Indiana. He is indebted to Professor Robert H. Lande, who worked with the author on earlier law review articles on cartel overcharges; he also was responsible for locating several overcharges from antitrust verdicts in U.S. courts and provided meticulous comments on this version. Anonymous reviewers of *RLE*, John Kwoka, and numerous comments on two previously posted working papers resulted in a large number of constructive suggestions, for which I am grateful. My students Jeff Zimmerman, David Ubilava, and Yuliya Bolotova assisted in coding early versions of the *Master Data* spreadsheet summarizing these data. Numerous users of this spreadsheet have provided corrections and additions.

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INTRODUCTION

For at least 125 years, hundreds of economists, historians, commissioners, and jurists have labored mightily to assess the effectiveness of cartels.[341] Criteria that have been devised to assess effectiveness, including longevity, stability, efficiency, and profitability, but chief among them is market price effects.[342] The particular price effect of interest in cartel studies is the increase in selling prices[343] caused by the collusive conduct of suppliers in a market.

Objective

The principal purpose of this paper is to assemble and analyze the most comprehensive collection of quantitative estimates of monopoly overcharges generated by private, hard-core cartels.[344] Candidates are cartels that operated in all geographic locations of the world and in all historical eras. The estimates are assembled from serious published social-science studies by disintererested authors and from the decisions of competent judicial bodies (see Appendix). Although the sources met minimal quality standards, no effort was made to apply additional subjective quality filters during the collection phase. Later, however, the estimates were examined for systematic differences in reliability across types of sources or methods of calculating overcharges.

Analysis in this paper is limited to descriptive tabulations using categories that have been shown to be significantly differnent by more formal analyses. However, this paper attempts to convey its findings in a style approachable by practioners and policy makers who may not be professional economists.

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[341] I eschew the term "success" used by many authors of cartel studies, because it connotes the financial performance of price-fixing activity from the point of view of the cartel managers or the participating companies. "Effectiveness," on the other hand, seems to be consistent with (and inversely related to) the social welfare perspective embedded in economics.

[342] Longevity, also called duration, measures the lifespan of a cartel or, if it has more than one, the length of time of one episode. Some researchers use the term stability synonymously with duration, but more commonly it refers to the absence of price wars or other reversions to competitive conduct during a cartel's time span. Stability is perhaps equivalent to low variation in a cartel's "discipline," where discipline may be measured by how close a cartel's selling prices are to its target prices. Efficiency can refer to static allocative efficiency or, rarely, to technical efficiency or dynamic efficiency.

[343] The *undercharge* from a buyers' cartel is symmetrically defined as a price effectuated by buyer power of an input purchased by companies acting as a cartel. For details, see a fine legal-economic treatise on monopsony and oligopsony (Blair and Harrison 2010).

[344] Private cartels are those not protected by treaties or sovereignty, and "hard-core" is overt price-setting or quantity-setting conduct. Such cartels are subject to the most severe penalties.

Compilation should serve two subsidiary concerns. First, the results of the survey can be used as benchmarks to assess the ability of current antitrust penalties to deter illegal cartels. Second, these data may demonstrate empirical regularities that may suggest hypotheses for formal economic model-building.

Overcharge Defined

The increase in purchase costs to buyers due to an effective sellers' cartel is commonly called an *overcharge* by economists and legal writers.[345] When multiplied by the quantity sold be a cartel, it becomes the major portion of cartel *damages*.[346] The overcharge *rate* is calculated by comparing actual cartel-enhanced prices to an appropriate non-collusive *benchmark* price[347] (Connor 2008).

[345] The term overcharge is little used in economic discourse. For example, the magisterial *New Palgrave* lists it nowhere (Eatwell *et al.*1987). In contrast, a basic handbook on antitrust damages prepared by a committee of lawyers and economists has a long chapter devoted to entirely to overcharges (ABA 2010: Chapter 7). However, the overcharge rate has close correlate in the well known economic measure of market power, the Lerner Index (discussed below).

[346] Antitrust damages are legal remedies for persons (natural or business) that are injured by prohibited anti-competitive conduct of other persons (ABA 2010:3). While many remedies can be ordered by courts, the most common are monetary payments to compensate victims for their losses ("make them whole"). These are also known as objective, special, or single damages. Injunctive relief in the form of constriants on future conduct by the defendants is sometimes seen. Authorities may also impose punitive costs on the perpetrators, for example, the portion of treble damages awarded above single damages.

Overcharges incurred by buyers are only partial damages. *Potential buyers* who reduce or eliminate their purchases are also injured, but the latter effect is not an overcharge. Economists refer to this consumer loss as the dead-weight loss. Courts generally do not regard the harm inflicted on buyers priced out of the market compensable harm because it is difficult to identify these particular victims and because of the presumed difficulty of accurately calculating the dead-weight loss. (However, the State of Mississippi's antitrust law does allow for harm to the State's economy, which might reasonably be equated with the dead-weight loss). A solution to this conundrum would seem to be for courts to allocate additional *cy pres* awards of 10% to 20% of the value of recoveries. (See Connor and Lande (2012) for the derivation of these percentages).

[347] The benchmark is referred to as the "but-for price" – the market equilibrium price that would have been observed were it not for the overtly collusive conduct of the sellers. The benchmark may be the purely competitive price, or it may be a somewhat higher price generated by legal tacit collusion by companies in an oligopolistic industry.

To be precise, if a sellers' cartel is effective in raising the market price P_m for a period of time because of collusion, then the unit monetary overcharge is $\mathbf{P_m - P_c}$, where P_c is the competitive or benchmark price that *would have been observed in the market* absent overt collusion. Given the quantity sold during the conspiracy (Q_m), the total overcharge is:

$$\textbf{Dollar Overcharge} = (P_m - P_c) \times Q_m$$

The price difference $P_m - P_c$ is conventionally converted to a *rate* (a ratio or percentage) by dividing the price wedge by the benchmark price. That is,

$$\textbf{Overcharge Rate} = (P_m - P_c)/P_c$$

The overcharge can in theory range from zero to infinity, though the latter is highly unlikely. If P_c is properly measured, an overcharge of 0% would imply that the cartel was ineffective in controlling market price and that buyers from the cartel had suffered no antitrust injuries.

Overcharge Rates Computed

There are a couple of reasons why overcharge ratios may be systemmatically under-reported. First, commentators can err, even when the dollar overcharge and the affected sales are known precisely. Calculating an overcharge rate is straightforward when working with prices, but converting a *monetary* overcharge into a percentage overcharge can easily lead to an underestimate of the overcharge rate.[348]

[348] It is also easy to convert the (incorrect) ratio of overcharge to affected sales (OV/AS) to the correct one. Let OR be the overcharge rate. Then OR = 1/(1 – OV/AS). For example, if the overcharge is $5 and affected sales $10, then the true OR is 1/(1 – 5/10) = 1/0.5 = 100%. This shows that if reported overcharge rates are computed using affected sales, the true overcharge rates are being under-reported.

Let us examine a specific overcharge calculation. In 1992-1995, the world's five producers of synthesized lysine (an amino acid that accelerates the growth of muscle tissue in animals) conspired to raise its global price. In the U.S. market, the cartel obtained a dollar overcharge of $80 million on sales of $460 million (Connor 2007b: 200, 220-235). Most observers would readily infer that the overcharge rate is (80/460)x100 = 17.4%. This is the method commonly followed by counsel when reporting how well they have represented their clients.

However, the appropriate calculation is more complicated. It involves dividing the overcharge by the *competitive or but-for sales*, not the actual (affected) sales.[349] The correct formula is:

$$\textbf{Overcharge Rate} = (P_m - P_c)xQ_m/(P_mxQ_m(1 - ((P_m - P_c)xQ_m/P_mxQ_m)))$$

So, in the lysine example the divisor ought to be *competitive* rather than overcharge-inflated affected sales. That is, the proper divisor is $460-$80 = $380 million, and the true overcharge rate is (80/380)x100 = 21.1%. Note that when working with *prices*, underreporting overcharge rates should not be an issue. The average monthly prices were about $0.945 and the but-for price about $0.78, which also yields an overcharge of 21%. A recent example of using the wrong denominator to calculate the overcharge rate can be seen in a widely read report commissioned by the European Commission from a respected consultancy: on page 53, prices of an Austrian cartel fell from €1140 during collusion to €900 after a raid; the report computes the overcharge to be 22%, whereas the correct overcharge is 26.7% (Komninos *et al.* 2009).

A second cause of low reported overcharge rates is under-reporting of affected sales (see Box).

[349] The but-for sales might also be output under Cournot or some other resonable non-cooperative oligopolistic conduct, which would also be considerably smaller than collusive sales. In the lysine case, the conspirators twice reverted to to prices that were slightly below the long-run marginal cost of the industry leader.

The *Iowa Ready-Mix Concrete Antitrust* Case

An order handed down by U.S. District Court Judge Mark W. Bennett in this case contains the following information:

> "The combined settlement fund of $18.5 million is sufficient to repay completely each class member's actual overcharge damages …. even after fees and costs….[which is] 'very unusual' in an antitrust class action …. The $18.5 million sum is especially remarkable, given that the United States Department of Justice estimated that the total volume of commerce affected by the price fixing conspiracies was only $5,666,348.61" (Bennett 2011: 4).

Later in this decison we learn that the settlement fund includes $7,638,113 in fees and costs, which implies that the overcharges were $10,861,887. To compute the rate, the first impulse of counsel is to take the overcharges ($10,861,887) and divide them by the sales during the collusive period ($5,670,000). The result is 191.7%.

Under-reporting of cartel sales is a common practice by antitrust authorities. One reason for this tendency is that authorities in many jurisdictions must defend their decisions when the alleged cartelists appeal their fines to a higher court. Because fines are directly, positively related to affected sales, the authorities customarily (1) cut down the list of *products* that probably were cartelized to list only products that were incontrovertibly subject to price fixing, (2) exclude *regions* within the jurisdictions that arguably were subject to price fixing, and (3) foreshorten the collusive *time period* either because early-period written documents are incomplete or because there is possibly contradictory testimony by cartel managers concerning start or ending dates. Lengthy appeals over imposed fines are common in the EU, Brazil, and many other legal systems. Appeals are also possible when defendants go to trial in criminal antitrust regimes.

In criminal jurisdictions like the United States, cartel fines are also linked to the size of affected sales, but the size of fines are usually the result of guilty-plea negotiations; the resulting agreements cannot be appealed. However, prosecutors have incentives to carve down affected sales during plea negotiations in order to avoid the risk of trials, where the standard of proof is "beyond a reasonable doubt." Concessions may be and are offered to defendants about which products, geographic regions, and time periods to include in affected sales (or the degree of harm caused). For example, a plea agreement may state that price fixing began "...as early as May 1, 2000," when in fact collusion is later proven to have begun much earlier.[350]

[350] The follow-on U.S. private damages litigation frequently adds time to the period of time mention in DOJ plea agreements. Also, in international cartel cases, the durations in decisions of other antitrust authorities tend to be longer than the durations for the same cartels negotiated in U.S. plea agreements.

Overcharges are Important in Economics and the Law

A price-fixing overcharge is a transfer of income or wealth from buyers to the members of the cartel that occurs as a result of an overt collusive agreement.[351] *Ceteris paribus* when a cartel achieves high levels of effectiveness (i.e., longevity, stability, and high overcharge rates), it tends to generate large customer losses, i.e., measurable reductions in consumer surplus.[352] Although there are other economic effects of price fixing, legal-economic scholarship on antitrust injuries tends to focus on the overcharge.[353] Effective cartels are also viewed as destructive of the competitive process in the sense that they weaken the natural effects of demand and supply in price formation and cause deadweight social losses.[354] That is, effective cartels cause economic, allocative inefficiency. The deadweight losses result from the costs incurred by customers when they are forced to substitute inferior substitutes, if any, the costs incurred by the members of the cartel in managing the collusive enterprise, and rent-seeking behavior by the cartel such as efforts directed at forestalling entry. "Umbrella pricing" or "free riding," the tendency of suppliers outside the cartel to sell at the cartel's elevated price, creates further harm for customers of fringe suppliers. In this paper, I focus on cartel overcharge rates as the root indicators of the many harms or damages created by price fixing.

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[351] An overt collusive agreement is a contract that is the result of observable, explicit *communication* between the parties. The contract may be a written document, a verbal unwritten agreement, a "handshake" (or "gentlemen's) agreement, a cryptic or encoded message, or even simply body language (a "wink and a nod"). In some cultures, silence at the conclusion of a meeting at which consistent proposals were made may indicate a consensus agreement. In a jurisdiction with no antitrust laws or one that provides an industry exemption, the contracts may be publicized and may be enforceable in a court of law. In jurisdictions with anti-cartel laws, such contracts are usually hidden and are enforced only by the cartel members themselves. The need for self-enforcement of a secret agreement is the unique economic feature of contemporary cartels.

[352] Customers are direct buyers and they are usually industrial buyers, but overcharges normally will be passed in whole or in part to final consumers as indirect buyers. If cartels improve technical or dynamic efficiency, this may offset the buyers' losses. The EU and some other jurisdictions permit innovation cartels in those rare occasions when the fruits of innovation passed on to consumers outweigh the static losses.

[353] Technically, as a matter of economic and statistical principles, collusion can and does affect prices in ways other than a correctly measured overcharge. Keep in mind that P_m and P_c are ordinarily prices *averaged* over the collusive period for several hours or several decades. However, there is a burgeoning literature that focuses on the *dispersion* of prices that result from collusive conduct (Connor 2005). In statistics the mean average is but the first of four "moments" (or formulas) that statistically describe a sample of prices; the other higher-order moments are variance, skewness, and kurtosis. Cartels, for example, tend to reduce price variance and increase skewness. Theoretically, cartels can significantly affect price dispersion without creating an overcharge, but empirical works shows that changes in mean prices are usually accompanied by changes in dispersion (Connor 2004d, Connor *et al.* 2008, and von Blanckenburg 2010). Analyses of price-dispersion effects have promise in the detection of cartels and in proof of antitrust damages.

[354] In large U.S. markets for manufactured products, the dead-weight loss is typically one-fifth to one-tenth as large as the overcharge, and the two losses are highly correlated (Peterson and Connor 1995). Connor and Lande (2012: 457-461) determined that from the few good studies available, the ratio was more in the 3% to 20% range.

Direct purchasers from an effective sellers' cartel are the immediate losers. However, if the cartel is comprised of manufacturers (the most common story), then other buyers farther down the distribution channel are also harmed. These indirect purchasers typically will be other manufacturers, wholesale distributors, retail distributors, and the final consumers of the cartelized product.[355] Indirect buyers pass on part of or all of the overcharge contained in the direct purchase. Under simplifying assumptions, indirect purchasers in perfectly competitive industries pass on 100% of the initial overcharge, but if the indirect buyer is a monopolist then only 50% will be passed on at any one stage.[356] If all the distributors use percentage mark-up rules, a fairly common situation, then the consumer pass-through rate is 100%. If the cartelized product is highly differentiated, then the pass-on rate will exceed 100%.

Until about 1990 scholarly literature surveys of the economics of cartels seldom addressed overcharges, but interest in this subject has blossomed in the past decade. For example, Levenstein and Suslow (2006: §6.1), while focusing their article on duration, examine eight cross-industry and 54 "selected" case studies of cartels in 19 industries for evidence about price or profit effects.[357] They conclude that (1) almost half of the industry case studies do not address the issue, (2) when addressed, nearly all find at least short-run price changes due to cartelization, but (3) few of the latter are explicit about the counterfactual (i.e., the but-for price) (*ibid.* pp. 81-82). Today textbooks of economics conventionally devote considerable space to the market price effects of cartels.[358] While empirical studies of cartels routinely survey selected

[355] This picture is simplified. Real-world distribution channels may lengthened if there are multiple sales from distributor to distributor, the cartel members may sell their products as components to other manufacturers for final assembly, or the channel may be foreshortened by manufacturer-distributor integration. Or, the chain may be much shorter than the example above, if, for example, consumers buy directly from cartelists via Internet sites.

[356] Linear demand and supply curves, a homogeneous product, constant returns to scale, and fixed proportions in input use. See Harris and Sullivan (1979). In an extreme case of a monopolistic wholesaler and retailer, the pass-through rate from a manufacturing cartel to consumers is 0.5 x 0.5 = 0.25 or 25%. If the chain of sellers in the vertical distribution sysem is long, then a pass-through rate below one will shrink greatly before it reaches the consumer. If the distributors are competitive and the product is highly differentiated like cigarettes, then consumers could bear a 120% overcharge or higher.

[357] An early (2004) version of the present study is cited (Levenstein and Suslow 2006: note 96).

[358] The dominant U.S. textbook in the 1990s devoted 15 pages to cartels (Scherer and Ross 1990: 235-248, 258). Its market successor, about the same total length, spends 13 pages (Carlton and Perloff 2004: 128-131, 140-145, 148-150).

antecedents as a prelude to the study being presented, to my knowledge no one has published a work aimed principally at comprehensively surveying and analyzing cartel overcharges.[359] This paper is aimed principally at filling this gap in the legal-economic literature.

The actual size of cartel overcharges is an issue at the heart of a number of legal and economic controversies. First, knowing the size and distribution of cartel overcharges is necessary to justify the underpinnings of antitrust authorities' guidelines for sanctioning illegal cartel conduct. Many commentators on government fining practices have noted the absence of appropriate empirical data for the rational design of such policies. Second, because the typical harm from cartel operations was mainly anecdotal, there are widely varying opinions among experts on the critical issue of the size of sanctions needed for optimal deterrence of cartel formation.[360] The following sections discuss these issues.

Overcharges and Cartel Fines

The United States

The Sentencing Reform Act of 1984 created the U.S. Sentencing Commission (USSC), a judicial-branch unit charged by the U.S. Congress with devising guidelines for criminal sentencing for the federal judiciary (USSG Advisory Group 2003). The first set of guidelines was promulgated in 1987, and after public comment was made law in 1989. The guidelines included sanctions for organizations guilty of horizontal price fixing and bid rigging (Cohen and Scheffman 1989: 332). Although the Sherman Act of 1890 is a criminal statute that encompasses other types of restrictive business practices, by long tradition only horizontal price fixing and market-sharing agreements have triggered criminal indictments by the Department of Justice (DOJ).[361]

[359] I exclude, of course, antecedants of this article by the present author.

[360] In a personal communication to the author in 2006, Terry Calvani (former Commissioner of the U.S. FTC and of the comparable Irish competition authority) commented on the release of my first working paper on overcharges, saying: "[M]uch of what we thought we knew about cartel overcharges was largely 'urban legend.' "

[361] Criminal filings are made in cases of *per se*, covert, intentional conspiracies by participants who are aware of the probable anticompetitive consequences (Hovenkamp 1999:585-586). More than 95% of all naked cartel cases are brought as criminal actions, but a small number of such cases are, at the discretion of the DOJ, filed as civil matters.

The issue of how high cartels typically raise prices was crucial when the U.S. Sentencing Commission (USSC) established the fine levels for cartel violations. The USSC's formulas for calculating cartel fines follow from an embedded assumption: "It is estimated that the average gain from price-fixing is 10 percent of the selling price."[362] The Commission added: "The purpose for specifying a percent of the volume of commerce is to avoid the time and expense that would be required for the court to determine actual gain or loss."[363] As the Sixth Circuit noted, the Sentencing Commission "opted for greater administrative convenience" instead of undertaking a specific inquiry into the actual loss in each case."[364]

The USSC appears to have adopted the 10% presumption because its use was advocated by the then-head of the Antitrust Division, Douglas Ginsburg.[365] The origin of Ginsberg's 10% figure is not publicly known. However, a prominent analysis of the issue by Cohen & Scheffman (1989) published shortly after the antitrust sentencing Guidelines were promulgated, asserts that the economic evaluation of only three price-fixing conspiracies was particularly important in

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[362] The USSC Guidelines start with a *base fine* double the 10% presumed overcharge and use it in conjunction with the assigned base Offence Level for antitrust offenses. They adjust this offense level by a number of factors, such as whether bid rigging and other aggravating factors were involved, and by mitigating factors as well. This adjustment results a pair of "*culpability multipliers*" that are between 0.75 and 4.0. The product of the base fine (20% of the affected commerce) and the culpability multipliers results in the fine range that is to be imposed on a cartel member. Thus, the fine range recommended for convicted cartelists is at its lowest 15% and at its highest 80% of affected sales. These fine ranges usually are adjusted downwards for cooperation or as a part of the Division's leniency program. The USSC's Commentary also notes that "In cases in which the actual monopoly overcharge appears to be either substantially more or substantially less then 10%" it might not employ the 20% base fine. But in practice the DOJ almost always uses the figure of 20% of affected commerce as their starting point in their criminal fine calculations.

[363] See *U.S. Sentencing Commission Guidelines For the United States Courts, 18 U.S.C. Section 2R1.1, Bid-Rigging, Price Fixing or Market-Allocation Agreements Among Competitors*, Application Note 3.

[364] See *United States v. Hayter Oil Co*., 51 F.3d 1265, 1277 (1995). The court noted: "The offense levels are not based directly on the damage caused or profit made by the defendant because damages are difficult and time consuming to establish. The volume of commerce is an acceptable and more readily measurable substitute..."

[365] In a statement to the Commission, Assistant Attorney General Ginsburg stated that "the optimal fine for any given act of price-fixing is equal to the damage caused by the violation divided by the probability of conviction . . . such a fine would result in the socially optimal level of price-fixing, which in this case is zero"(USSG 1986:14). He stated his judgment that "price fixing typically results in price increases that has harmed the consumers in a range of 10 percent of the price..." and that these violations had no more than 10% chance of detection (*ibid.* p.15). Connor and Lande (2012) comment extensively on the appropriate detection probability for cartels and the other standard assumptions of the simple optimal deterrence model. For exemple, they consider the implications of risk-loving behavior of cartel managers or corporatte cartelists in place oft he usual assumption of risk neutrality (ibid., pp. 432-455), and the implications of the prevent value of expected future monopoly profits and cartel penalties rather than nominal values (ibid.)

shaping Ginsburg's views. It says further that "…there is little credible statistical evidence that would justify the Commission's assumptions which underlie the Antitrust Guidelines (p. 333)." If this analysis is correct, a critical assumption in setting cartel penalties in the United States is supported by a surprisingly small amount of evidence.

In the history of antitrust before 1990, the sum of all cartel penalties amounted to less than $100 million (Gallo et al. 2004).[366] From 1990, a series of record corporate fines and other penalties were imposed for criminal price fixing by U.S. courts, most of which were prosecutions of international cartels (Connor 2011c). A similar upswing may be noted for fines imposed by the European Commission, the EU's Member States, and a few antitrust authorities in Asia, Africa, and Latin America. By 2010, U.S. and EU government and private monetary penalties amounted to at least $84 billion (p.31). In early 2012, worldwide cartel penalties surpassed $100 billion. This figure does not include legal fees, corporate reputational effects, or penal sanctions.

The consensus of scholars is that current antitrust regimes are under-deterring price fixing (Ginsberg and Wright 2010, Harrington 2012, Connor and Lande 2012). However, some attorneys engaged in defending alleged international price-fixing conspiracies have argued that the Guidelines have resulted in excessive penalties. For example, just as the DOJ's campaign against international cartels was gathering steam, Adler and Laing (1997) assert that "the fines being imposed against corporate members of international cartels are staggering (p.1)", placing the blame on the "uniquely punitive" requirements of the U.S. Sentencing Guidelines.[367] Denger (2003) too decries the prevalence of excessive price-fixing fines and private settlements. He places the blame for excessive fines on the Corporate Guidelines base fine calculation (p. 3). This approach, he notes, unlike all other white-collar federal crimes, means that the actual degree of direct harm caused does not have to be proven by prosecutors.[368] Denger blames this state of affairs on a gap in the economic-legal literature: "…we have little information on what level of criminal or civil exposure is needed to deter most cartels (p.4)."

[366] Although the Gallo et al. (1994) study covers only U.S. fines, cartel fines in other jurisdictions were negligible before 1990.

[367] Adler and Laing are correct that the fining standards of the DOJ do not compute fines simply as a function of damages, but rather as a function of the company's affected commerce, which is loosely related to damages. However, these authors do not document their claim that antitrust fines are harsher than other corporate crimes. In recent years, corporate fines for fraud and environmental crimes have greatly eclipsed antitrust fines.

[368] Denger appeals primarily to an increase in settlement rates in treble-damage direct-purchaser suits to establish the unfairness of the high fines imposed on corporate price fixers, an increase that, he believes, cannot be explained by increases in overcharge rates. He cites about 8 domestic U.S. law cases that settled for 2 to 4 % of sales in the 1970s and one international case in 2001 that settled for 18 to 20% (pp. 3-4). It is argued below that settlements are inappropriate evidence of overcharges.

Concern about the lack of empirical evidence on the size of overcharges caused by price fixing is not confined solely to those sympathetic to the increased exposure of corporate defendants. DOJ official Graubert (2003) notes that the controversy over whether antitrust payments are excessive is largely attributable to the "…difficulty of gathering useful data." In a law-review article noting the sharp increase in U.S. criminal fines on international cartels in the late 1990s, Klawiter (2001) believes that these fines and other related antitrust penalties "…have substantially increased the level of deterrence in antitrust criminal cases" (*ibid.* p. 756).[369] Yet, he laments the paucity of information needed to make a more sweeping conclusion. "There are no known applicable empirical studies on the adequacy of the present mix of criminal and civil antitrust sanctions from the standpoint of deterrence" (*ibid.* note 79).

Other Jurisdictions

U.S. antitrust enforcement has been a model for many other countries that have more recently adopted such laws (Wells 2002). Germany and Japan had antitrust laws imposed on them by the U.S. occupation authorities in the late 1940s.[370] After a vigorous debate, Germany revised its competition law in 1958; it, in turn, became one of the principal influences on the adoption of a similar statute by the original six members of the European Economic Community (Goyder 1998:18-33). After four years of confidential political discussions[371] within the EEC's Commission, Regulation 17 was passed in 1962; it lays out the powers of the Directorate General for Competition (DG-COMP) to fine companies for competition-law infringements (*ibid.* p. 45). That rule sets a maximum corporate fine of 10% of the company's total sales in the year prior to the Commission's decision and specifies that the specific fine will depend on the duration and seriousness of the offense.[372]

[369] Klawiter (2000) contrasts enforcement powers in the late 1990s with the clearly suboptimal maximum fine of $10 million available to the DOJ in the 1970s and 1980s.

[370] Japan's Antimonopoly Law was seriously weakened after 1953 by a perceived need for centralized industrial planning. However, it has been reinvigorated since the 1980s by the growing influence of the country's consumer organizations and a new appreciation of the efficiency benefits of more intense market competition. Taiwan, South Korea, and other East Asian countries have adopted aspects of Japan's antitrust law.

[371] The practice at the time was for the Council of Ministers to appoint an Advisory Committee comprised of Commission civil servants to develop a report on proposed regulations of administrative practices. Although regulations whese were essentially EEC laws, the Parliament had no role at the time. The Comissioner of Competition (a German) is often credited with drafting Regulation 17.

[372] Rule 17 was amended in 2004, but these provisions were unaffected.

Harding and Joshua (2003) state that EC fines are supposed to incorporate both compensatory and punitive components, the latter meant to serve deterrence (p. 240). Methods of calculating EC cartel fines are explained in 1998 and 2006 Notices (Connor 2010a). Under the earlier guidelines, EC cartel fines were loosely related to overcharges because cartels with large damages that are geographically widespread and relatively large companies were given larger fines. Since late 2006, EC fines have been tied to affected sales in the EU, and they have become more severe. After considering a number of culpability factors, the Commission ensures that the fine does not exceed 10% of a defendant's global sales in the year prior to the date of the decision. Rarely does the EC need to worry about reaching the 10% cap.

Canada is another jurisdiction with relatively tough sentencing for cartels. The Canadian Competition Bureau (CCB) uses a fairly simple standard for setting fines. Although not spelled out in any administrative guidelines, decisions of Canadian courts have, in the absence of aggravating and mitigating circumstances, imposed fines hew closely to 20% of Canadian affected sales (Low 2004, Connor 2003).[373] A former Canadian prosecutor comments that "there has not been any economic or judicial analysis of the assumptions behind this proxy for harm that this represents…" (Low 2004:19). The Canadian 20% rule seems to mimic the base fine of the USSGs.

Overcharges and Cartel Deterrence

Concerns about the inadequacy or excessiveness of antitrust sanctions are part of the larger issue of the effectiveness of antitrust interventions. Most legal scholars accept that the fundamental objective of price-fixing laws is *deterrence*: that is, to minimize the future formation of new cartels or recidivism by previous cartel violators.

To make any headway in assessing empirically the adequacy of anticartel enforcement, analysts must have reliable information about the degree of harm generated by private cartels. Antitrust sanctions should be calibrated to cartels' overcharges. Total cartel injuries to purchasers are positively related to three economic factors: the size of the cartel's market, the duration of the conspiracy, and the percentage overcharge. Cartel deterrence can also be affected by other

[373] Until recently, under Section 45 of Canada's Competition Act, fines were limited to C$10 million, but foreign price-fixing conspiracies can be prosecuted under Section 46, which has no fine limit (Low 2004:17).

enforcement rules. Amnesty programs and general investigatory procedures can increase the probability of cartel detection or reduce the duration of cartels.

The sentencing guidelines developed in the United States, the EU, and elsewhere for fining hard-core cartels are consistent with the *optimal deterrence* standard first suggested in a seminal article by Becker (1968) and elaborated by William Landes (1983). Landes showed that to achieve optimal deterrence the damages from an antitrust violation should be equal to the violation's expected "net harm to others", divided by the probability of detection and proof [374] (Landes 1983: 666-68).

Critics of the U.S. Sentencing Guidelines suggest that their assumed average overcharges are too high. For example, Cohen and Scheffman (1989) argue that fines based on the USSGs, when coupled with civil and marketplace sanctions will cause "a serious overdeterrence problem" (p. 334). That is, they and other critics of the Guidelines believe that there is a disparity between the size of the corporate fines mandated[375] for antitrust violations and the amount of the economic injuries caused by overt price fixing. Specifically, Cohen and Scheffman argue that actual overcharges are well below the 10% level assumed in the Guidelines (pp. 343-347).[376]

During recent years their criticism has been repeated with perhaps even more intensity. For example, in a provocative essay that quickly drew rebuttals,[377] Crandall and Winston (2003) argue that extant empirical evidence demonstrates that U.S. antitrust policy has been ineffective in deterring anticompetitive conduct. To support their view that the prosecution of overt price fixing is misdirected, they cite five empirical studies of overt collusion that find no upward

[374] In 1986 the Assistant Attorney General for Antitrust, Douglas Ginsburg, estimated that the enforcers catch less than 10% of all cartels (USSG 1986: 15). If he is correct, optimal penalties for cartels should be more than tenfold damages. See also the illustration of detection probability in Landes (1983: 115 fn. 1). The percentage of cartels that are caught and proven guilty is probably higher since the mid 1990s (Miller 2009). There is, however, neither evidence nor speculation that it exceeds 33%, either historically or at present (Connor and Lande 2012: Table 3).

[375] Mandatory since their inception, the U.S. Sentencing Guidelines became advisory in January 2005.

[376] For larger price-fixed markets "…ten percent is almost certainly too high" (Cohen and Scheffman 1989: 343). They arrive at this conclusion in part by relying on evidence of price-fixing *settlements* rather than awards made after trial; because settlements are the result of bargaining under uncertainty, reliance upon settlements biases overcharge estimates downward. However, their article in internally contradictory. It cites seven to ten overcharge observations. Despite the downward bias, the median is in the range of 8% to 14%.

[377] See Baker (2003), Werden (2003), and Kwoka (2003). According to Kwoka (2003: note 2), Crandall and Winston's earlier drafts "… endorsed consideration of outright appeal of the antitrust laws."

effects on prices of conspiracies convicted in U.S. courts. In his comment on Crandall and Winston, Kwoka (2003) faults them for their "startlingly selective" body of evidence. He suggests that they should have included "… studies from any source with appropriate evaluation of their credibility" (p. 4).

There are few empirical studies of cartel deterrence. Even the most ambitious have focused on strictly national data (Connor and Lande 2012). Yet since about 1995, a large majority of the overcharges generated by cartels have been international in membership and global in their geographic impact (Connor 2001a, 2003, 2008). To assess the likelihood of deterrence in the context of international schemes, *worldwide* monetary sanctions must be considered. Connor (2012: Figures 8 and 9) summarizes a large data set on the severity of penalties on global cartels during 1990-2010.[378] He finds that total monetary penalties worldwide average about 11% of affected sales (higher in North America and the EU, lower elsewhere). Penalties disgorge at most 40% of the worldwide overcharges generated.[379] Given that the odds of being caught are less than 100%, optimal deterrence requires cartel sanctions to be somewhat punitive. That is, disgorgement must exceed 100% of overcharges. Because it does not, punitive sanctions are the exception not the rule for illegal international price fixing. Clearly, information on both damages and penalties are needed on a worldwide basis.

In sum, there does indeed seem to be a broad consensus among legal and economic writers that the question of the optimality of price-fixing penalties turns mightily on the actual degree of harm caused by cartel conduct, and that not enough is known about this issue. Moreover, even if the creators of the USSC Guidelines were correct that in the 1980s cartels generally raised prices by 10%, the harsher cartel sanctions imposed more recently could mean that this presumption is no longer justified. The contents of this paper could provide a factual foundation for dialogs on optimal deterrence and rational anticartel policies.

[378] Severity for non-global cartels with international membership is similar but lower in every jurisdiction (Table 7).

[379] If adjusted for inflation and the time value of money, the 40% figure would be reduced by 20% to 40%.

LITERATURE OVERVIEW[380]

This paper was prepared by examining approximately 1500 social science publications and legal documents.[381] Of these, 524 contained usable quantitative overcharge estimates.[382] The major portion of the overcharge estimates included in this paper is taken from books, book chapters, conference proceedings, or papers published in economic, historical, and legal journals whose readers and contributors are mainly academics. The great majority of these publications are peer reviewed. A minority of the estimates are taken indirectly from newspapers, magazines, and similar journalistic outlets; from reports issued by governments; from academic working papers; and from decisions rendered by courts or antitrust commissions. This section focuses on the evolution of social-science concepts about cartels and their price effects.

Early Cartel Studies in Brief

Adam Smith (1776) has a claim as a founder of industrial-organization economics. He explicitly examined business collusion, which he called "a conspiracy against the public." From 1880 to 1920 there was vigorous debate in the economics profession over public policies to address market power, market regulations, and the "trust problem" (Martin 2007). However, these discussions were hampered by the nearly exclusive reliance of the economics profession on the models of pure competition and monopoly.[383] What changed in the 1930s was the development,

[380] This section section summarizes a fuller treatment of the conceptual development of the concept of and empirical study of cartels by economists contained in Connor (2013b), which is itself a revised and expanded version of Connor 2007b: 65-72 and 129-135)

[381] Almost half of the publications seemed promising, but ultimately contained no useful information.

[382] The References section below lists about 780 sources with useful information about private cartels. The 514 unique citations used for quantitative overcharge estimates are listed in Appendix Table 2.

[383] The exclusive attention to the theories of perfect competition monopoly, and perhaps monopolistic competition (and the absence of oligopoly) prior to the 1920s is illustrated by the dominance of the English-language microeconomics textbook of Alfred Marshall (1890). However, a few oligopolistic topics are treated in Marshall's largely empirical *Industry and Trade* (1919).

slow at first, of conceptual models of oligopoly (*ibid.* pp. 6-11).[384] At that point the sub-field of industrial economics was born and flourished.

Cartel studies spent 70 years being practiced before it had a name. The empirical economics literature on cartels up to the 1940s is characterized by a groping towards a conceptual understanding of the nature of private cartels and the first tentative steps toward quantitative evaluation of the market effects of overt collusion.

Formal economic studies of cartels began in Germany in the 1870s; books and articles written in German continued to dominate the literature up to the 1920s. Among German scholars, the ideas of Smith, Ricardo, and the other classical economists spread only slowly during the early 19th century (Gerber 1998: 81-88). While the core concepts of classical economics continued to be accepted, during the late 19th century the "historical school" came to dominate the scholarship of German academic economists. The historical school emphasized the importance of unique temporal and institutional factors in explaining empirical phenomena; it consciously rejected abstract theories as a guide to empirical studies. Cartels were usually seen as an inevitable response to historical overproduction. Despite their understanding of the monopolistic tendencies of cartels, evaluation of cartels was almost solely from the producers' perspective rather than consumers' interests. Especially influential was the German economist Liefmann (1897, 1932). His concept of a cartel as a voluntary, contractual association of independent firms intent on profit maximization[385] and monopolistic control of a market became the accepted definition.

An unfortunate legacy of the German historical school of cartel studies was its view that gauging price effects was either fruitless or impossible, a presumption that discouraged Continental European economists from attempting to estimate overcharges until the late 20th century.[386] However, U.S. social scientists inherited a more pragmatic tradition driven by an awareness of

[384] Although Cournot's oligopoly model was published in 1838, it was more than 100 years before it was rediscovered (Martin 2007).

[385] An issue among economists up to the 1940s was whether cartels raised average prices in a manner consistent with monopolies or whether cartels simply stabilize price movements with no net increase in prices. Liefmann was in the minority that accepted profit maximization as the goal of a cartel.

[386] Unlike most of his colleagues, who believed that price or output stabilization were the objectives, Liefmann accepted that raw-materials cartels typically did raise prices. However, Liefmann considered the price effects of industrial cartels an open question. While most of his contemporaries considered such calculations impossible, Liefmann took the position that precision was difficult because of simultaneous changes in demand and supply. The lack of attention to estimates of price effects may also have resulted from an absence of cartel suits in German courts.

the country's new antitrust law, which was passed in 1890 after a long debate that highlighted the negative effects of cartels on small businesses. Court decisions interpreting the Sherman Act in the early 1900s stimulated further scholarship on cartels. As a result, most quantitative estimates of overcharges made prior to 1945 were produced largely by American social scientists.[387]

Some highlights include Jenks' (1888) path-breaking analysis of the Midwest salt cartel; Jones' (1914) book on the anthracite coal industry; Edgerton's (1897) superb analysis of price effects of a short-lived but highly effective international cartel, the U.S. Wire Nail Association; Andrews (1889) sketch of what is quite possibly the world's first *global* cartel, the Secrétan copper syndicate of 1887-1889; and Stevens' (1912b, 1912c) study of the convicted Gunpowder Trust, notable for focusing on what was believed to be the longest-running discovered cartel in the Nation's history (it lasted 35 years, of which 17 were illegal).[388]

In the decade after World War I, hundreds of cartels were established (or re-established) in a wide range of commodities and industrial products, gaining control if nearly half of world trade in the 1930s. Nearly all of them operated in the open. Contempoary scholars now regard the Inter-War era as something of a Golden Age of Cartels. Yet, exceedingly little published work by professional economists dates from this era.

Post-World War II Cartel Studies

During and immediately after World War II, a surge in publications examined the roles of cartels in international trade and in war production. Hexner (1946) produced the most comprehensive economic study of international cartels yet published. Hexner had an insider's knowledge of cartels (Barjot 1994: 65). Marlio (1947), a French economist who wrote a detailed account of the international aluminum cartel, was also a cartel manager (*ibid.* p. 66). Both of these authors

[387] An interesting exception is the book on Australian trusts by Wilkinson (1914), which grew out of that colony's 1906 federal competition law modeled on the U.S. Sherman Act (Shanahan and Round 2008). However, the law's requirement that collusive conduct had to be proven to have been to the "detriment of the public" lead to confusion in the courts.

[388] The current world champion for endurance is the *Indo-Ceylon-Pakistan Shipping Conference*, which was established in 1875 and dissolved by the Competition Commission of India in October 2008 – a life of 134 years (Connor 2009b).

found much to admire in international cartels, whereas post-war works by American authors tended to be distinctly more skeptical, if not hostile regarding the economic and political effects of the interwar cartels (e.g., Berge 1944, Edwards 1946).

Perhaps the first publications to attempt to quantify systematically the price effects of cartels were a pair of books produced by a team of economists that had access to information handed over to investigators of Congressional committees and to criminal court proceedings (Stocking and Watkins 1946, 1948).[389] These books were the culmination of eight years of study by a team of economists.[390] They set a new intellectual standard for the economics literature on cartels, because they were the first to apply rigorous modern concepts of the emerging field of industrial economics; because of access to ample quantitative information spawned by numerous Congressional investigations, the Federal Trade Commission, and law suits; and because they were among the first to focus on the market effects of international cartels.[391] Numerous and continuing citations to their books by leading contemporary scholars attest to their status as seminal works and classics in the field (Mueller 2007: 188).

The increasing evidence of negative impacts of cartels during 1920-1945 began to bring about a reappraisal of cartels among Europeans just after World War II. In Germany there was a healthy parliamentary debate over its cartel laws in 1951-57 (Wells 2002:165-74, Gerber 1998: 270-277). Through the early 1950s, a majority of the UK's manufacturing output was affected by cartels (Symeonidis 2002, Swann et al. 1974). A long series of empirical studies by the Monopolies Commission investigated the structure and performance of British industries and made recommendations to the government about restrictive practices, dominant firms and

[389] Stocking and Watkins had access to the results of a number of major investigations. The Temporary National Economic (or "Kilgore") Committee published its hearings a few years before their books were published (U.S. Congress 1938-1940). Other Congressional committees investigated the munitions industry and patent pools. The authors also had information on U.S. criminal prosecutions by the Justice Department of more than 40 international cartels.

[390] Stocking appears to have had overall leadership of the team. George W. Stocking was a professor at the University of Texas during 1926-47. He was appointed as the economic advisor to the new U.S. Attorney General Thurman Arnold in 1938. Stocking served as the co-chair of the Consent Decree Section of the DOJ through at least 1943 (Mueller 2007: 187-188). It was in the early 1940s that the DOJ investigated the many international cartels that would be formally indicted by the DOJ in 1944-48. As there were few if any economists employed by the DOJ, Stocking played a role something like the first Chief Economist of the DOJ. Stocking mentored many students who became leaders in the fields of industrial organization economics, including my mentor Willard F. Mueller (Anon. 1976, Marion 2007).

[391] Technically, because one of the defendants was British American Tobacco, the 1911 conviction of American Tobacco *et al.* was the first U.S. prosecution of an international cartel.

mergers.[392] By the late 1950s, anticartel legislation was adopted in the UK that placed the burden of proof on cartels to prove the economic benefits of their price fixing and related conduct. Germany was the prime mover behind the adoption of tough anticartel provisions in the Treaty of Rome, which solidified the antitrust tradition in the EU and its Member States.

In the second half of the 20th century relatively few books were written about the empirical economics of cartels, but there have been three brief periods of interest. First, there was intense but short lived U.S. attention to domestic cartels when the "Great Electrical Equipment Conspiracy" burst onto the Nation's consciousness in 1960-1961.[393] The great electrical equipment conspiracy resulted in the release of more publications in a few years than any other single historical event since the beginning of cartel literature. The scope of the conspiracy, the fame of the leading companies involved, and the U.S. Government's aggressive prosecution of the violators – all these factors lead to a degree of public fascination and publicity about an antitrust action not seen since the Supreme Court decisions against the Standard Oil and American Tobacco trusts in 1911.[394] Several trials provided unusually detailed pictures of the cartel's organization.[395] This cartel has become a standard example in textbooks in industrial organization (e.g., Carlton and Perloff 1990).

Second, there was a brief revival of interest in international cartels after 1973 when the Organization of Petroleum Exporting Countries (OPEC) first used its power to raise crude petroleum prices.[396] Some economic studies tried to predict OPEC's staying power by studying previous international cartels.[397] Griffin (1989), who has several cartel studies to his credit, specifies a formal cartel model which allows for a fringe of competitive, non-cooperating

[392] I found 22 of these reports had useful overcharges estimates.

[393] When the guilty pleas were receive in the Philadelphia U.S. District Court in early 1961, nearly every daily newspaper in the United States placed the events on their front page.

[394] The conspiracies are notable for their duration (up to 40 years), the as yet unsurpassed size of the sales involved ($7 billion per year in the late 1950s), the large number of well known companies involved (General Electric, Westinghouse, etc.), the size of the fines imposed (over $2 million), the size of the damage awards in three trials and private settlements ($400 to $500 million) from more than 1900 suits, and the imposition for the first time of significant prison sentences for several top executives.

[395] Works about the conspiracy include at least six monographs (Herling 1962, Smith 1963, U.S. Congress 1965, Sultan 1975, Epstein and Newfarmer 1980, and Bane 1973). In addition, three journal articles were devoted to the cartels (Kuhlman 1972, Finkelstein and Levanbach 1983, and Lean *et al.* 1985).

[396] I do not include OPEC in this survey because it was created and enforced by a multilateral treaty organization.

[397] George W. Stocking wrote a non-technical study in 1970 of the oil industry, *Middle East Oil*, that his biographer calls "prophetic" (Anon. 1976: 454).

producers outside the cartel. From this theoretical model, Griffin derives a simple empirical model that explains variation in the Lerner Index[398] of market power for a large sample of cartels.

Third, scholarship seems to have been stimulated by the large number of well publicized, U.S. and EU prosecutions of global cartels that commenced in the mid 1990s. Many of these cartels were organized by some of the world's most recognizable multinational companies. The first global case in decades in both jurisdictions was *Lysine,* which was capped in the United States by a notorious 1998 criminal trial of three executives of the Archer Danieal Midlands Co. The trial record provided a degree of testimonial evidence which is unique for international cartels discovered after World War II (Lieber 2000, Eichenwald 2000, and Connor 2007b). EC decisions have become major sources of information about contemporary cartel conduct (Harrington 2007).

After about 1973 many empirical analyses of cartel effects began to appear in professional academic journals. The shift away from monographs to journal papers is remarkable. Of the 125 journal papers in this survey with useful overcharge information, 88% were published after 1973.[399] While a few are historical narratives, the later articles tend to focus on statistical tests of theoretical hypotheses or demonstrations of the superiority of a novel estimation technique. In general, these journal papers supplied only about one-fifth of the estimates in the vast literature in economics that measures the price effects of cartels. It is small because external information is needed to identify markets in which sellers overtly colluded from the much larger number of markets characterized by presumptively tacit collusion. These papers for the most part depend heavily on statistical methods of analysis. Around the early 1970s, statistical methods started to

[398] The Lerner Index is also computed by starting with the *dollar overcharge* in the numerator, just as one calculates the overcharge rate, except that the Lerner Index is measured by dividing the overcharge by the monopoly price instead of the competitive benchmark price. That is, the Lerner Index is a *margin* on the collusive selling price, while the overcharge is a *mark-up* on the competitive benchmark price. Thus, for the same cartel the Lerner Index is a smaller number than the overcharge ratio, though the differences are small for small overcharges.

The Lerner Index is L = (P-C)/P, where P is the observed market price and C is the but-for or competitive price. Because C is equal to marginal cost in competitive equilibrium, L is also a profit *margin* on sales. L is zero in perfectly competitive markets and has a maximum value of one. The monopoly overcharge is a *mark-up*: MO = (P-C)/C. MO is also zero in perfectly competitive markets, but can approach positive infinity when C is very small. Because P is always greater than or equal to C, MO is greater than L whenever L is positive. If the but-for scenario is perfect competition, the simple algebraic substitution allows one to express MO as a function of L, viz., MO = L/(1-L). Alternatively, L=MO/(MO+1). If, however, the but-for state of competition is effective noncooperative oligopoly, then the overcharge conversion will overstate the Lerner Index (Boyer and Kotchoni 2012). For that reason, we include Lerner Indexes in the sample of overcharges *without conversion.* This will cause averages of overcharges to be understated.

[399] In addition to journal articles, this study draws upon numerous working papers of economists, many of which became journal papers.

become standard for prooving cartel damages (Finkelstein and Levanbach 1983). Other important sources of scores of overcharge estimates are the decisions of courts and competition-law commissions, most published since 1990.

Quantitative Estimates of Cartel Overcharges

Most cartel studies published in academic journals since 1974 use econometric methods to estimate overcharges. The first published work that uses econometrics to estimate a cartel overcharge is Sultan's (1974) analysis of the U.S. electrical equipment conspiracy of the 1950s.[400] Fisher (1980) and Finkelstein and Levanbach (1983) show that econometric evidence of price fixing was being presented by experts in U.S. civil trials as early as 1970. Econometric evidence on monopoly overcharges was also published to critique government-enforced compulsory cartels; Kwoka (1977) is the first of many analyses of the price effects of agricultural marketing orders. However, quantitative analyses of the size of *buyers'* cartels' undercharges are rare; Daggett and Freedman (1985) seem to have been the first to publish such a study. Sophisticated econometric modeling has spread into historical studies of cartels: a notable pair of studies by Hausman (1980, 1984) examines two UK coal markets from 1699 to 1845 and Levenstein (1997) analyses the century-old bromine cartel. Genesove and Mullin (2001) is a rare example of a widely cited cartel study in a leading journal that does not employ statistics.

A new development in the cartel literature was the statistical analysis of auctions and bid rigging, much of it inspired by the urge to test game-theoretic notions (Porter 2001 surveys this literature). Howard and Kaserman (1989) study collusion in public tenders for sewer construction; Froeb *et al* (1993) federal-government procurement of frozen fish; Brannman and Klein (1992) state road-building contracts; and Lee (1999), Porter and Zona (1999), and Pesendorfer (2000) school-milk procurement. These studies were made possible by U.S. "freedom-of-information" laws that mandate public access to bids for public project tenders. Although such laws exist outside the United States, few have been used there to obtain data on bid rigging of public tenders.

Novel methods continue to be applied to estimating cartel mark-ups. There is substantial work focused on understanding cartel stability from which price effects can be derived. Grossman

[400] He does not say, but Sultan's work may have arisen from a consulting project for the defendants.

(1996) looked at the 1851-1913 railroad express delivery market, and several have studied the 19th century Joint Economic Committee railroad cartel (Porter 1983, Briggs 1992, and Ellison 1994). Bajari and Ye (2003) applied the Baysian statistical method to a U.S. seal-coating conspiracy. Clarke and Evenett (2003) apply a trade model to importing countries to estimate price increases during the 1990's bulk vitamins cartel. Dynamic estimation methods have begun to yield insights into cartel conduct (e.g., de Roos 2006).

Surveys of Cartel Price Effects

Given the importance of the topic for legal-economic discourse, there have been surprisingly few compilations of the empirical findings of cartel overcharges. Economics textbooks devote limited space to the subject.[401] I have been unable to find any research publication that has as its *principal* aim collecting or analyzing information on the price effects of overt collusion. However, I have found seven works that mention a significant number of studies of mark-ups due to overt collusion. The overcharges are assembled as a prelude to scholarly research or policy analysis, not as an end in itself; none claims to be a comprehensive survey.

The seven brief surveys are summarized in Table 1. They report on overcharges from 127 to 129 cartels, most of which operated in the Inter-War era. The median average mark-up is 27.1% and the mean average is 32.4%.[402]

[401] Of the leading textbooks in industrial organization, Carlton and Perloff (1990) devote more space to cartels than most – almost 50 pages out of 852 total pages. This work mentions by name 60 cartels, most of them interwar, international cartels. Other textbooks have far fewer numbers of cartels cited.

[402] Thirty-nine observations are Lerner Indices, not overcharges. If competition is assumed and the indices aer converted to overcharges, the averages raise to 38.9% and 53.2%, respectively.

GENERAL DESCIPTION OF THE SAMPLE

Technically, the *observed* cartel overcharges collected for this paper are a sample of a larger population of cartel overcharges, both seen and unseen. The *unobserved* overcharges are the vast majority of the total for two reasons. First, since about the middle of the 20th century (and earlier in the United States) most cartels are clandestine. The great body of expert opinion is that in the past few decades fewer than one-third of all cartels are discovered by antitrust authorities (Connor and Lande 2012: Table 1). Second, among those cartels that never hid themselves or that were discovered by antitrust authorities, sufficient price data were unavailable (or of no interest to the writer) for roughy half or more.[403] Thus, the sample of overcharges in this paper, while quite large, is no more than one-fourth of the total of all cartel overcharges.

Because the sample of observed cartels may be different in some respects from the total population of all cartels, the features of the sanple about to be described may be subject to "selection bias." Only samples that are selected randomly from a list of the whole population are fully representative of that polulation, but that process is not possible in the case of cartels. Fortunately, a recent study from Germany suggests that selection bias may be minor. Haucap et al. (2010) compared all illegal cartels with state- or fedeal-authorized German cartels during 1958-2004, hundreds of the latter being permitted for a wide range of reasons.[404] In terms of

[403] Of the published cartel studies that I found from the periods when cartels operated openly (and for some export cartels up to the present time), about half were discarded because they contained no usable price data. In the *Private International Cartels* data set, which is comprise entirely of discovered cartels since 1990, for only about one-third can overcharges be obtained or computed.

[404] Of the 360 cartels operating in 2004, 17% were permitted to set conditions of sale, 66% could set domestic quantities or prices, and 15% were export cartels.

industry distribution, the legal cartels had a greater share in mining, textiles, machinery, and metals manufacturing than did illegal cartels. Surprisingly, there was virtually no difference in the average number of firms per cartel between the two types. The major difference was was that the median duration of legal cartels, having state support, was 2.75 times the illegal cartels, and legal cartel with few members or in the food industry tended to be the most durable (ibid. p. 18). What Haucap et al. (2010) suggest is that the cartels sampled for this study may well be representative of all cartels, except for their endurance.

The data are organized according to *three levels of analysis*: markets, episodes, and overcharge estimates. By "market" is meant the industry or product that was subject to price fixing.

(1) Markets are precisely self-identified by the participants in the conspiracy, though occasionally there are alternative names for the same market.[405] The name of the market is eponymous for the cartel. The range of cartelized markets is impressive.[406]

(2) Episodes, discussed more fully in the Data Appendix, are distinct periods of collusion separated by price wars, temporary lapses in agreements, or changes in cartel membership or internal organization. Episodes may be adjacent in time or may be separated by significant gaps of time.[407] The markets marked by adjacent multiple episodes will typically be regarded by antitrust law as one infraction, but as economic phenomena as multiple cartels. Because there are sometimes multiple publications about the same episode and because a single analyst will sometimes apply alternative methods of estimation, this paper often records several estimates for a single episode.

(3) Overcharge estimates are the most numerous and detailed level of observation in this study. Each episode will in principle have one true "average" (episode-long) overcharge and one "peak" overcharge.[408] After examining the distribution of the three levels in this "General Description" section, I find that the three result in similar information. Thus, most of the analyses in this paper will use overcharge estimates as the units of observation.

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[405] For example, the "nitrogen" cartel is in fact dry salts of nitrogen used as fertilizer, not the gaseous form. The hugely successful "vitamins" cartel is best regarded as a series of overlapping ventures, each of which focused on one of 15 products.

[406] There is no limit on the types of goods and service cartelized. Even spiritual services can become cartels (Axarloglou et al. 2012).

[407] Episodes are in principle different from phases of cartels that give rise cartels instability. Episodes mark changes in cartel *organization*, whereas stability is measured by changes in the degree of cartel *discipline or cohesiveness.*

[408] In the rare instances where a cartel kept the market price absolutely constant for the whole episode, the two overcharge concepts collapse to the same number.

Number of Cartelized Markets

My search yielded useful overcharge or undercharge information on cartels that operated in **532** markets (Table 2). If one group of sellers decided to fix prices of a product in one geographical region and a different group colluded on the same product in a separate geographical region, these may be counted as two markets. Of the 532 markets, 55% were cartelized by international agreements, where "international" describes the membership composition of the cartel and not necessarily the geographic spread of the cartel's effects. Some international cartels affected directly the commerce of only one nation, though the vast majority was international in a geographic sense as well. National-membership cartels account for the remaining 45% of the cartelized markets.[409] In this category I count some purely national price-fixing cartels that were formed for the sole purpose of controlling a nation's export sales of a particular product; in the United States, these export cartels[410] are called Webb-Pomerene Associations. In addition, some domestic cartels had side agreements with international cartels that protected their domestic market from exports from the international cartel's members.

One-third (34%) of the sample consists of markets affected by bid-rigging cartels (Table 2).[411] Although many cartels have some sales to government entities or industrial customers that purchase by tenders, these cartels are explicitly described to have been principally or exclusively engaged in bid rigging. The proportion of bid-rigging schemes in the sample is probably underestimated because some sources did not always provide enough detail on the cartels to be certain of the degree of bid rigging. Recall that the U.S. sentencing guidelines assume that bid rigging leads to higher overcharges than otherwise identical conspiracies. The remaining 66% of

[409] A few markets were cartelized by both types; typically, a domestic cartel was expanded to respond to foreign competition. The potash cartel is one example; originally German, it became international shortly after World War I because after World War I potash mines in Lorraine became part of France. A joint Franco-German scheme was established to regulate world exports. Thus, after 1918 the two jointly administered national potash cartels became counted as international; however, the earlier pre-1918 domestic German episodes are classified as national.

[410] Of course, if an export cartel is composed of companies drawn from two or more countries, then this cartel is categorized in this study as international. Some contemporary export cartels registered in Germany contain companies from several European nations. Price-fixing export cartels maintain the fiction that their activities do not affect prices in the "home country." Most export cartels cooperate on merchandising or other non-price matters. For a survey of export cartels, see Levenstein and Suslow (2004b).

[411] In Europe, bid rigging is generally referred to as collusion involving "tenders."

the cartelized markets may be called "classic" price-fixing cartels, those that set market prices and/or market quotas for each or its members.[412]

Cartels may profit by attempting to either raise selling prices of their outputs or suppress the prices of their purchased inputs. Buyers' cartels are often overlooked in the literature. I find that 6.4% of the cartels buyers' cartels; that is, one out of ten of the price-fixing cartels fixed the prices of their inputs, not their outputs. This ratio is likely to be higher than many experts would have expected.

Three-fourths of the cartels (75%) were found to be in violation of antitrust laws by at least one legal body.[413] Sometimes these are called "discovered" or detected cartels. The determination of guilt or liability may take the form of guilty pleas (or *nolo contendere* in U.S. courts up until the early 1960s); of a decision at trial by judge or jury; of a commission decision to impose fines, consent decrees, or other sanctions; of the payments of civil penalties; or of negotiated settlements by defendants in a suit. Eighteen percent of the remaining cartelized markets are known or believed to be "legal," because they operated prior to the enactment of antitrust laws in the jurisdictions in which they functioned or because they were organized and registered under antitrust exemptions, such as export cartels or ocean shipping conferences. About 7% of the cartels may be described as "extra-legal" because there was nothing in the case material indicating that they were punished by an antitrust authority.

Who ran these cartels and where did they function? Regarding membership composition, the largest number (187 or 35%) hail from Western or Central Europe, of which about 40% were comprised of companies from a single European nation. The next highest number is North American cartels (165 or 31%), followed by Asian (16.5%), and rest of the world (ROW = 3.8%). The final category is one that will loom large in the discussion below – global cartels. These are the 70 cartels (13%) with at least two members from from different continents, though typically North America, Western Europe, and East Asia are represented.

[412] Only a small number of cartels were oligopsonies.

[413] Counted in this category are criminal convictions; adverse decisions of the UK Monopolies Commission, which made recommendations to the government similar to consent decrees; adverse decisions of the European Commission and similar civil authorities; and those cartels that paid court-approved damages. A few unfinished probes by antitrust authorities are placed in this category because 96% of these investigations yield convictions. Since 1990, virtually all the cartels in the sample are guilty; prior to 1990 the ratio is below 60%.

The loci of operatons is somewhat different (Table 2). The large majority of price fixing by cartels (80%) is directed within the boundaries of a single national jurisdiction (and one-fourth of that is more localized. The rest involves cross-national operations (and more than half of that is global). The largest single geographic category (34%) is North American cartels – those operating in the United States, Canada, or both markets. The second largest geographic group (27%) is cartels that functioned in only one nation in Western Europe; if these are combined with trans-EU cartels, then Western Europe is the largest continent with 35.1% of the sample. Global cartels (trans-continental cartels) comprise merely 12% of the sample; these tended to fix prices in North America, Western Europe, and Asia. Asian and ROW cartels (20%) tend to be domestic schemes populated by local companies.

The apparently heavy location of cartels in only two continents is somewhat misleading. It is an artifact of the relatively early enforcement of anti-cartel laws in North America and Western Europe, giving rise to numerous well documented cartel cases that could be studied by academics in those regions. The numbers likely understate cartel activity in Asia and the ROW. Going forward, cartel numbers are more likely to reflect the geographical distribution of antitrust convictions and the local capacities to analyze the cases.

Number of Episodes

A more precise way of accounting for the distribution of cartel activity is by counting cartel episodes rather than whole cartels. This term *episode* is commonly used in modern cartel studies. If a cartel had more than one episode, then each episode is marked by a change in membership composition, the terms of the collusive agreement, method of management, geographic focus, or other major organizational innovation.[414] In other words, when a cartel is re-formed, it adopts a new organizational configuration. The end of an episode is often instigated by expansion of fringe sales, by an intolerable level of cheating by cartel members, or by the appearance of a new process or product technology that redefines the market boundary. Between episodes, pricing discipline often breaks down; for some of the cartels the interregnum is a period of contract renegotiation. The inter-war global aluminum cartel, for example, went through six distinct

[414] Because of the multiple dimensions that must be assessed, it is not unusual for experts to differ on the dates of cartel episodes.

phases from 1901 to 1939 that sometimes were adjacent in time and sometimes were several years apart. This heavily researched cartel has 28 overcharge observations (Appendix Table 2).

The total number of episodes is undercounted. Some single episodes reported are in fact averages of groups of episodes. For example, one episode summarized the results of 109 bid-rigging convictions in numerous distinct fluid milk markets of the Southeastern United States that occurred within a few years of each other (Lanzillotti 1996). Each of the 109 convictions should be counted as a separate episodes because each conviction represented a distinct buyer. Similarly, the long-running *Dutch Construction* cartels involved tens of thousands of rigged bids, and the contemporary *Auto Parts* super-cartel encompasses more than one hundred parts and separate schemes for each part directed at several major auto manufacturers (Connor 2013a).

For 49% of the cartels found, only one episode was reported. The *Bulk Vitamins* cartels had 78 episodes, or about five for each vitamin product. The most impressive single-product cartel was the *Newcastle Coal* cartel, for which 22 distinct episodes were recorded during its impressively long life from 1699 to 1845. An additional 17 cartels have had five or more episodes, most of them global commodity cartels.

Table 2 shows several key characteristics of cartel episodes (cf., Table 1). They are generally distributed in a similar fashion to the cartels themselves. International cartels tend to have more episodes than non-international cartels, and this is especially true of geographically global cartels. So, while global cartels comprise only 13% of the sample, their episodes are 27% of the sample. On the other hand, bid-rigging cartels (34% of the sample) tend to have single episodes written up (24%).

Number of Episodic Overcharges

While many cartels have only one overcharge estimate, there are multiple overcharge estimates for a large minority of the markets. Consequently, for three reasons there are many more overcharge estimates than the number of cartelized markets.

First, about half of the markets experienced multiple phases or "episodes" for which the price effects differed. This term is commonly used in cartels studies. If a cartel had more than one episode, then each episode is marked by a change in membership composition, the terms of the collusive agreement, method of management, geographic focus, or other major organizational innovation. In other words, when a cartel is re-formed, it adopts a new organizational configuration. The end of an episode is often instigated by expansion of fringe sales, by an intolerable level of cheating by cartel members, or by the appearance of a new process or product technology. Between episodes, pricing discipline often breaks down; for some of the cartels the interregnum is a period of contract renegotiation. The inter-war global aluminum cartel, for example, went through six distinct phases from 1901 to 1939 that sometimes were adjacent in time and sometimes were several years apart. This heavily researched cartel has 28 overcharge observations (Appendix Table 2).

The present study's sample consists of **1530** cartel episodic overcharges (Table 3). In the simplest and most common situation, a cartel has only one episode. However, about half of the markets experienced multiple phases or episodes; they had an average of about six episodes.

This term *episode* is commonly used in modern cartel studies. If a cartel had more than one episode, then each episode is marked by a change in membership composition, the terms of the collusive agreement, method of management, geographic focus, or other major organizational innovation.[415] In other words, when a cartel is re-formed, it adopts a new organizational configuration. The end of an episode is often instigated by expansion of fringe sales, by an intolerable level of cheating by cartel members, or by the appearance of a new process or product technology that redefines the market boundary. Between episodes, pricing discipline often breaks down; for some of the cartels the interregnum is a period of contract renegotiation. The inter-war global aluminum cartel, for example, went through six distinct phases from 1901 to 1939 that sometimes were adjacent in time and sometimes were several years apart. This heavily researched cartel has 28 overcharge observations (Appendix Table 2).

Researchers usually report the *average* price increases over a whole episode or a representative portion of it. Episodic averages are the measure most relevant for forensic purposes and are the measures that will be the focus of most analyses in this paper. Many, probably most episodic overcharges are conservative numbers.[416] In some cases, the episodic prices are carefully

[415] Because of the multiple dimensions that must be assessed, it is not unusual for experts to differ on the dates of cartel episodes.

[416] Sometimes authors report monetary overcharges along with affected sales, in which case a true calculation of the percentage overcharge can be made (i.e., one that calculates the denominator by subtracting the dollar overcharge

weighted by the sales in each year or month of the episode, but in most cases the authors give equal weights to the price changes in each sub period during the total affected period. Sometimes it is not clear from the source whether the averages are weighted or unweighted; if the conspiracy period is marked by steady slow market growth, it matters little which is reported. Less commonly, some authors report *minimum* overcharge estimates. To be conservative, all minimum estimates are counted as episodic averages.[417] If analysts give minimum and maximum estimates, I employ the center of the range for calculation purposes.

The distribution of episodic overcharges across types of cartels is shown in Table 3. In general, that distribution is similar to the distribution of cartelized markets across cartel characteristics (cf., Table 2). International cartels tended to have above-average number of multiple overcharges than did domestic ones and bid-rigging cartels lower. However, *global* international cartels really stand out with six to eight overcharges per cartel on average. The number of overcharges per market does not vary significantly across other type categories. Therefore, international cartels seem to be uniquely able to fall apart and reform, often with better internal organization than before. This ability to renew and generate new episodes is a major factor that accounts for their longevity.

Two kinds of cartel mark-up data are available: *episodic* and *peak.* Peak overcharges are interesting because they indicate the effectiveness of cartels when internal and external conditions are briefly optimal. Comparisons of the two measures will be made in the "Peak Overcharges" section below.

Defining Time Periods of Analysis

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from affected sales). More commonly, authors provide a percentage overcharge that is *understated* because they divide the overcharge by total affected sales during the episode. Readers often are in the dark as to which method of calculation is used.

[417] I have preserved these ranges in the appendix tables of Connor (2004b), but have used the midpoints of the ranges for the tables in this paper. The median ranges, if any, are quite narrow.

One of the advantages of this sample is the broad time span of the data collected – more than three centuries.[418] To simplify exposition, tabulations are organized into seven time periods. The seven periods were selected to represent different antitrust regimes in the United States and abroad.[419] In addition, the periods correspond roughly to the major changes in the relationship of antitrust jurisprudence to economics (Kovacic and Shapiro 2000).

(1) *Before 1890.* The era up to 1890 is an obvious first period because of the enactment of the Sherman Act in the United States and the 1889 Anti-Combines Act in Canada. Prior to 1890, no effective antitrust statute had been passed, mainly because of weak sanctions.[420] Except for a few export-trade cartels, international cartels were rare.
(2) *1891-1919.* During the early decades of the 20th century, numerous U.S. court decisions made the scope and power of the U.S. anticartel law apparent to lawyers, enforcement officials, and business persons in the United States (Wells 2002).[421] This period marks the emergence of significant numbers of international cartels. The year 1919 is chosen as a break point because it represents the end of a period of intense interest by economists and U.S. antitrust activism. Because of World War I during 1914-1919 nearly all international cartels, a few of them with U.S. corporate members, ceased operating. Many of the prewar cartels were re-established after 1919, but in the majority of instances without the active participation of U.S. firms.
(3) *1920-1945.* Despite the appearance of hundreds of truly international cartels, during the Inter-War period U.S. antitrust enforcement retrenched as did the empirical writings of economists. The year 1945 is another logical break point. During 1939-1945 nearly all of the interwar international cartels became infeasible and were disbanded; moreover, wartime price controls and cost-plus government contracts made cartels superfluous. Scores of U.S. criminal prosecutions of international cartels during 1943-1947 clarified for U.S. firms the illegality of many more subtle forms of cartel participation, such as patent pools, cross-licensing of technologies, and the creation of overseas subsidiaries as loci for cartel participation.
(4) *1946-1973.* The post-World War II era is characterized by the emergence of industrial-organization as a separate discipline within economics, of rapid advances in empirical methods of analysis, and of the adoption of effective anticartel laws outside of North

[418] One rather rough estimate from the 4th century BCE Ancient Greece is also included. For a narrative of this interesting case, see Connor (2007c: 32-33).

[419] They are also convenient to chart changes in the historical views toward cartels and in methods of analysis. For example, the constant-cost method was popularized around 1890, and econometric modelling of overcharges in the early 1970s.

[420] There were written laws against price-fixing in ancient times (Assyria, for example), in 15th century England, and in revolutionary France. None is known to have been effective against private hard-core cartels. The Canadian Statute was largely ineffective until a 1986 revision (Low and Halladay 2011).

[421] But few economists. The first time the Supreme Court took notice of the work of economists was in the 1925 *Maple Flooring* decision (Kovacic and Shapiro 2000:47).

America. Kovacic and Shapiro (2000) note that in the United States by the 1940s "…there was considerable consistency between judicial decisions and economic thinking…" (pp. 51-52). Moreover, the vast expansion of higher education in North America and Europe brought about a parallel expansion of the economics profession as a whole and, consequently, an acceleration in the total resources devoted to theoretical modeling (particularly after 1980) and related empirical testing on collusion.[422] While econometric methods began to be offered as evidence in U.S. courts around 1970, 1974 was the year the first econometric analysis of an overcharge appeared in a published work.

The transition years 1945-1973 correspond with four relevant changes in anticartel enforcement. First, the antitrust idea became firmly implanted in the laws of countries outside North America for the first time: Germany and Japan in 1947, the United Kingdom in 1956, and the European Economic Communities (EEC) in 1958. Second, the European Commission (EC), the administrative arm of the EEC, after a decade of registering cartels, successfully prosecuted its first cartel in 1969. Third, U.S. price-fixing enforcement penalties became significantly more severe in 1974. A change in U.S. anticartel legislation was the 1974 law that made price fixing a felony, thereby lengthening maximum individual prison sentences and strengthening the bargaining power of the DOJ.[423] Class action suits became far more common by the mid 1970s because of changes in federal court rules, a change that permitted plaintiffs to attract better lawyers and economic expertise (White 1988: Table 1.1). Fourth, Beginning in the 1960s, economists in North America began to work more closely with prosecutors and the private bar in antitrust cases, and many of them began to analyze and write about those activities. This is a major factor responsible for the fact that nearly 80% of the estimates of "national" cartels (most of them prosecuted in North America) are drawn from the post-1945 time period.

(5) *1974-1989.* Kovacic and Shapiro (2000) identify 1973-1991 as the years during which the Chicago School of economics had its greatest influence on antitrust law and enforcement. The Chicago School was as hostile to cartels as the mainstream economists, but tended to be skeptical that cartels were widespread or durable market phenomena. In the 1980s, U.S. federal antitrust

(6) *1990-1999.* By 1990 nearly all the present criminal sanctions available to the U.S. government were in place. In 1990, penalties for corporations rose from $1 million to $10 million.[424] Moreover, in the early 1990s, the DOJ had in place three devices that improved detection and prosecution of cartels: the U.S. Sentencing Guidelines for corporations (1989), the automatic amnesty policy for corporate whistle-blowers meeting

[422] Up until the mid 1990s, however, there is a notable absence of empirical publications by European economists working out of European research institutions. Obviously, there are many European analysts, most lawyers by training, located in EU and national antitrust authorities' bureaucracies and performing cartel studies, but few of them publish outside of their governments' official organs.

[423] Although the prosecution of price-fixing of relatively inconsequential domestic conspiracies was at a high level in 1974-1990, the DOJ did not give a high priority to investigating international cartels, nor did it have any success in the courtroom in the few international cases it did pursue (Connor 2001a).

[424] Raised to $100 million in April 2004; maximum prison sentences rose from 3 to 10 years.

certain criteria (1993), and a demonstrated ability since 1994 to impose fines above the $10-million statutory cap by means of an alternative sentencing provision. These devices were in some cases adopted by the EU and other antitrust authorities, which significantly improved the investigation and prosecution of international cartels. Both U.S. and EU prosecutions of international cartels increased markedly; both convicted *global* cartels for the first time.

(7) *2000-2013.* The U.S. DOJ refined its ability to imprison non-U.S. cartel managers, and began an anti-cartel campaign that substituted prison sentences for corporate fines. The decade of the 1990s was when leniency programs were new and experimental; in the 2000s leniency programs beacame standard features of antitrust enforcement worldwide. In particular, a flawed EU leniency program was revised and a new, more effective one put into place by the EC in 2001. EC Commissioners Monti and Kroes implemented fining guidelines (2001 and 2006) that vastly enhanced EC cartel fines. Additionally, around 2000 the EU's National Competition Authorities began to coordinate their activities and ramped up enforcement against international cartels. Some NCAs criminalized their price-fixing laws. Finally, around 2000 a dozen antitrust authorities in middle-income countries began attacking international cartels. Because of these shifts in antitrust enforcement, this paper distinguishes data of the decades of the 1990s from the 2000s.

To summarize, there are seven time periods distinguished in the present analysis: the years up to 1890, 1890-1919, 1920-1945, 1946-1973, 1974-1989, 1990-1989, and 2000-2013. Connor and Bolotova (2006) demonstrated in formal econometric testing that these time periods were significantly different with respect to the level of overcharges.

Numbers of Episodic Overcharge Estimates Over Time

One of the first cartels subject to historical scholarship is a London coal-buyers' cartel that began as early as 1595 and persisted on and off for about 200 years.[425] The buyers were lightermen, wholesale coal merchants who were able to manipulate the prices paid to the owners of coal-laden ships in London's harbor. The government took many actions that proved ineffectual. Acts of Parliament against bid rigging were passed in 1642 and 1665. Later, in 1729 a Parliamentary investigation found that ten lightermen controlled 67% of purchases in London, and the investigation report specifically blamed them for 1722-29 price increases. Moreover, price controls for London coal were legalized in 1744, to be administered by three judges. In 1788 a

[425] UK coal-cartels studies include Ashton and Sykes (1964), Levy (1927), Sweezy (1938), Hausman (1980), and Tan (2003).

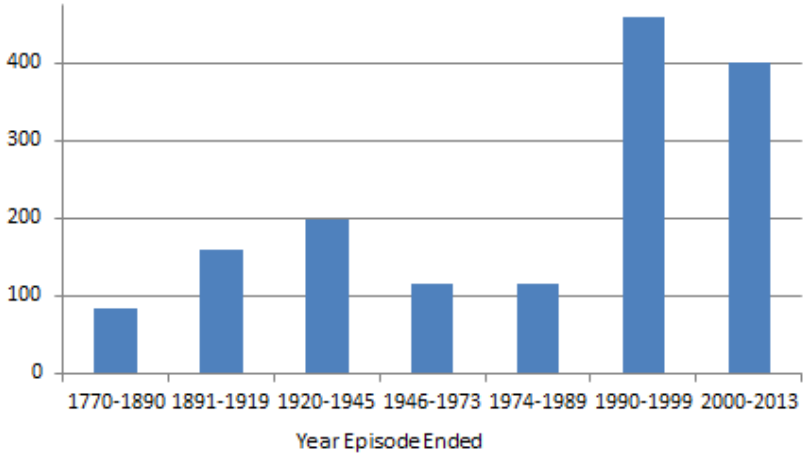
law made any agreements among or partnerships of more than five coal buyers illegal "combinations in restraint of trade." A 1700-1702 bid-rigging episode in London is the first overcharge estimate in the present study.

London consumers of coal were later affected by a seller cartel of coal-mine owners. The first mining cartel for which price effects can be found is the Coal Gild of northeastern England (later known as the "Newcastle Vend"), which made its first collusive agreement on London coal prices in 1699.[426] In the early 19th century when the Vend was well organized, Tan (2003: 22) estimates that various episodes resulted in coal overcharges of from 12% to 16%. Although highly unstable, the Vend did not finally collapse until 146 years later in 1845. It the most durable cartel in the data set.[427]

[426] Records of taxes paid on "sea coal" in London go back to 1213 (Levy 1927:9).

[427] Mine owners who sent coal by coastal ships from Newcastle to London controlled this cartel. The number of mines was quite large at times. Coal was mined in many parts of Britain, but high land transportation costs conferred a monopoly on the Vend over a wide range of delivered London prices. When railroads from the Midlands reached London in the early 1840s, the Newcastle owners' transportation-cost advantage disappeared.

Fig. 1. Number of Episodic Overcharge Estimates Collected over Time



The total number of episodic estimates is summarized in Figure 1. Because of the long period covered by the sample, the mix of overcharge numbers changes quite a bit. Except for a bump in the two decades following the 1890 Sherman Act, the number of domestic-cartel estimates does not vary much across the seven time periods (Table 4). However, the number of *international*-membership cartel estimates tend to increase and peak twice: first in the interwar years (1920-1945) and then in the last 24 years (1990-2013). Although not shown, dual peaks for global cartels are even more pronounced in those years.

From 1920 to 1945 most data are drawn from studies of international cartels. Five to seven overcharge estimates are available per year during these periods. The proportion of international schemes is especially high during the interwar period and especially low during 1946-1990. It is likely that there were more domestic cartels operating legally in Europe in the early 20th century than there were international cartels, but the latter were given more publicity because they appeared to be novel forms of business organization.[428] The increasing awareness of the

[428] When the UK, Germany, and the EEC began requiring registration of cartels in the 1950s, hundreds came forth in each jurisdiction.

illegality of price fixing in the United States may also account for the absence internal records of domestic cartels in the United States after 1890. Moreover, because the penalties were so low (a maximum of $5000 per count), relatively few court decisions bothered to give details about sales or prices during the conspiracy.

Another trend is that the proportion of estimates from cartels that were judged guilty by a government or competent antitrust authority rose very slowly until 1989, but reversed positions thereafter. The majority (71%) of the guilty-cartel overcharges occur in episodes ending after 1989. Before 1990, 40% of the episodic estimates were from guilty cartels, whereas after 1990, 83% were. It is likely that these estimates patterns reflect objective market conditions, i.e., the globalization of many markets in the early 20th century, recessions in the Inter-War period, and the surge in anti-cartel detection after 1990.

One other change in the mix of cartel pricing conduct may reflect the the availability of data and the changing preferences of economists rather than objective market conditions. In particular, the number and proportion of episodes involving *bid-rigging* increased markedly. Before 1945, bid-rigging episodes accounted for only 11.8% of all sample overcharges; during 1946-1989 it was 19.7%; and after 1989 it rose to 28.4% (Table 4, and Figure 5). Rather than a trebling of bid rigging in natural markets, more likely explanations may lie in the direction of newly available data sets and keen interest by economists in testing new theories in aution theory.[429]

Prior to the 1950s, overcharges could be located for only six cartels that primarily engaged in bid-rigging conduct.[430] Remarkably, in the 1945-1989 periods almost half of all the overcharge observations in the sample were primarily bid-rigging conspiracies. Awareness of the importance of bid rigging among economists may have been triggered by the well publicized U.S. electrical equipment conspiracies discovered around 1957. In addition there were advances in economic theories of auctions that spurred interest in empirical testing the theories. Post-War studies of bid-rigging cartels focused on national cartels in the United States, most of them local milk or construction conspiracies. The immediate victims of most of these bid-rigging conspiracies were governments. Relatively few international cartels rely primarily on rigging

[429] In the 1970s many U.S. state passed laws releasing bids on requests for proposals under open record laws. The U.S. Freedom of Information Act and similar national laws elsewhere opend up valuable, large data sets on government tenders. See Hansen (1985) and Athey et al. (2011).

[430] They are four early episodes of UK copper smelting (1787-1867), coal lightermen in London ((1700-1729), a UK books auction (1919), military gunpowder (1851-1862), power equipment in Japan (1931-39), and cast-iron pipes in the United States (1895-1896).

auctions or tenders for public projects. What may seem like a refocus in effort may in fact be a consequence of changes in data availability. Most of the articles on bid rigging have drawn on public records of state or federal agencies that have been the objects of these conspiracies. It is possible that the increase in bid-rigging cases seen in the data is simply due to the advent of open-records laws in the 1960 and 1970s at the state and municipal levels similar to the federal Freedom of Information Act.

Except for dips in 1946-1973 and 2000-2013, the number of observations *per year* has grown over time (Figure 2). The growth in observations in episodes ending in 1990-1999 was extraordinary. The primary factor that explains the upward trend in the number of overcharges is the growth in the number international cartels with usable data (Figure 3).[431] Up until 1890 when price-fixing was legal everywhere in the world, only one estimate is available about every six months on average. During this early period, the vast majority of price effects are reported for domestic cartels operating in the United States, the United Kingdom, and Germany. Although there were large numbers of domestic cartels extant in the late 19th century; the small size of the fledgling economics profession, a literary approach to writing in economics, and inevitable destruction of most business records over time contributed to the fewness of quantitative overcharge observations for 19th century cartels.

[431] Although there is a dip in 1946-1990, the correlation between the number of episodic observations per year and a linear time trend highly positive.

Fig. 2. Number of Episodic Overcharge Estimates per Year

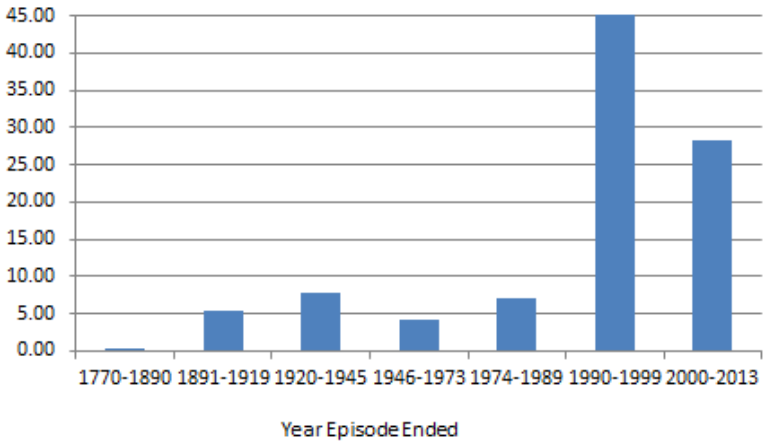
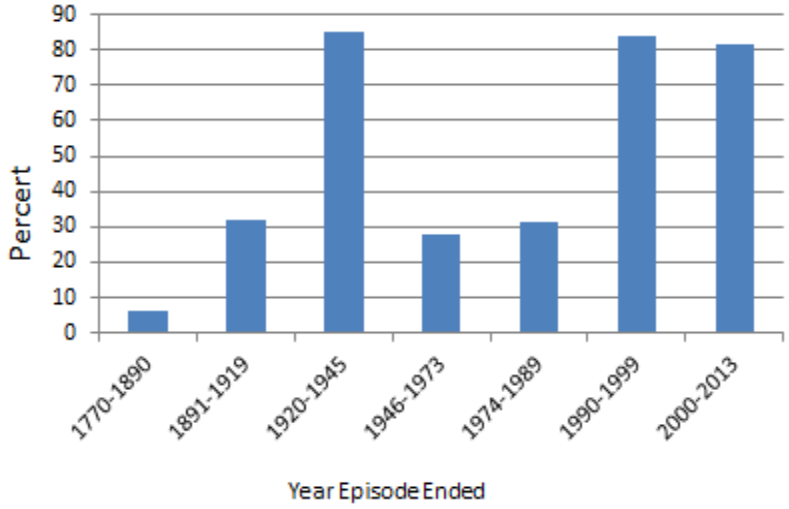


Fig. 3. Proportion of Episodic Overcharges International



During 1891-1919, there were 5.4 price observations per year; the rate rises to 7.7 per year in the interwar period. More data are available for international cartels during 1920-1945 than for cartels composed of companies from a single nation. One reason is that international cartels

mostly were based in Europe, where they operated with legal impunity. That is, other than Weimar Germany for a few years after 1923, cartels had freedom to set prices. In a few European countries, cartels were required to register with the government. In others, private cartel contracts were enforceable in the courts.

Many of the interwar international cartels were organized as federations of national cartels and were aimed primarily at creating national monopolies and assigning shares for export sales.[432] As nearly all of them were legal under the national laws of the time, their activities often were openly reported by the business press.[433] Members of these cartels did not attempt to hide their activities; indeed they often publicized their operations, particularly if they achieved putatively efficiency-enhancing industry rationalization, protected national markets, increased national employment during stressful economic times, or promoted price stability. During this period, many countries passed legislation specifically authorizing cartels that controlled national exports, even if that meant agreements on prices in various overseas markets. In a few cases, including the United States, these cartels were used as cover organizations for domestic price-fixing.

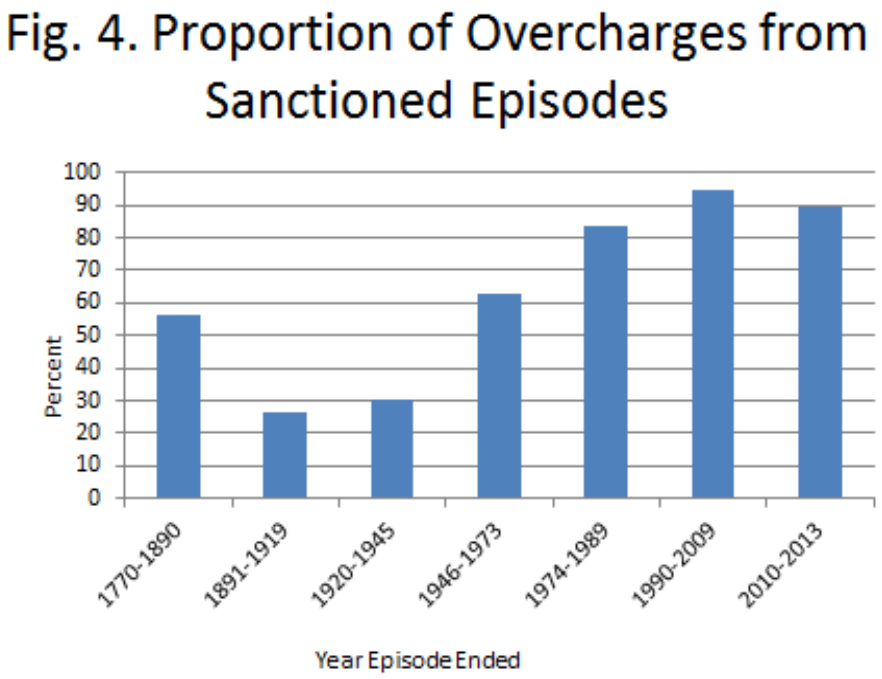
In the early and mid 1940s, many of the interwar cartels were investigated by the U.S. Congress, indicted by the DOJ, and sued by private parties. Combined with the expanding size of the economics profession and the growing interest among economists in imperfect competition, the transparency of non-U.S. cartels led to a large number of empirical cartel studies. For 50 years after the end of World War II, the number of known international cartels declined markedly. Perhaps because of the aggressive prosecution of cartels by the DOJ in the early 1940s, it appears that international cartels were by and large driven underground for decades after 1945. From 1946 to 1989 an annual average of five or six overcharge estimates could be found, nearly all of them domestic conspiracies. Few international cartels were discovered or prosecuted until the early 1990s -- one or two international cartel episodes every year.

[432] I do not include national cartels that were fostered by governments (some governments even compelled all the companies in an industry to join) in this data set; likewise, I exclude many international commodity-stabilization schemes that were regulated by government ministries under parliamentary laws or came about because of a multilateral treaty. The second tea cartel in the 1930s, which was authorized by several parliaments of the British Empire and regulated by the Colonial Office, is one example of a "public" cartel. However, I do include a few international cartels with one or more members consisting in part of government-appointed committee members, government-owned corporations, or government-sanctioned national cartels, if they were formed by a voluntary agreement among the members. An example is the sugar cartel in the late 1930s. Many of the European export cartels also created national monopolies for their members.

[433] U.S. companies apparently believed that patent pooling with foreign firms was legal; others joined cartels indirectly through controlled overseas subsidiaries. U.S. courts judged these and other subterfuges illegal.

Several explanations have been offered for the hiatus in international cartel formation in the two decades following 1945. The destructiveness of World War II left the United States with as much as 65% of world industrial capacity in the late 1940s. As a result, manufacturers in Europe and Japan were oriented mainly toward rebuilding their domestic markets; not only were few industrial partners available for international agreements, it seems that U.S. firms were less prone to form cartels than firms from countries with no or weaker antitrust cultures. In the 1950s and accelerating in subsequent decades, U.S. firms embarked on a period of rapid foreign direct investment as the preferred means of improving profits; leading European and Asian firms adopted this strategy increasingly after the late 1960s. Until the early 1980s, most United States markets were subjected to little import competition, but by the 1990s imports were exerting a powerful influence on price competition across a wide spectrum of commodity markets. Most international cartels have arisen only in industries with internationally traded merchandise and populated by multinational corporations with strong leading positions. For all these reasons and probably several others as yet unknown, international-cartel formation was seemingly at an historically low level until the 1980s.

Since 1989, the number of overcharges available has exceeded 35 per annum – more than double the previous period. In part this may be ascribed to the launching of an historically high number of international cartels in the early and mid 1980s. Many of these cartels could not have been contemplated without the direct participation or passive cooperation of leading U.S. companies in the cartelized markets. Other factors that may be responsible for the surge in overcharge estimates may include greater interest in collusive phenomena by economists, shifts in antitrust enforcement priorities, expansion in the sheer number of antitrust authorities worldwide, and improved cartel-detection programs.



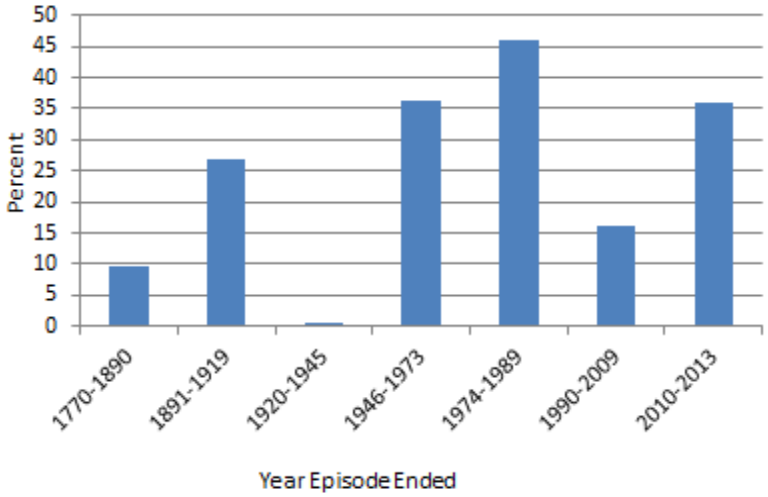
A second important reason for the surge in overcharges is that most cartel data now arise from prosecuted cartels (Figure 4). Prior to 1946, about one-third of the observations refer to cartels known to have been sanctioned.[434] Prior to the late 1940s, U.S. anticartel sanctions were weak by today's standards, but increasingly after 1911 or so businesspersons became aware of the legal dangers of overt collusion in the domestic market. However, until the early 1970s national and international cartels comprised of European companies could form cartels subject only to registration requirements in most European countries (and the EEC after 1960).[435] The European Commission began imposing fines on unregistered cartels that affected EEC trade beginning in 1969 (Harding and Joshua 2003:121). During 1974-1990, U.S. corporate sanctions on cartels

[434] This ratio may be deceptively high. Many durable cartels straddled eras that bridged shifts in public attitudes or antitrust enforcement. Almost all the sanctioned-cartel observations prior to 1890 derive from the Newcastle Vend, which was not "punished" until the 1830s when a British Parliamentary committee issued an unfavorable report but no further consequences. Later in the 19th century, Parliament again passed laws making coal price fixing illegal, but no monetary sanctions were levied. Similarly, the U.S. *Anthracite Coal* cartel operated for four decades before it was indicted and convicted, with weak remedies imposed.

[435] Export cartels that in theory did not affect the jurisdiction's commerce were permitted in the United States from 1918 and in most other nations throughout the 20th century. Today less than one-third of all countries permit export cartels, and many that have an antitrust exemption appear ready to repeal the loophole (Levenstein and Suslow 2004b).

became significantly more severe, and the European Union's prosecutions moved in the same direction (Connor 2003). Both jurisdictions imposed historically unprecedented penalties on international cartels beginning in the late 1990s. After 1990, virtually all the observed cartels in the sample were prosecuted or fined by one or more antitrust authority. This pattern suggests a marginal improvement in cartel deterrence (albeit still sub-optimal), but it does not necessarily mean that the probability of discovery by prosecuting bodies has gone up. However, it probably does represent a heightened aggressiveness in anticartel enforcement by a much larger number of authorities as well as more productive research methods by social scientists.[436]

Fig. 5. Proportion of Overcharges from Bid-Rigging Episodes



[436] In the last decade, announcements of probes, guilty pleas, and fines on cartelists are more and more to be found in convenient Internet sites and through Internet search engines than formerly.

Finally, it is important to note the special role of *global* international cartels in this study. There are 383 episodes of episodic global-cartel overcharges, which account for 25.0% of the total number of overcharge estimates in the sample. There are few global-cartel overcharges available prior to 1900. The first recorded global cartel were a series of French-Belgian zinc national cartels that began in 1847 and later mearged into a global export cartel; the first global-export cartel episode that began in 1862 was reportedly ineffective (Devos 1994). The second global scheme, Secrétan copper syndicate of 1887-1889, was highly effective. Although organized by four French and British firms, the syndicate cornered the supply of copper by signing long-term supply contracts with mine owners all over the world. The syndicate made profits when the contraction of supply forced up the price of copper contracts traded on European commodity exchanges (Andrews 1889). It was unanticipated supplies of Asian recycled copper that brought this pioneering global cartel to its end. It is noteworthy that nearly all the global-cartels episodes in the sample that ended before 1890 were minerals, metals or metallic ores – all industries with very high fixed, sunk costs.

The Inter-War period witnessed an explosion in global cartels, many of them Europe-based export cartels. From 1920 to 1945, more than than 163 episodic overcharges of global price fixing were recorded; these global cartels account for an impressive 77% of all episodes in the interwar period, a record-high proportion that still stands. Discovered global cartels remained relatively scarce until the 1990s when 77 episodes of price fixing ended, but these episodes comprise only 17% of all of the episodes in that period. One can only speculate as to why global collusion apparently first became feasible in the 1920s and later – during 1980-1999 – revived in popularity. The availability of improved international and trans-oceanic communication and transportation very likely played a role. International trade and foreign investment surged in the 1920s and 1980s, factors that may account for intensified price competition or the formation of strategic conjectures about all the world's major suppliers in an industry.

Data Reliability Issues

Many readers will have prior beliefs about the most appropriate data and methods that ought to be employed to derive estimates of the price effects of cartels. Some might regard a lengthy historical investigation with access to the internal communications of a cartel's managers as the surest path to the truth. Others might give greater credence to such communications only where the cartelists had reason to believe that their activities were legal or where the managers are writing about an illegal cartel years after the statute of limitations had passed. Some might

assume that disinterested social scientists are likely to be closer to the mark than prosecutors, plaintiffs' counsel, defendants' counsel, or other interested parties. Indeed, the cross checks of a more global retrospective analysis might contradict delusions, if they are delusions, of cartel managers about their power over markets. Among economists, ever cognizant of the march of progress in quantitative research methods, there may be a tendency to regard peer-reviewed studies applying methods of the most recent vintage to highly disaggregated, detailed data the most reliable.[437] Among legal scholars, many will view criminal trials or other procedures with criminal protections as the gold standard of fact-finding, whereas civil-law administrative hearings likely to contain more errors.

By design, this research project did not filter out some groups of cartel studies because they are purportedly surpassed by other groups in quality.[438] Rather, three approaches are taken to learn whether the various overcharge estimates are sensitive to the methods utilized, data sources, time period, or disciplines of the authors. In my view, statistical meta-analysis applied after data collection is a more appropriate tool to handle such issues, and that is the approach taken in Connor and Bolotova (2006). Their model uses a large sub set of the data shown in this paper and controls for a large number of cartel-estimation factors and predicts quite satisfactorily. I summarize their findings in this section.

Confidence in the estimates may be judged in part by the high quality of the publication sources from which the overcharge estimates were derived (see Bibliography). The large majority of the estimates are drawn from the traditional end-product outlets of academic research: academic books, book chapters, and peer-reviewed journals account for 65% of the total (Connor 2004b: Table 11). In addition, 15% of the estimates were taken from economist' working papers, most of which examine modern international cartels and are intermediate versions of subsequently published book chapters and journal papers. The majority of the government reports (4% of the estimates) were authored by civil servants with specialized training in economics, and some were written by academics commissioned by the agency; typically these reports would be vetted by a panel of experts. For example, the legal decisions of the UK Monopolies Commission were reviewed and approved by panels that contained a couple of leading professors of industrial economics working alongside senior civil servants attached to the Commission. Much the same process was used for United Nations, OECD, and Congressional Committee reports on cartels. Court and competition-law commissions accounted for 12% of the estimates. In sum, four-fifths

[437] One highly critical response to the sampling methods employed in this paper falls into this category. Ehmer and Rosati (2009) state: "Many of [Connor's] estimates are taken from the works of historians, political scientists, and journalists … rather than from economic studies published in refereed economics journals" (p. 2). They then state that because I have not rejected such publications of "lesser quality" [sic], the sample is fundamentally unreliable, biased, and inflated. They sampled about 10% of the larger overcharge estimates and found one episodic overcharge that was incorrectly computed. It has been removed from this edition.

[438] A very small number of omitted studies and the reasons for rejection are given in Appendix Table 3.

of the estimates are drawn from the formal or informal writings of academic social scientists, and most of the remainder was the product of professionally trained individuals subject to the checks and balances of internal reviews.

The types of publication outlets have changed over time. Before 1974 books and chapters in edited collections accounted for 58% of the publications that contained usable overcharge data. Most of these earlier works show evidence of meticulous scholarship, but the share of them subject to blind reviews is small. After about 1973, books became a very minor component of this survey's source materials. Instead, the three-fourths of overcharge estimates shifted to the published decisions of courts and commissions and academic working paper and journal papers. That is, in recent decades most estimates are drawn from papers that have been peer-reviewed, from an adversarial forum, or from decisions likely to be reviewed by courts of appeal. Some may regard the latter review processes as likely to induce more reliable calculations.

Controlling for other factors, Connor and Bolotova (2006: Table 6) find that government reports tended to have systematically lower overcharges than the reference group, books and monographs. Estimates published in all other publication forms were not statistically different from books.

A singular characteristic of science is its tendency to improve on the past. I examined whether there are systematic differences between the episodic overcharges across time, using the date of publication of the study as a proxy for analytical advances. The intuition here is that the authors of more recent empirical studies of cartels have learned to avoid the methodological pitfalls of their predecessors.[439] Among the economic studies that dominate the sample, there is an undeniable trend away from mere narrative historical case studies sometimes embellished with simple graphical illustrations towards more formal statistical modeling. Correspondingly, in industrial economics generally there is a trend away from evaluating cartels from the point of view of the theory of pure monopoly toward a more sophisticated and nuanced view informed by game theory and other conceptual advances.

Controlling for other factors, Connor and Bolotova (2006: Table 6) find that overcharge estimates decline slightly over time, but the effect is not completely monotonic. Of course, other things are changing over time as well, including generally tougher anti-cartel enforcement with respect to cartel discovery and severity of penalties. A more direct test involves qualitative

[439] Alternatively, one might infer that analysts may have increasingly employed techniques that have won court approval as forensically reliable (see Connor 2004a).

variables for the author's estimation method. In this case, the yardstick method tends to result in significantly higher estimates than the reference group, which is the "after" method. The rest of the analytical methods are not significantly different from each other or the reference group. Thus, with one minor exception, methods used do not cause bias in estimating overcharges.

For this paper, except for about 5% of the episodes where no method was given, I classified the remaining 1461 episodes according to one of eight estimation methods used to derive the overcharge rates. (Table 11). One of the most unusual methods (accounting for 2% of the episodic overcharges) is an historical examination of original cartel archives. This method of analysis resulted in *by far the lowest* mean overcharge of 10.8%; in fact, more than half of such estimates were zero. Echoing the findings of Connor and Bolotova (2006), estimates derived from a yardstick approach were the *highest* on average. Cost-based estimation (69 episodes) produced the second-highest mean overcharges. Interestingly, the most popular method (639 episodes) – the three „straight-line" before-and-after methods -- had lower-than-average mean values. But even lower were episodes derived from econometrics (289) and from legal decisions (245).

The fact that some methods result in above- or below-average overcharges does have implications for accuracy, as each type of method may be associated with different mixes of cartel types, locations, or time periods. Econometric methods and legal decisions, for example, tend to be of a more recent vintage.

In sum, apart from minor exceptions, neither sources nor methods suggest unreliability.

ANALYSIS OF THE RESULTS

Number of Overcharge Observations

There is a total of 2044 quantitative estimates of overcharges and undercharges drawn from about 350 publications.[440] The sample consists of 1535 episodic (long-term) and 470 peak estimates (highest price achieved for one year or less). Every estimate is assigned to one episode. Of the 1589 price-fixing episodes in the sample, 1536 (96.7%) have only an episodic estimate[441] and 53 (3.3%) have only a peak estimate, but 455 episodes (28.6%) have both types of overcharge estimates.[442]

A large majority (65%) of the *episodic* overcharge estimates are drawn from international-membership cartel episodes (Table 4). More than two-thirds of the estimates (71%) come from episodes that were legally sanctioned and almost four-fifths (78%) from "classic" price-fixing schemes. The smallest cartel type by far is buyers' cartels (4.6%).

The episodes made be classifide according to their geographic extent or geographic region of operation. Of the episodic overcharges, 17% are local/subnational, 47% cover entire nations, 36% involved multiple nations within one continent, and 25% are global. In regional terms, the great majority of episodic overcharge estimates are drawn from Western European (30%) or North American (25%) conspiracies (Table 9). However, the share of episodic estimates drawn from episodes of *global* price fixing is also quite large (31%). Information on African, Asian, or Latin American cartels is relatively sparse. International-membership and global-international collusion tends to be more durable and to spawn far higher numbers of episodes per cartel than any other types of collusion.

Twenty-three percent of the 2005 overcharge figures that were assembled are *peak* price effects. In some cases the peak price was reached for only one day during a cartel episode; in other cases, the peak may be the highest one of several years; most often it was an intermediate length. Peak price changes indicate the potential for maximum harm when a cartel is at its most disciplined or when market conditions were most congenial. Classifying a particular estimate as an average or

[440] The same estimates sometimes appear in multiple publications (see Bibliography). Here I count only the total number of books, articles, and reports that contain one or more original estimates. The undercharges are entered as positive numbers.

[441] By "an estimate," I mean to include a point estimate, single range, or the midpoint of a range.

[442] Note that 1536+455+53 = 2044. Most episodic tables have only 1535 observations because one overcharge is infinity.

peak figure in a minority of cases required judgment. If the original source is unclear about which type of estimate is being presented, in order to be conservative I have assumed it is a peak estimate. Peak estimates are separately analyzed below.

Height of Episodic Overcharges over Time and by Type

Table 5 and Figure 6 display the medians of all episodic overcharges reported, distinguished by membership type, legal type, mode of pricing conduct, and time period. Median averages may be preferred by some readers because nearly all the cells contain negatively skewed figures. That is, a few very high overcharges in any particular category tend to overwhelm the larger number of low-to-medium percentages when calculating the more common type of average, the mean. Moreover, while there is no upper limit on overcharge estimates, they cannot fall below zero. In such situations the means are larger than the medians, and the median may be a better representation of central tendency. The median cartel overcharge for all types and time periods is 23.3% and for effective ("successful") cartels 26.0%.[443]

I will demonstrate later below that the highest overcharge estimates are in no sense aberations. They are generally taken well conducted studies of cartel episodes that arose from monopolitsically structured markets and, therefore, do not deserve to be rejected. Hence, the mean average also has a strong claim to represent the central tendency of the sample. The mean episodic overcharge is 49%; for effective episodes it is 59% (Table 6 and Figure 7).

Overcharges over Time

Cartel mark-ups vary according to time period, but it is hard to tell from the raw data whether the 300-year trend is rising or falling (Table 5 and Figure 8). They are above average for two periods (1891 to 1945), below average during two periods (1946-1989, and closer to the all-periods average for the other three time periods (before 1890 and 1989-2013). Variation over time appears to be related primarily to changes in the mix of cartels types. For example,

[443] "Successful" cartels are those with nonzero overcharges (Table 5A). In the earliest reports of this research, the median average was 25.0%, but as more observations were added, mostly from cartels ending in 1990-2013, the median has declined.

overcharges are relatively high when the time-period mix is rich in unpunished and/or international cartels but poor in bid-rigging cartels (cf., Table 4).

Looking more deeply into the micro data (1531 episodes), a strong upward linear time trend in international-membership cartel episodes is apparent.[444] Episodic overcharges are slightly positively correlated with international membership (r = 0.06), but there is no evidence of a simple correlation of overcharges with any of the other cartel characteristics.

A finding emphasized in this study is the superior price effeciveness of international cartels relative to domestic ones (and correspondingly the higher mark-ups of geographically expansive collusion over small-scale schemes). However, this disparity is disappearing over time. A steep secular decline in episodic overcharges is evident among international cartels.[445] Median international-cartel overcharges were an unequalled 53.0% prior to 1920. During the Inter-War period these cartels attained only average levels of price effectiveness; median overcharges fell by 31% compared to before 1920. Given the poor economic conditions of the 1930s, the profits generated by these cartels may have been satisfactory. But overcharges continued to decline by 43% in 1947-1989 and finally by 60% in 2000-2013 relative to pre-1920 levels. In fact, prior to 2000-2013 international cartel episodes had exceeded domestic ones in every period by large margins, whereas in the most recent 14 years their positions had reversed![446]

Regression analysis confirms that, after changes in mix of types of cartels is taken into account, cartel overcharges were significantly lower after 1919 than before 1920 (Connor and Bolotova 2006: 1133). During the interwar period, overcharges were six to seven percentage points (about 20%) below the 1770-1919 reference period. During 1946-1989, overcharges were eight to 11 percentage points lower than the reference years. Finally, after 1989 – the era of strongest antitrust enforcement – overcharge rates declined about 40% below the pre-1920 reference

[444] International membership is also bi-modal, rising shaply after 1880 and falling from a plateau after 1940 and repeating this pattern after 1989.

[445] It is rather odd that the notable surge in discovered international cartels after 1990 came at a time when the profit incentives for cartel formation were at an historic low (Connor 2003). Of course, if profits declined in the 1980s and 1990s, it is possible that the *percentage increase* in expected cartel profits may have been at an historic high point. Uctum (1998) presents evidence of just such a decline in the USA, Canada, Germany, and Japan from the 1950s or 1960s to the 1990s.

[446] I do not often use explanation marks in professional writing. This is a most curious phenomenon that demands an an expalanation. Several experienced plaintiffs' antitrust attorneys have conveyed to me privately their surprise at the historically low overcharges being estimated by economist-experts in high-profile global damages cases.

period. While the temporal decline in cartel overcharges in undeniable, the historical forces responsible have not been pinned down and they may not be irreversible.[447] The rigor and geographic spread of antitrust enforcement seems to me the most natural candidate as the principal factor responsible, but other forces may be contributing.[448]

It is a challenge to explain the downward trends for some types of cartels. Besides the possible influence of the spread of effective anticartel enforcement, several alternative hypotheses may be put forward. Perhaps the application of more sophisticated quantitative methods by researchers in recent decades systematically yield lower estimates of price effects than the earlier studies that relied on simpler before-and-after comparisons. Perhaps expected profit rates in cartelized industries declined as the impacts of globalization were felt in formerly protected markets, and those companies that join cartels are satisfied with smaller percentage increases from collusion. Industry mix could provide an explanation. The sample drawn from the earlier periods tends to contain more minerals and metals conspiracies, whereas the later estimates have a higher proportion of chemical, construction, and services firms represented. Construction and services have historically returned very low profit margins. Because the most recent periods contain a higher proportion of cartels that were caught by antitrust authorities, the more recent estimates may be drawn from a population of cartels that is relatively incompetent in hiding their activities; similarly, the greater antitrust scrutiny in the United States from 1940 and from Europe since the 1960s could prompt cartelists to refrain from full monopoly pricing increases so as to reduce the chances of detection. Some of these hypotheses will be investigated below.

There are significant differences in the height of overcharges when the sample is split according to three cartel characteristics: national or international in membership, bid-rigging or classic price-fixing conduct, and sanctioned or unsanctioned cartels history. In the aggregate and for all time periods, highest mark-ups are associated with international membership, classic price-fixing methods, and no history of official sanctions (Figure 6). The patterns evident from these tabulated overcharges have been verified by a more formal statistical analysis (Connor and Bolotova 2006).

[447] Note that antitrust enforcement was suspended in the United States in 1933, in Germany after the Weimar Republic, and in Japan after the mid 1950s.

[448] Globalization (through freer international trade and foreign direct investment) does not seem to be a strong alternative explanation. Most cartels appear in manufacturing. The rise of Asia as the world's new center of gravity for manufacturing may have played a subtle role in international cartels. Most of these cartels discovered after the mid 1990s (but organized typically from the early 1980s or later) contained non-Chinese Asian companies. It is possible that these firms were more likely to cheat or, more likely in my view, were more likely to have lower long-term profit goals (before and during collusion). Chinese firms have been the biggest spoilers of international cartels since about 1990; if they should become joiners rather than remaining on the fringe, cartel formations will rise.

International-Membership Cartels

The median overcharge for national cartels is 18.2%, whereas for international cartels it is 25.1% (38% higher). Measured by the mean averages, international overcharges are 56% and national are 35% (Table 5B). Regression analyses verify that international cartels have overcharges about 45% higher than domestic schemes (Bolotova 2009: Table 4). The strongest categorical pattern is that until the 2000s in every historical period international cartels have had higher overcharge rates than domestic cartels (Table 5).

Up to the 1990s, international cartels were on average twice as effective in raising prices than "national" cartels (cartels that fixed prices in one country and export cartels comprised of firms from single countries). This is not so surprising in the pre-World War II era because most of the prewar sample of national cartels operated in the United States and achieved quite low overcharges.[449] But the fact that the differences persisted in the postwar period is somewhat unexpected. Besides antitrust-enforcement considerations, the greater pricing power demonstrated by international agreements may reflect a greater degree of freedom from threat of entry than for geographically more localized cartels. International cartels in all eras tended to attract members that controlled the lion's share of production in all the regions of the world with modern production facilities. Also, international cartels by their very nature deal with internationally tradable commodities, mostly homogeneous producer intermediates with relatively low long-distance transportation costs. Finally, international cartels can more easily engage in third-degree price discrimination among national markets than cartels organized within a single geographic market.

[449] Few international cartels in 1900-1945 had U.S. corporate members. Those U.S. companies that did join international conspiracies may have believed that they had structured their participation in international cartels in ways that would not run afoul the Sherman Act.

Fig. 6. Median Episodic Overcharges by Cartel Type

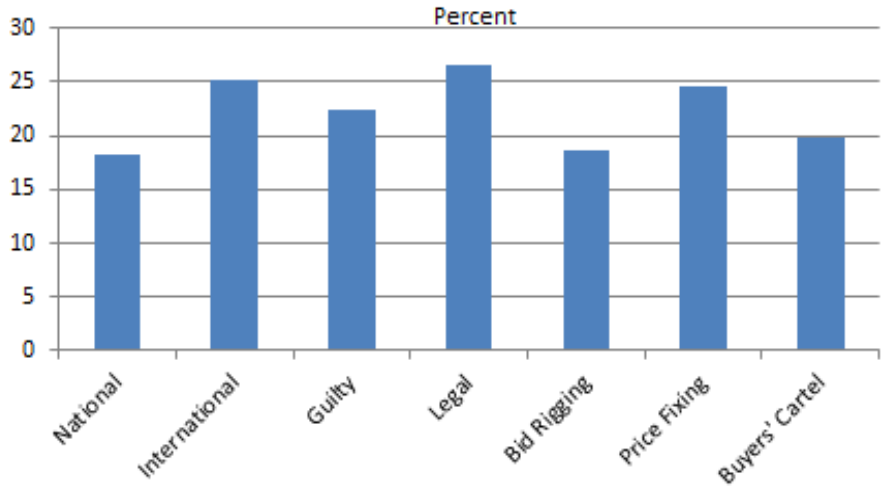


Fig. 7. Mean Episodic Overcharges by Cartel Type

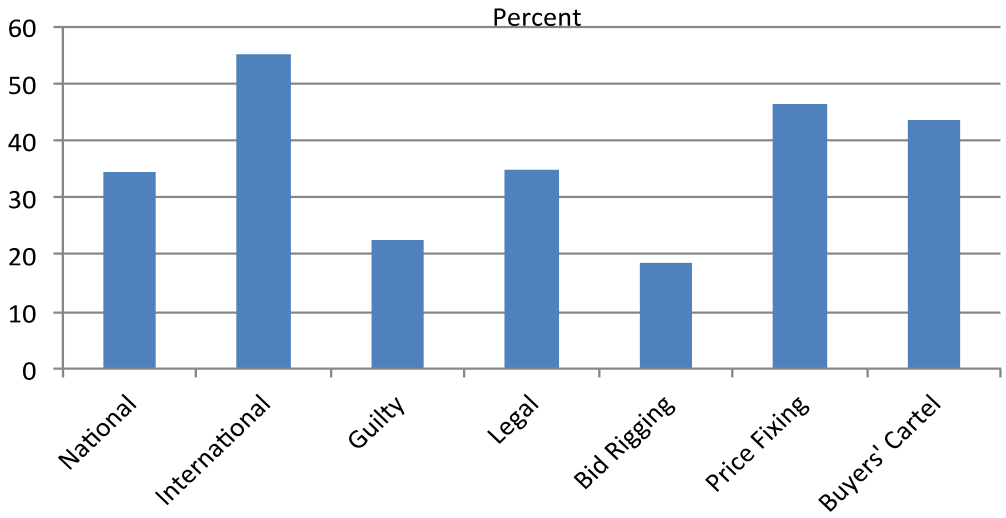
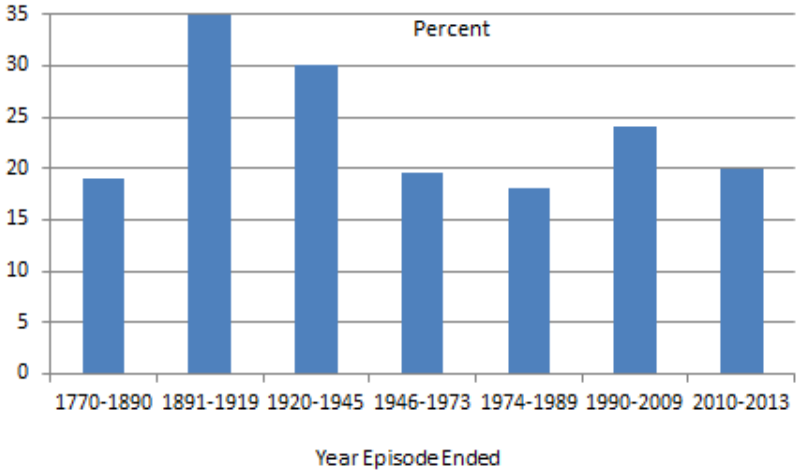


Fig. 8. Median Episodic Overcharges over Time



In the 1990-2005 period, the superior pricing power of international schemes ebbed. The median overcharge fell to an historical low of 24.4%. In a sharp break from the first five periods, overcharges of international cartels averaged only 16% higher than national ones. The reasons for the convergence of national and international cartel mark-ups are difficult to divine.[450]

Bid Rigging Schemes

A somewhat similar difference may be seen in the higher median overcharges for classic price fixing over bid rigging. In the sampled cartels classic price-fixing conduct led to 32% higher median overcharges than observed for bid-rigging methods. Bid rigging cartels often are organized to exploit tenders for government public-works projects. Some economists have hypothesized that government buyers are less competent in detecting rigged bids than are

[450] One possibility is the rise in exports of manufactures from China. Prior to 2005 there is no example of a Chinese company joining an international cartel.

professional industrial buyers.[451] Relatively few international cartels engage primarily in bid rigging, so this conduct category may be confounded with geographic extent or industry type (most are found in construction).

The apparently lower overcharges arising from bid rigging may be an illusion. Regression analyses suggests that overcharges from bid rigging are no different from classic price fixing (Connor and Bolotova 2006, Bolotova 2009). This finding has policy significance, because it undermines an assumption of the U.S. Sentencing Guidelines, which impose higher penalties for bid rigging. Most other governments have no stated guidelines imposing extra fines for bid rigging, but there is evidence that bid-rigging of government tenders is treated more harshly (Connor 2009c).

Sanctioned versus Unsanctioned Cartels

The difference in median overcharges for "legal" versus guilty cartels is rather small; punished cartels achieve lower median overcharges overall, though not in most time periods (Table 5). Regression analysis verifies that there is no significant difference in overcharges by legal status (Bolotova 2009: Table 4).

Contrasting cartels according to their legal status may shed light on "sample selection bias," an important methodological issue in cartel studies. Many cartel studies depend on samples of *convicted* cartels, and critics of these studies have asserted that cartels discovered through government investigations or sued by private plaintiffs are as a group inept compared to cartels that either had no fear of sanctions or remained clandestine. "…[I]t is not known whether cartels that find themselves in court are unsuccessful or merely unlucky" (Carlton and Perloff 1990:216-217). In particular, an influential study by Asch and Seneca (1976) finds that price fixers that were caught in 1958-1967 were significantly less profitable during collusion than a control group of unprosecuted firms.[452] Lower profitability ought to go hand in hand with relatively low overcharges.

[451] Cohen and Scheffman (1989:345) also cite low normal profits and declining demand.

[452] The authors interpret their results in two ways. Firms are more likely to collude when industry conditions cause profits to decline, or cartels that are relatively ineffective at raising prices are also inept at hiding their illegal conduct and, consequently, the most likely to be detected and indicted by the antitrust authorities.

The data in Table 5 suggest a resolution of this paradoxical finding. U.S. cartels punished in the time period covered by the Asch and Seneca study (53 episodes in 1946-1975) were indeed relatively inept: their median overcharges of 17.3% are lower than any of the "guilty" cartels in any of the seven time periods. Moreover, their sample appears to have been drawn disproportionately from domestic bid-rigging conspiracies, the categories that throughout history have generated the lowest overcharges. While a more precise analysis is needed, it appears that the Asch and Seneca study may itself be flawed by sample selection bias.

Buyers' Cartels

Blair and Harrison (2010) argue that monopsony and oligopsony are topics often given short shrift by economics and rarely addressed by the courts, in part because of the mistaken belief that if buyer power forces down prices below competitive level then consumers must benefit. In fact, if buyers explicitly collude on the price of a procured input, then an *undercharge*[453] is likely to be be imposed on suppliers that is symmetric to the antitrust damages created by overcharges on buyers from sellers' cartels (ibid. pp. 157-163). In both cases, industry output contracts from the level that would be seen in purely competitive or noncooperative oligopsonistic procurement markets and allocative inefficiency is created.

Blair and Harrison (2010) valiantly attempt to convince readers that buyers' cartels are "...far more prevalent than many have recognized" (ibid. pp. 1-14). Restricting their purview to cases brought in U.S. courts[454] or documented in publications by American economists, by my count they assemble a sample of 24 documented buyers' cartels.

Drawing upon a slightly older version of this work's price-fixing overcharges data, Jing Liu (2011) statistically analyzed the prevalence and unique economic characteristics of buyers'

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[453] Oddly, this term does not appear in Blair and Harrison's book. They stick to the more rigidly formal economic jargon of a "Buyer Power Index." They do not present more than one or two examples of empirical buyer-power estimates.

[454] In some cases, plaintiffs were denied standing or lost their cases.

cartels. She finds four notable differences. Throughout history, only 5.5% of all cartel price effects were undercharges by buyer groups, but that ratio had risen from practically zero to above 8% after 1990 (*ibid.* Table 1). While sellers' cartels are mainly in manufacturing, buyers' cartels are preponderantly discovered in the food, tobacco, raw materials, and services industries (*ibid.* Table 4). Buyers' cartels are much more likely to be domestic bid-rigging schemes than other cartels (*ibid.* Figures 8 to 10). Finally, the average price effects of buyers' cartels are 33% weaker than those of sellers cartels (*ibid.* Table 11). Enlarging upon her work, I find that scholars have published studies on 70 cartel undercharges; that these comprise 4.6% of the sample; and that median undercharges are 19.8%, the lowest type-of-cartel overcharges (Table 4A and 5A).

Market Structure

Overcharges are a measure of group (multilateral) market power exercised. A long tradition of empirical research in industrial economics has demonstrated a strong association between market power and several dimensions of market structure. For example, high seller market concentration raises sellers' power, while buyer concentration lowers it. While information on market structure is difficult to obtain (particularly for older cartels), Bolotova (2009) managed to construct a sample of 156 international cartels discovered between 1990 and 2005 that includes five measures of market structure (Table 2). These variables have as a group strong power to explain variation in overcharges.[455] Bolotova's regression results demonstrate that the cartel supply share (close to seller market concentration) is positively related to overcharges and buyer concentration negatively related, as expected (Table 5). Furthermore, inequality of size among the cartel members (the leading firm's market share) lowers overcharges. Two other structural variables were not statistically significant.

There are historical examples of cartels that ended because of the growth of fringe production; In such cases, one would expect supplier concentration to decline after collusion ends. The vitamin C cartel of the 1990s is one well documented case (Connor 2007b). However, that may not apply to cartels that were broken up through enforcement actions. A recent study by Levenstein *et al.* (2011:12) examines the levels and changes in an importer-based proxy for supplier

[455] Market structure variables are far stronger explanatory variables than industry type or geographic location Bolotova 2009: Table 5). In a broader sample of cartel episodes, industry was the strongest explanatory group. This is evidence that industry variables capture variation in the structure of supply.

concentration.[456] While their sample is limited to seven global organic chemicals cartels in the 1990s that ended because of antitrust actions, they find that supply is very highly concentrated in all cases. A key regression analysis shows that three to four years after the break-up year, in six out of seven cases there was no significant decline in concentration (*ibid.* Table 8).

Unsuccessful Cartel Episodes

It is worth noting that there are relatively few unsuccessful cartels in the data set. Only about 6% of the overcharges indicate that an analyst judged an episode to have produced no significant effect on market prices, even though the members had established an agreement in principle to fix prices. I do not wish to make too much of this percentage. It may understated because of selection bias in the studies relied upon. Injurious cartels may be inherently more interesting to analysts, because they are more policy relevant or the results more publishable than those about incompetent cartels. Not counting failures to discover a feasible contract, my intuition is that the true proportion of unsuccessful cartels (discovered and undiscovered) is likely to be higher than 6%.

Size Distribution of Overcharges

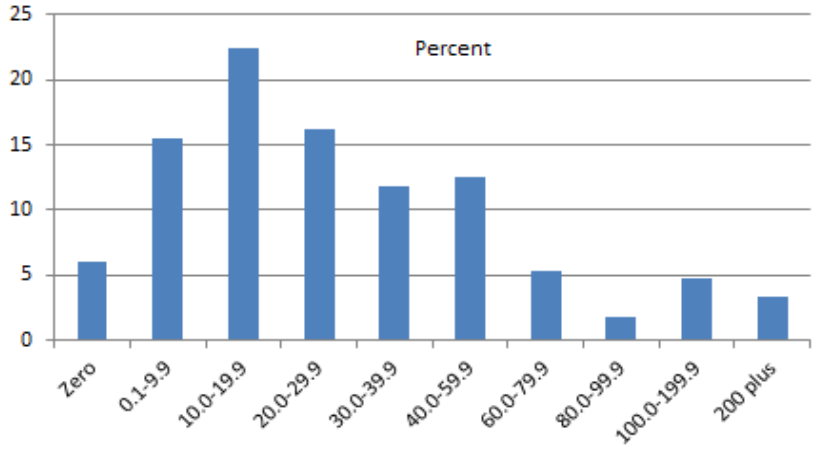
The cartel fining guidelines of several jurisdictions, notably the EU and United States, are based on formulas that are multiples of assumed overcharges (or proxies thereof). Given the interest in the factual foundations of the U.S. and EU Sentencing Guidelines applied to cartel sanctions, an examination of the size distribution of the overcharge estimates ought to be of interest. Figure 9 classifies the average estimates into eight size categories. Because the U.S. Sentencing Guidelines are predicated on the assumption that the average cartel has a 10% overcharge, that break point is of special interest.

[456] The Herfindahl index is computed from national import values for several years before and after the cartel broke up. It may be understated because in some cases (probably uncommon) two cartel members may each have plants in the same exporting country and because domestic production in the importing country is ignored.

The discussion of Table 6 focuses on the effective cartels (non-zero overcharges). Perhaps the most striking result is that **60**% of the cartel episodes have overcharges above 20%.[457] The remaining episodes have overcharges less than 20%. The mean overcharge of these episodes is 12%. *These are the episodes imagined to be typical by the creators of the U.S. Sentencing Guidelines.* By contrast, the 60% of the cartel episodes with overcharges of 20% or higher have a mean overcharge of 79.7%, which is eight times the level assumed by the authors of the U.S. Guidelines.

The Guidelines were designed to deter recidivism, but even if one makes the wildly optimistic assumption that the probability of detection is 100%, five-eighths of the cartel episodes in the sample would have been under-deterred.

Fig. 9. Size Distribution of Episodic Overcharges



[457] Note that from a legal perspective, each episode is an actionable offense. For the highest overcharges the implied own-price elasticities of demand are very large. One of the highest overcharges (800%) is for tungsten carbide, for which General Electric had a monopoly in the United States in 1927-1937. This newly developed material was sold at $453/lb. to most customers and at $360/lb. to a few favored buyers; up to 1927, Krupp sold it at $50/lb. in the United States and during 1927-1937 at $45 to $50/lb. in Europe (Stocking and Watkins 1948: 132). These numbers imply that the U.S. elasticity of demand was 81.5 to 64.8.

Looking in Detail at Extreme Observations

As noted in the previous section, about 3% of the sample of episodic overcharges is 200% or higher. These are rates about which an anonymous reviewer and previous readers have expressed incredulity. Because they strongly affect the mean sample value[458], I will examine them in detail. Are the high-overcharge cartels from unique historical periods? Were the data or analyses of poor quality? Do their other traits differ significantly from the rest of the sample?

To answer these questions, Table 12 isolates the 50 largest episodic overcharge observations and lists their essential characteristics. It also includes in the last column my subjective qualitative evaluative of the reliability of the estimates – something I have refrained from doing elsewhere in this report.[459]

The high-overcharge cartels tend to be drawn from older cases; their average beginning year is 1949 versus 1962 for the remaining effective observations. Another difference is that the high-overcharge cartels were on average two years more durable than the remaining cartels: 10.0 years as compared to 8.1 years. I would not ascribe the high estimated price effects to poorly executed analyses. Fully 75% of the grouped observations in Table 12 were rated from very good to excellent analyses.

In terms of overall industrial mix, the high-overcharge cartels look very much the same as their lower-overcharge counterparts: a few raw materials, some services, but mostly manufactured intermediate inputs. However, closer look reveals that a large proportion of the cartelized products were new products in great demand as essential industrial inputs with few or no

[458] The reviewer suggested the 200% break point as worthy of special attention. The mean average of all 1,447 episodic non-zero overcharges is 51.02%. When the 49 overcharges of 200% or higher are excluded, the mean average drops to 32.57%, or by 36%. (The *median* average is very little affected: it falls from 24.8% to 24.0%).

[459] My assessment is based upon a combination of what I know about the quality of the price data available, craftsmanship in applying the method of overcharge analysis, professsional reputation of the authors or organization responsible (if known), and evidence of balance in presentation of results (including peer or editorial review).

practical substitutes and that near-monopoly supply conditions obtained (Appendix Table A2). Shipowners relied almost exclusively on hemp cordage for their rigging in the late 19th century. With the use of natural manures, farmers worldwide have become dependant on phosphate and potash for ferilization of crops. Radium was highly prized as a novel illuminant for instuments in 1912-18 when world production was dominated by a duopoly. Incandescent light bulbs were also quite new consumer products in 1922-1941 in many parts of the world, and a global cartel effectively created territorial monopolies almost everywhere except Japan. The tungsten carbide cartel was a U.S.-German territorial duopoly for what was then patented and the hardest machine coating material available for four decades.[460] (Note also the large number of mutually supporting independent studies of high overcharges).

I conclude that that are no reasons to exclude the very high overcharges from the sample. They are high for reasons consistent with economic reasoning: very inelatic demand combined with duopoly or very tightly organized , monopolistic cartels and no threat of entry.

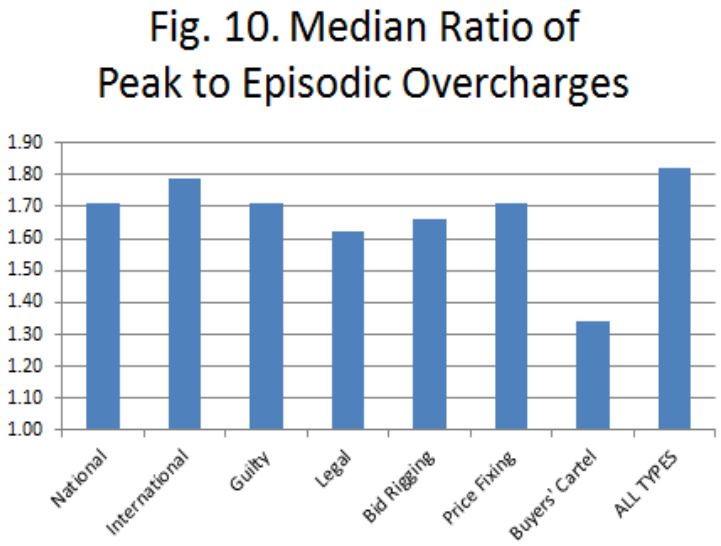
Peak Overcharges

So far only the episodic overcharges have been examined – those that refer to the mean price change over all or most of a price-fixing episode. Figure 10 and Tables 7 and 8 display over 5table 400 peak price effects attained by cartels – the maximum, usually brief mark-ups observed for one week, one month, one quarter, or one year of an episode, depending on the price series available. It is not always clear from a source whether a price effect being reported is episodic or peak; if it is vague, the effect is classified as peak.

It is well known that collusive arrangements typically generate price changes that fall short of what a pure monopolist in a blockaded market would set in order to obtain maximum profits. Tacit collusion generally results in prices that are above, but closer to competitive levels than to monopoly levels. While overt collusion should be somewhat more effective than tacit collusion at raising prices *ceteris paribus*, information failures, potential competition, and cheating also typically result in sub-monopoly price effects. Because the peak periods are generally too brief

[460] Tungsten carbide was simultaneously invented by General Electric and Krupp Steel in the early 1920s. Only industrial diamonds are harder, but natural diamonds were prohibitively expensive for most industrial applications until artificial diamonds were first marketed in the 1950s.

for significant changes in the structure of the industry to change, the observed peak overcharges are measures of the short-run market power exercised by cartels when the market-structure conditions are closest to optimal and the discipline of the members is at its most cohesive.[461] Thus, the peak price effects are instructive about the potential harm that cartels can cause when they are unfettered by coordination problems.



From Figure 10 it is apparent that on average the peak overcharges are 60% to 80% above the episodic overcharges for all types of cartels except buyers' cartels. Table 7 shows the median peak overcharges in detail over time and across types of effective cartels. The highest median peak cartel mark-ups are from the interwar period.[462] For all types of collusion, there is no trend in peak effectiveness over time.[463] There is a slight decline over time in peak overcharges of

[461] Peak price changes may well be affected by short-run shifts in demand. Exogenous, unanticipated shifts in demand may exaggerate the peak price changes. However, in some cases these shifts are endogenous. Especially when a well financed cartel felt free to announce a new agreement that buyers perceived as likely to be effective, "panic buying" often ensued, which amplified the purely collusive effect on prices.

[462] Approximately one-fifth of the 413 observations available for Table 7 refer to interwar cartels, which have been well studied by economic historians who often had available public commodity-exchange prices. Forty-two percent of the observations on peak prices are for episodes ending after 1989.

[463] The correlation of episode end year with peak overcharge for all 413 observations is not significantly different from zero.

international cartels and a weak positive trend for bid rigging.[464] The absence of significant time trends for peak overcharges reinforces the idea that these are proxies for monopoly overcharges.

The pattern of peak overcharges across cartel types is similar to that for the effective episodic overcharges (Table 7): (1) In all time periods, international cartels were able to reach higher levels of peak price effectiveness than the "national" cartels – on average 86% higher; (2) Peak mark-ups are also higher (68% higher) for legal cartels than for sanctioned ones; and (3) Cartels that fixed prices or production levels are 85% more harmful as bid-rigging agreements, both overall and in each of the seven time periods.

Table 8 provides calculations of *how much higher* median peak overcharges are compared the median episodic overcharges. Generally speaking, the peaks are about 50% to 70% of the episodic mark-ups. There are no noteworthy trends in these ratios over time. However, the ratio for international cartels are far lower than domestic schemes, and lower for bid rigging than for classic price fixing. These ratios have a couple of interesting interpretations. First, a high peak/average ratio is a rough indicator of price instability during a conspiracy.[465] Second, the ratios may be regarded as inverse indicators of *pricing efficiency*. An efficient cartel is one that has achieved episodic prices that are close to the profit-maximizing (monopoly) price. That is, low ratios may be interpreted as cartels that achieved few operational problems or external challenges from customers or fringe producers. If this latter interpretation is correct, then international cartels and bid-rigging arrangements are relatively efficient. These hypotheses await formal tests.

Overcharges by Location of Cartel

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[464] The correlation over time (the end year of each episode) for international cartels is r = -0.102 and for national cartels r = +0.070; for bid-rigging schemes, there is a weak positive time trend (r = +0.085); but for guilty cartels, legal cartels, and classic price-fixing cartels, there is no time trend.

[465] These ratios could be relevant for assessing whether cartels intend to maximize profits through price increases (as most economists assume) or whether the goal is to control *variation* in their output or prices. Apologists for cartels, particularly those writing about international cartels during the Great Depression, tended to assert that cartels did not aim to raise prices so much as stabilize prices (Marlio 1947, Pyndyck 1979). There is little evidence in table 8 that the interwar, international cartels achieved greater price stability than those ending before or after the interwar period.

Law-makers and antitrust enforcement officials may be interested in the locus of decision-making by the cartels in the sample. Figure 10 and Table 9 classify episodes according to the location of the cartel's headquarters or the place of residence of the great majority of the cartel's corporate members. In many cases corporate membership mix corresponds to a cartel's geographic field of operations, which is examined next.[466]

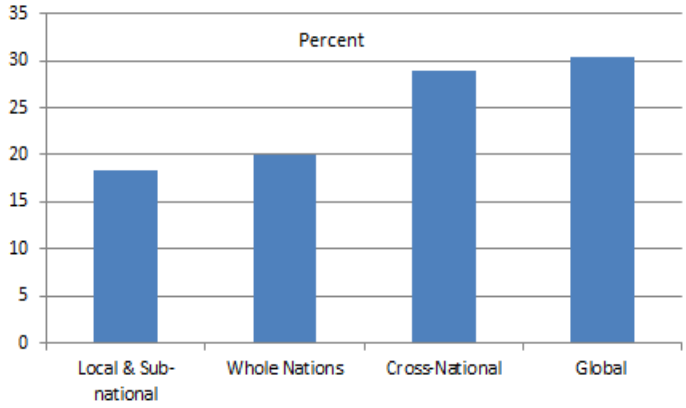
Cartels may be composed of member companies with headquarters in only one country or one continent; many contemporary cartels are "virtual" joint ventures with no permanent addresses. On the other hand, many early 20th century cartels established secretariats with professional staffs in London, Zurich, or similar locations. In more recent decades trade associations or management consulting firms have assisted with cartel operation. In these cases the geographic locus is easy to identify. Cartels with corporate members from multiple regions are more difficult to classify, but if a supra-majority of the companies were headquartered entirely in North America, Western Europe, or Asia, the cartel is categorized in one continent. Global cartels are international cartels that fixed prices on two or more continents; nearly all global cartels aimed at controlling prices in at least Western Europe, North America, and East Asia.

Geographic Spread and Price Effects

The section above looked at examined differences in overcharges according to cartel membership composition. Here I analyze whether cartel overcharges vary due to the geographic scope of their pricing conduct. Four categories of geographic scope are employed. From most extensive to least, they are: (1) *Global* (pricing schemes designed to affect two or more continents, (2) *Cross-National* (price effects in multiple countries in one continent or in world trade), (3) *National* (price effects intended for only one national market or a portion of it), and (4) *Local/Sub-National* (a small geographic area, such as one or a few municipalities, counties, or regions of a single state). All local cartels are also national cartels, but not the reverse. Otherwise, the categories are non-overlapping.

[466] The major exception is export cartels, which are categorized in their country or region of origin but set prices in the "rest of the world."

Fig. 11. Median Average Overcharges by Geographic Extent of Pricing

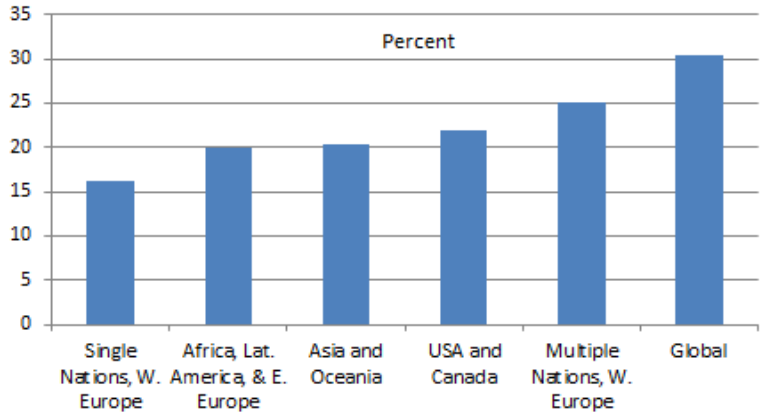


Geographic spread of collusion makes a difference in episodic price performance (Figure 11). Using the Global cartels as the numeraire, the data show that Cross-National cartels achieve 5% lower median and 13% to 15% lower mean overcharge rates. Single-Nation cartels fare substantially worse, with rates 33% to 35% below their Global counterparts. Finally, Local/Sub-National cartels face the greatest challenges in raising prices; relative to Global types, small-area cartels generate margins that are 40% to 45% lower than Global.

The lesson is clear: Cartelists that are fortunate enough to co-opt all the world's suppliers into a price agreement are far more likely to profit handsomely than are firms trying to rig bids on a municipal tender. There may be many explanations for this disparity, but the superior ability to global cartelists to deal with entry by fringe suppliers and to exploit geographic price discrimination must rank high on the list. Because the Cross-National cartels suffer little in price-raising ability on average, operating across customs unions like NAFTA and the EU seems to keep many fringe producers at bay because of distance or trade barriers.

Grouping cartels by geographic regions produces parallel results (Figure 12). Those that operated in only one Western European country have on average the lowest overcharges; cartels in single nations in the ROW were slightly more profitable – with median overcharges around 20%. Cross-national cartels -- those managed across North America,[467] the EU, or other adjacent nations -- have significantly higher overcharges than the single-nation cartels. But those organized across continents were as a group the most successful. In general, cartels able to organize themselves over broader geographical areas were able to achieve higher price effects than those in smaller zones.

Fig. 12. Median Average Overcharges by Geographic Location of Pricing

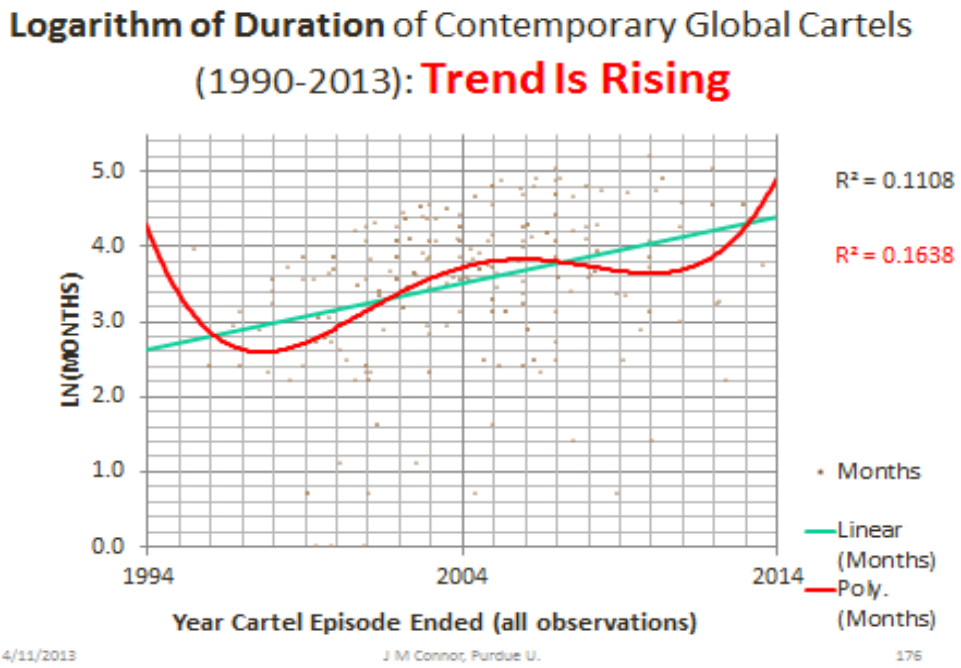


Overcharges and Duration

The price-fixing overcharges data set includes information on duration for each cartel episode. It is very likely the largest data set on cartel duration ever assembled. An earlier, smaller version of these data were analyzed by Zimmerman (2005) and more recently by Abrantes-Metz and Connor (2009).

[467] Defined here as the USA and Canada, but could include Mexico in many cases because of the absence of formal tariff bariers. Unfortunately, until recently the Mexican federal antitrust commission did not often prosecute international cartels. Connor and Bolotova (2006) confirm that North American cartels and single nations of Western Europe as a whole have significantly lower overcharges.

The relationship of overcharge rates to episodic duration seems tenuous. I examined many plots of the two variables for various time periods and for various types of cartel conduct. Generally, overcharge rates were found to be unrelated to variation in either time or collusive duration. However, for a sub-sample of 352 contemporary global price-fixing episodes, duration is rising over time (see chart below), while overcharge rates for these global conspiracies were holding firm. This implies a need for greater antitrust priority for this class of cartels.



Overcharges and Market Size

The real affected sales of discovered cartels are becoming progressively larger.[468] A commentary in the U.S. Sentencing Guidelines asserts that there is an inverse relationship between the size of affected sales and the height of the overcharges achieved by cartels (USSG 1987). This commentary implies that judges are authorized to approve fines for criminal price fixing by cartels with large affected sales that are smaller per dollar of affected sales than for members of cartels with small affected sales. No conceptual or empirical justification is provided for this assertion in the Guidelines themselves.[469] Moreover, subsequent empirical evidence does not support a positive market size-overcharge connection.[470] Bolotova's (2009) regression analysis of a large sample of modern international cartels finds that affected sales is unrelated to cartel overcharges (Table 5).

DECISIONS OF ANTITRUST AUTHORITIES

Economists versus Courts or Commissions

[468] This can be shown for the past few decades, but it is difficult to know whether this statement applies to cartels throughout the 20th Century.

[469] The original testimonies about the USSGs are unpublished (U.S. Sentencing Commission (1987)). However, the few empirical studies of cartels with information on price effects available to the Sentencing Commission in 1986 (e.g., Hay and Kelley 1974, Asch and Seneca 1975, Fraas and Greer 1977, Posner 1976). Eckbo (1976) and Griffin (1989)) do not link the prices to cartel size.

[470] Appropriate data to test this proposition are contained in Connor (2003: Tables A.1 - A.12). This working paper develops affected sales and overcharge data for a modest sample of modern international cartels: approximately 92 pairs of such data are available. Sales are in current U.S. dollars and generally fall into the decade of the 1990s. Correlation statistics were calculated for a number of sub samples. The first sample of 50 cartels examined the largest geographic market for each cartel; the coefficient correlating sales and overcharge rates was not significantly different from zero (r = -0.105). To see whether extreme observations might unduly affect the result, I repeated the experiment but dropped first all cartels with $5 billion in sales or more and second all cartels with overcharges of 65% or higher; in both cases r became closer to zero (-0.065 and +0.019, respectively)., which indicates that extreme observations do not account for the low correlations found. Finally, I examined geographic sub groups of the cartels: global, U.S., EU and other single national markets. The correlations for these four samples varied from -0.17 to +0.24, none statistically significant.

Are there systematic differences between overcharge estimates made by economists – the ones reported above -- and those resulting from a judicial process? The answer to this question is important for the policy relevance of the present study. If the estimates taken from social-science publications differ significantly from the conclusions of juries, judges, or commissions, then policy makers may be skeptical of the overcharge estimates in this study as guides to assessing current anti-cartel enforcement or proposing changes in such enforcement.

A survey of final verdicts of U.S. courts in collusion cases finds that 25 collusive episodes had a median average episodic overcharge of 21.6% and a mean overcharge of 30.0% (Connor and Lande 2005).[471] The 9 cases that reported peak overcharges produce a median peak overcharge of 71.4% and a mean peak overcharge of 130%. All but 5 found that the cartel had raised prices by more than 10%. Due to the small number of final verdicts it would not be meaningful to analyze these verdicts in even smaller groups. By comparison, the 327 estimates for North American cartels had a median episodic overcharge of 21.0% and mean overcharge of 38.8%. Thus, the median averages from both sources are extremely close, but the mean is slightly higher from the economic studies.

Figure 13 and Table 10 combine the U.S. court survey above with other episodic overcharge estimates derived from cartel decisions by other antitrust authorities.[472] There are 485 such observations from 38 antitrust authorities – 32% from analyses of guilty findings of U.S. and Canadian courts, 24% from decisions of the European Commission that imposed fines on EU-wide cartels, 20% from commissions ruling on cartels that operated in single European nations, 20% from Asian and Oceanean antitrust authorities, and 3.5% from the rest of the world. Besides U.S., Canadian, and EC decisions, there are relatively large numbers of observations from decisions by the UK Monopolies Commission in the 1950s and 1960s and the Fair Trade Commissions of Korea, Japan, and Taiwan. Most of the decisions are from decisions that fined international cartels discovered since 1990. Texts of most of these decisions can be found on the web sites of the authorities or in various searchable law archives (Lexis Nexis, WestLaw, the *Official Journal of the European Communities*, EUR-Lex, and the like). In some cases press releases or press summaries contained sufficient information to calculate an overcharge, but

[471] Robert Lande and research assistants under his direction in 2004 calculated these figures. Less than 1% of all U.S. published court opinions on price-fixing damages contain both the dollar damages and the affected sales of a cartel. For a discussion of the merits of examining only final verdicts, see Connor and Lande (2005).

[472] Sometimes a published decision will mention explicitly an overcharge figure, but more commonly court and commission decisions need to be interpreted. For example, a decision may mention in passing the price series upon which it relied to determine the severity of a sentence, and that series is then interpreted by an economist. The DOJ, U.S. FTC, and federal courts and counted as one authority. However, the EC and the EU NCAs are counted as separate authorities.

more commonly an analyst used the product definition, affected sales, and conspiracy dates in the opinion and applied this information to prices from a third party to calculate an estimate. As in the case of U.S. final verdicts, only a small minority of available decisions contain the appropriate quantitative data.[473]

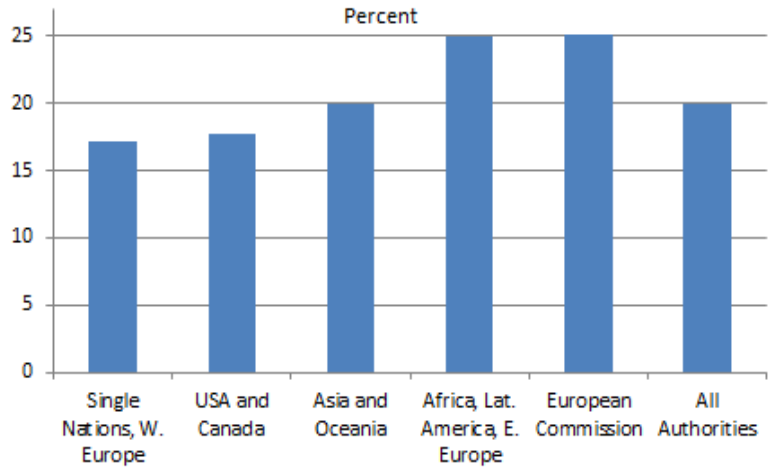
The median episodic overcharge from the 320 authority-decision-related estimates is 20.0%, and the mean is 40.8% (Table 10). The *median* and *mean* overcharges in Table 10 are close to the full-sample median of 23.0% (Table 5) and mean of 48.7% (Table 6), respectively. Overcharges from all jurisdictions are negatively skewed.[474] Moreover, the relative geographic pattern in Table 10 is parallel to that of Table 9; that is, median overcharge rates are highest for multiple-nation EU cartels, lowest for single-nation European cartels, and about 20% for all the other continents.[475]

[473] Guilty pleas and sentencing memoranda of the DOJ and Canadian Competition Bureau almost never mention damages. The EC has fined more than 100 cartels since 1969, but the full decisions are not always published, publication can be delayed for up to five years, and only a small proportion include price data. EC decisions yielded usable information on product definition, affected sales, geographic area, dates of the conspiracy, or other helpful information for 75 episodes. Similar comments apply to the other authorities' press releases, newsletters, or formal decisions.

[474] With three or more observations, the mean is higher than the median.

[475] Although not shown, decisions regarding *global* cartels resulted in higher overcharge estimates than other types or locations of cartels.

Fig. 13. Median Average Overcharges from Antitrust Authorities' Decisions



In three jurisdictions, there are enough observations to examine changes over time. In North America, median overcharges from before 1990 are slighty higher than from subsequent periods. Similarly, the UK Monopolies Commission's reports produced very cautious estimates compared to more recent UK cases. The EC's recent decisions suggest higher overcharges than earlier ones.

I conclude that, on the whole, estimates of the height of overcharges developed from decisions of antitrust authorities around the world differ little from estimates derived from other economic studies. The overall median overcharge of the 485 legal decisions (20.0%) is about 15% lower than the remaining sample estimates.

Cartels Targeted by Class Actions

In American and other common-law regimesjurisprudence, counsel for private plaintiffs are commonly regarded as complementary to the anti-cartel efforts of the federal and state attorneys

general (Lande 2010: 9). This follows from the increasingly outdated view that private suits „follow-on“ after criminal convictions have made the private suits relatively easy to prosecute. In fact, almost half of U.S. private damages suits so not follow DOJ convictions (Connor 2012; Lande and Davis 2006, 2008). So, what kind of cartels do plaintiffs sue these days?

I informally analyzed the overcharges of the cartels that resulted in the 50 largest price-fixing settlements from class-actions in North America during 1990-2012 (Connor 2012: Table1). They are ranked according to the amount of cash settlements received by direct or indirect purchasers in any jurisdiction (expressed in $2012). Of these 50 largest, 258 overcharge estimates are available for 41 cartels. The median overcharges of these 41 cartels were 29.4%, or 30% higher than all guilty cartels during the same period (Table 5). Except for being slightly less durable (7.2 years) than the average cartel (8.2), there were no other obvious differences between cartels that settled and other contemporarty cartels. Hence, on balance, cartels generating larger dollar injuries are being targeted by plaintiffs.

Price Effects of Antitrust Intervention

There is a body of opinion that competition-law enforcement is ineffective in improving the competitiveness of formerly cartelized markets. For example, a provocative paper by Crandall and Winston (2003) opined that U.S. antitrust laws should be abandoned. In support of their position they assembled five studies that they interpreted to show either that cartels do not raise prices or that prices do not decline after cartel convictions. This opinion piece immediately evoked an onslaught of rebuttals by Baker (2003), Werden (2004), and Connor (2004c), among others.

Rather than revisit that particular debate, it may be useful to examine what a larger body of studies shows about the effects of antitrust enforcement on cartel effectiveness. First, there is evidence of its effects on collusive price effects. Connor and Bolotova (2006) showed that price-fixing overcharges have declined secularly as anticartel laws and enforcement have strengthened since the late 19th century.

Second, there is an analysis of cartel duration following the break-ups of contemporary cartels by antitrust authorities. Levenstein and Suslow (2010: 13-18) identified six "causes of death" for 79 international cartels that colluded since 1990; they found that 62% of the cartels expired because

of antitrust legal actions and the remaining 38% because of unilateral reactions to economic incentives they term "natural causes" (including 22% convicted following defections by amnesty applicants) (*ibid.* Table 2). In their analysis of the antitrust determinants of duration, they find that duration shortens after 1995[476] and when cartel organization includes share quotas but excludes third-party support and punishment mechanisms (*ibid.* Table 4).

Third, one of the most convincing responses is the study of the long-lasting German high-voltage power-cable manufacturing cartel of 1901-1997 (Normann and Tan 2013). This cartel was legal from 1901 to 1957, illegal from 1958 to 1974 (and convicted three times), exempted from prosecution from 1975 to 1984, and once again made illegal after 1984 whereupon it was heavily fined in 1997. Profits rose 16% to 19% each year the cartel was exempted with no compensating efficiency gains (*ibid.* pp. 11-12).

SUMMARY AND IMPLICATIONS

Summary

This paper's major goal is to collect and analyze the largest possible body of serious, quantitative estimates of price-fixing and bid-rigging overcharge rates. From several hundred publications dating to 1888, I assembled 2044 such estimates that belong to 532 cartels functioning during the past three centuries.

[476] They choose 1995, the year the *Lysine* cartel war punished in the U.S., as a "defining moment" – a watershed or regime shift -- for international cartel enforcement (note 29). It is also close to the years in which leniency programs were introduced in the U.S. and EU. Besides being a rather Americocentric choice, so many other changes occurred before and after 1995 that I am skeptical that any qualitative variable is adequate to the task. A continuous variable along the lines of Zimmerman and Connor's (19XX) amnesty awareness index seems preferable.

The primary finding is that the median[477] episodic cartel overcharge for all types of cartels over all time periods is 23.0%. It is lower for cartels with solely domestic membership (18.2%), higher for international cartels (25.1%), and highest of all for global cartels (30.4%). Overcharges from courts and commissions are slightly lower that from social science analyses. Cartel overcharges are skewed to the high side, pushing the mean overcharge for all successful cartels to 52%. The "peak" cartel overcharges in the sample are typically almost double those of the long-run averages.[478]

This paper's findings are generally consistent with the few, more limited works that comment on cartel overcharges.[479] Seven previously published economic studies with samples ranging from five to 38 overcharges report a simple average median overcharge of 28% of affected sales. A comparison of social-science and legal sources also yields generally similar average estimates. Finally, more recent findings from controlled market experiments with representative cartel structures also support the social-science-based conclusions.

The authors' professions, types of publications, years of publication, intensity of peer review, and analytical estimation methods incorporated in the sample vary greatly. There is some indication that estimates prepared from the yardstick method are higher than other approaches and that estimates appear in government publications are lower than others.[480] Otherwise, however, extensive examinations of variation in overcharge rates across such categories give no reason to regard any sub set of the sample as inherently biased or unreliable.

Implications for Economics

[477] All medians presented in this section incorporate all relevant zero estimates and omit peak results unless otherwise mentioned.

[478] If one assumes that the peak mark-ups are the result of a cartel having achieved something close to monopoly price levels, then the lower episodic overcharges imply that historical cartels are constrained by substitutes, fear of entry, internal discord, or other factors that frustrate optimization. This is a common finding in studies that measure the degree of monopoly power.

[479] All of the relevant estimates in the seven works are incorporated in the sample assembled for this paper.

[480] Two other types (historical case studies and government reports) tended to be low.

The great majority of economists, whether swayed by collusion theory or by empirical evidence, roundly condemn cartels. Yet, there is a small minority view among industrial-organization economists that there is little evidence that cartels injure the markets in which they operate. Cartels, they believe, rarely raise prices significantly above non-collusive levels. Moreover, even if cartel price effects are significant, cartels are such fragile coalitions that the harm to the allocative functions of markets is negligible. Finally, they believe that the negative static allocative effects of cartels are counterbalanced by two forces: improved static productive and increases in the dynamic performance of cartelized industries through increased productivity growth.[481] In sum, these critics dismiss the importance of the cartel phenomenon and, by implication, the relevance of economic cartel studies. In this sub-section, I briefly respond to the empirical validity of these criticisms.[482]

In defending the value of empirical studies of cartels, I must once again mention a great limitation of the behavioral social sciences: one cannot observe the unobservable. Increasingly, since the middle of the 20th century, most cartel managers have gone to great lengths to hide their illegal joint ventures from public view. Consequently, in the past several decades, empirical studies of cartels have been limited to analyzing samples of discovered, punished cartels. "…[W]e know a great deal about cartels that get caught, but very little about those that escape detection" (Carlton and Perloff 2005:127). These samples may not be representative of the population of all cartels. Successful, clandestine cartels may well have better managers, greater endurance, and superior financial returns than the putatively inept discovered cartels. Or not.

Several responses can be made to concerns about "sample selection bias" (nonrepresentative cartel samples). First, this survey's sample is unparalleled in its extraordinarily large amount of data spanning centuries. The historical depth of the sample suggests that time is not a source of potential bias. Large numbers of the cartels in the present study operated in legal environments with little or no fear of prosecution or severe monetary penalties: they *predate* the current era of high penalties.[483] Second, the present study distinguished between overcharges of "guilty" cartels

[481] Such beliefs seem to arise from theoretical modes of collusion that typically do not allow for communication or contain unrealistically strict assumptions. For example, Telser (1985) has a proof that joint sales agencies improve efficiency, but in fact few contemporary cartels forward vertically integrate. Those in the past that did create sales agencies tend to have longer duration (Levenstein and Suslow 2006: 69).

[482] There are theoretical models that prove the possibility of efficiency improvements under overt collusion.

[483] In the United States, corporate penalties for cartel conduct were light until the early 1990s, and prison sentences for individuals likewise (Connor 2004b, 2009b). The EU only began imposing serious cartel fines in the late 1980s and still has no managerial penalties. Outside these jurisdictions, significant penalties appeared in only the past ten years. There is a good case to be made that even today global cartels function with impunity.

versus unsanctioned cartels. These categories mimic, however imperfectly, discovered versus undiscovered cartels. There is no great difference in overcharge rates between the two categories. Third, there are still legal cartels to be studied today. Samples of legally registered export cartels and government sponsored cartels also tend to find evidence of positive price effects. Fourth, controlled laboratory market experiments find ample evidence of strong price effects when the conditions are correctly specified. Fifth, even if undiscovered cartels are indeed different from detected cartels, international discovered cartels are the most appropriate sample for studying the influence of competition laws. In short, the absence of sample selection bias seems just as likely as its presence.

Beliefs about the fragility of collusive conduct are driven by cartel theories that focus on the profit incentive that individual cartel members have to cheat on price agreements. While this incentive is undeniable, so is the creativity of cartels that create credible punishment mechanisms.[484] The empirical reality is that durable cartels are observed in the great preponderance of quantitative studies. Duration is bimodal, with a large number lasting less than a year and the remainder much longer lasting (Levenstein and Suslow 2006: 44-45). Median duration of cartels is typically five to seven years, but the median life of international and global cartels is higher, probably because of smaller fringe competition and higher profits from geographic price discrimination. Moreover, the mean cartel duration is higher than the median because some cartels last for many decades.[485]

Finally, although data constraints are especially severe, most recent economic analyses of, investment, or productivity change do not support a sanguine view of cartels on this score.[486] One intensely studied phenomenon is legal German commodity cartels. Regression analyses of output of a large sample of German coal-mining firms determined that productive efficiency did not change when they joined the Ruhr cartel during 1883-1913 (Burhop and Luebbers 2008). Audretsch (1989) collected information on a large number of post-1945 German cartels; he showed that cartel formation resulted on lower output, not lower costs.[487] Blankenberg and Geist

[484] The development of infinitely repeated games demonstrates the wide range of conditions over which collusion can persist indefinitely.

[485] There are four cartels that endured from 96 to 134 years. Two were ended by antitrust agencies and two by entry.

[486] An oft-cited study that the author suggests shows that cartels can be efficient is Dick's (1992a) study of 16 legal U.S. export cartels. Of the 16, he finds that six either lowered prices, raised output exported, or both; of these, only three were "efficiency-seeking." Three cartels raised prices, and seven had insignificant or conflicting effects either way. This seems to be an almost random outcome. See also Günster et al. (2011).

[487] For studies that purport to find that late 19th century government-controlled German coal, iron and steel cartels were efficiency-enhancing, see Troeksen (1989), Kinghorn (1996), and Kinghorn and Nielsen (2004).

(2011) analyzed data from the German cement cartel of 1981-2002; during collusion this cartel experienced significant price increases, changes in price dispersion, and declines in cost efficiency. Another heavily researched natural market experiment is the temporary introduction of government-supervised cartels in the United States under the National Industrial Recovery Act (NIRA) in 1933. Although Bittlingmayer (1995) found no output changes due to cartelization, this finding is not supported by several other studies. After mid 1934 when federal compulsion flagged, many of the cartels fell apart; however, those that were able to implement open-price filing (Krepps 1997), those industries where firms had symmetric costs (Alexander 1994), and those cartels with viable self-enforcement mechanisms (Alexander 1997) did experience output contraction.[488]

One might think that higher profits from collusion might result in increased industry investment. Peters (1989) and Steen and Sorgard (1989) do observe this in two cartels. However, Connor (2008: 205) displays internal capacity data for the lysine cartel that shows more plant investment before and after collusion than during collusion. Levenstein and Suslow (2006: 85) conclude that the effects of national cartel policies have no clear effects on national economic productivity and development. However, rigorous empirical research on the dynamic effects of cartelization is just beginning.

Implications for Public Policy

The results of the survey have significant policy implications. First, there is a minority view among antitrust writers that there is little evidence that cartels raise prices significantly for a period long enough to justify anticartel laws and, especially, contemporary cartel penalties.[489] Consequently, they argue for the repeal or scaling back of the fines or damages that result from collusion. This survey's results, which are based upon an extraordinarily large amount of data spanning a broad swath of history of all types of private cartels, sharply contradict these views. In fact, the data suggest the opposite. Mean overcharges are several times as high as the average

[488] The aggregate impact of the NIRA codes on U.S. durable-goods manufacturing output was at least negative 10% (Taylor 2002: 8). In a later paper using more disaggregated data, Taylor (2010) finds that about one-fourth of the industries with the most variable production displayed output increases associated with efficiency enhancement (many were dairy products); the remaining three-fourths experienced the expected output reductions.

[489] A paper by Crandall and Winston (2003) disparages the effectiveness of antirust laws and enforcement. It is answered well by Baker (2003) and Werden (2003). Connor (2004c) also criticizes Crandall and Winston's reliance on a slim sample of facts concerning cartels.

level presumed by the U.S. Sentencing Commission (i.e., 10% of sales) and similar guidelines of other antitrust authorities.

Generally speaking, sanction guidelines aim at optimal deterrence of cartel formation (Connor and Lande 2012). More specifically, antitrust enforcement generally seeks general deterrence rather than specific deterrence. Hence, rules for imposing cartel fines ideally combine a proxy for a cartelist's antitrust damages (typically its affected commerce) with some average multiplier of cartel harm.[490] It is not clear which of the many concepts of "average" are the most appropriate for an antitrust authority to employ in designing effective and transparent sanction guidelines. What is clear is that the median averages discussed in this paper are *inapproprately conservative guides* to cartel fines.

Alternative and perhaps superior *mean* averages are shown in Table 5B. Mean episodic overcharges are more than double the respective median averages. Moreover, if authors failed to compute overcharges with competive sales instead of actual sales[491], then the mean overcharges attained by cartels were around 100% -- much higher than the medians of 23% to 25%.

Second, the relative injuriousness of bid rigging is sensitive to the measure of central tendency employed. Compared to other forms of collusion, *median* bid rigging overcharges were generally 25% lower; but *mean* episodic bid-rigging overcharges were 11% to 24% higher than classical price fixing. These results suggest that antitrust sanctions' guidelines should not necessarily treat bid rigging *per se* more harshly than other forms of collusion.

Third, international cartels are typically more destructive of competitive market forces than domestic conspiracies. Connor and Lande (2012) propose raising the overcharge presumption for U.S. fines to 20% for hard-core cartels.[492] Despite the evident increases in cartel detection rates

[490] While most jurisdictions adopt a single percentage multiplier (within a stipulated range) as a starting point, others have categorical multipliers. The United States uses 10% and 20% to calculate a range. The EC chooses a single number between 15 and 30, depending on gravity. The JFTC has a much higher percentage for manufacturers than for retailers. Connor and Lande (2008) proposed a single percentage that was double for international cartelists compared to domestic cartels.

[491] I do not know what share of estimates this correction ought to be to. In most cases when working with dollar overcharges, authors did not reduce affected commerce by the amount inflated by collusion. However, authors computing overcharges with prices need no such correction. So, these figures are to be regarded as upper limits.

[492] As an anonymous reviewer of an article derived from material in this paper suggested that such *changes* need to be considered alongside appropriate levels for private settlements. These recommendations are particularly

and the size of monetary fines and penalties in the past decade, a good case can be made that current global anticartel regimes are under-deterring (Bush *et al.* 2004, Connor 2005). Global cartels especially are more difficult to detect, have less fear from entry of rivals, achieve higher levels of sales and profitability, and systematically receive weaker corporate antitrust sanctions than comparable domestic cartels. Base fines of 20% of cartelists' affected commerce, even when adjusted by significant culpability multipliers,[493] will do little to deter most of these cartels.

Fourth, hundreds of overchare estimes based on the after-price method conclude that when cartels collapse because of the direct intervention of antitrust authorities, prices both in the short run and long run typically *do decline.* Nor does antitrust enforcement that suppresses collusion seem to have adverse effects on either static or dynamic industrial efficiency. See, for example, the research in Buccirossi et al (2012) showing that competition-law enforcement directly spurs total factor productivity growth.

When the effects of private suits are factored in, it is clear that the U.S. court system is already shouldering the bulk of the world's burden of punishing international cartels and their managers; moreover, more severe prison sentences for executives have relatively little additional deterrence power (Connor and Lande 2012). This survey suggests that overcharges generated by cartels discovered in most jurisdictions are higher than North America-centered cartels. Consequently, barring multilateral antitrust treaties, anticartel laws and fine-setting practices abroad are in even greater need of strengthening. The surge in EU cartel fines (by both the EC and the EU's National Competition Authorities) and the rising intensity of enforcement in 50 more jurisdictions since 2000 will marginally improve cartel deterrence. But with virtually no private rights of action or incarceration outside North America, total penalties are likely to remain sub-optimal for quite some time (Connor 2010).

One sanguine development is that for most types of cartels there are secular reductions seen in cartel mark-ups observed. Because the post-1990 era has been the period with by far the highest level of fines imposed, this decrease is consistent with the theory of optimal deterrence. It also suggests that the recent worldwide trend towards the intensification of cartel penalties has ameliorated cartel injuries. If procedures for calculating criminal fines correspond more closely

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complicated by corporate leniency programs and by the joint fining policies of overseas antitrust authorities for international conspiracies.

[493] For a variety of factors, however, very few firms actually pay a fine amounting to 20% or more of the amount of commerce affected. Most violators have their fines reduced by 60% to 80% of the maximums.

to the actual levels of cartel overcharges, monetary sanctions against price fixing will more closely provide optimal deterrence.

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TABLES 1 to 12

Table 1. Summary of Seven Economic Surveys of Cartel Overcharges

Reference	Number of Cartels	Episodic overcharge	
		Mean (%)	*Median (%)*
1. Cohen and Scheffman (1989)	5-7	7.7-10.8	14.0
2. Werden (2003)	13	21	18
3. Posner (2001)	12	49	38
4. Levenstein and Suslow (2002)	22	43	44.5
5. Griffin (1989)	39	28.0 [c]	28.7 [c]
6. OECD (2003), excluding peaks [a]	13	21.6	14.0
7. Davies and Majumdar (2002) [b]	23	24.9-33.9	20-25
Total, simple average of seven above	127-129	32.4	27.1
Total, weighted average of seven	127-129	38.1	31.0

a) One overcharge in the OECD survey with missing affected sales (U.S. lysine) was converted to percentages using affected sales data in a published U.S. Court decision. One overcharge reported to be "more than 13%" was recorded as 14%. If a range, the midpoint is used for averaging. Three percentages cited to be "as high as" were omitted because they are not likely to be representative of the overcharge rate for the whole episode. The OECD report states that its sample median is "between 15 and 20%."

b) The present author did not discover this estimable survey until 2011, perhaps because of its title.

c) Because one does not know what the benchmark prices are for these observations, I show average Lerner Indexes. If the benchmark is perfect competition, the mean and median overcharges would be higher, 53.2% and 38.9%, respectively.

Table 2. Number of Cartelized Markets and Episodes, by Characteristics

Characteristic of Cartel	Number of Cartels	*Percent of Sample*	Number of Episodes	*Percent of Sample*
Membership:				
International membership	294	55	515	59
Members from one nation	238	45	359	41
Conduct:				
Bid-rigging schemes	179	34	212	24
Classic price-fixing cartels	353	66	612	76
Buyers' Cartels	34	6.4	36	4.1
Legal Status:				
Cartel found guilty or liable for damages	399	75	629	72
Known to have been	97	18	245	38

operating legally				
No record of sanctions (presumed “legal”)	36	6.8		
Membership Location:				
North America	166	31	246	28
EU-Wide	57	11	77	8.8
Nations of Europe	131	25	179	20
Asia and Oceanea	88	17	103	12
Africa, Lat. Am. & E. Europe	20	3.8	30	3.4
Global (members from 2 or more continents)	70	13	240	27
Market Location:				
North America	178	34	288	33
EU-Wide	44	8.3	67	7.7
Nations of Europe	143	27	205	23
Asia and Oceanea	84	16	106	12
Africa, Lat. Am. & E. Europe	20	3.8	46	5.3
Global (operations in 2 or more continents)	63	12	168	19
Geographic Reach:				
Single Nation, of which:	425	80	608	70
Local/Sub-National	114	21	186	21

Cross-National, of which:	109	20	267	31
Global	64	12	162	19
Total Sample	**532**	**100**	**874**	**100**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

Table 3. Number of Episodic Overcharge Observations, by Type of Cartel			
Characteristic of Cartel	*Number*	*Percent of Sample*	*Episodes per Cartel*
International membership	1042	65.5	4.3
National members only	548	34.5	1.0
Bid-rigging schemes	341	21	1.9 [a]
Classic price-fixing cartels	1249	79	3.3
Buyers' cartels	72	4.5	
Cartels found guilty or liable	1137	71.5	2.7
No record of sanctions ("legal")	453	28.5	3.2
Membership Composition:			
North America	414	26.0	2.3
EU-Wide	195	12.3	4.4
Nations of Europe	289	18.2	2.0
Asia and Oceania	142	8.9	1.7
Africa, Latin America & Eastern Europe	51	3.2	2.6
Global (2 or more continents)	500	31.4	7.9

Market/Pricing Location:			
North America	512	32.2	2.3
EU-Wide	141	8.9	4.0
Nations of Europe	292	18.4	2.2
Asia and Oceania	146	9.2	1.6
Africa, Latin America & Eastern Europe	61	3.9	3.0
Global (2 or more continents)	383	24.1	7.7
Total (episodes with either episodic or peak estimates)	**1590**	**100.0**	**2.9**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

a) An episode is very likely to encompass a large number of bids, perhaps hundreds.

Table 4. Number of Episodic Overcharge Estimates, by Year and Type

Cartel Episode End Date	Membership		Legal Status		Bid Rigging	Classic Price Fixing	Buyers' Cartels	**ALL TYPES**
	National	Inter-national	Found Guilty	Legal				
	Number							
Before 1890	78	5	47	36	8	75	1	**83**
1891-1919	109	51	42	118	43	117	1	**160**
1920-1945	30	169	60	139	1	198	5	**199**
1946-1973	84	32	73	43	42	74	5	**116**
1974-1989	79	36	96	19	53	62	9	**115**
1990-1999	74	386	436	24	74	386	15	**460**
2000-2013	76	326	360	42	144	258	34	**402**
ALL YEARS	**530**	**1005**	**1103**	**432**	**330**	**1205**	**70**	**1535**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, Price Fixing Overcharges Master Data Set, spreadsheet dated October 2013.

Table 4A. Number of All Peak Overcharge Estimates, by Year and Type

Cartel Episode End Date	Membership		Legal Status		Bid Rigging	Classic Price Fixing	Buyers' Cartels	**ALL TYPES**
	National	Inter-national	Found Guilty	Legal				
	Number							
Before 1890	17	2	4	15	3	14	0	**17**
1890-1919	54	30	25	59	0	84	0	**84**
1920-1945	16	72	31	57	1	87	1	**88**
1946-1973	24	19	23	20	14	29	3	**43**
1974-1989	26	25	44	7	22	29	3	**51**
1990-1999	16	119	130	5	18	117	7	**135**
2000-2013	29	58	79	8	32	55	13	**87**
ALL YEARS	**182**	**325**	**336**	**171**	**90**	**417**	**27**	**507**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

Table 5. Median Average Episodic Overcharges, by Year and Type

Cartel Episode End Date	Membership		Legal Status		Bid Rigging	Classic Price Fixing	Buyers' Cartels	ALL TYPES
	National	Inter-national	Found Guilty	Legal				
	Median percent [a]							
Before 1890	8.4	18.2	26.1 [b]	16.0	85.0	19.3	32.5	**19.3**
1890-1919	19.5	35.0	15.0	31.3	12.5	31.6	25.0	**34.5**
1920-1945	20.0	35.0	27.0	29.0	20.0	29.0	12.5	**29.0**
1946-1973	24.0	28.5	16.7	24.0	18.7	21.2	57.0	**19.5**
1974-1989	13.5	15.9	21.5	18.5	15.0	22.3	12.5	**18.1**
1990-1999	27.5	45.5	23.9	21.0	17.8	22.1	20.0	**24.0**
2000-2013	20.0	15.0	20.5	57.0	21.0	25.1	36.7	**20.0**
ALL YEARS	**18.2**	**26.0**	**22.0**	**27.7**	**20.0**	**24.0**	**26.3**	**23.0**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

a) Medians of the point estimates or, where appropriate, of the midpoint of range estimates. Includes many zero estimates. See Table 4 for the numbers of observations in each cell.

b) Only three cartels (but with 47 episodes) were deemed guilty prior to 1890: *Wholesale Grain Merchants in Greece* (guilty by public trial), *Anthracite Coal* (by U.S. court), and *Newcastle Coal* (by the UK Parliament).

Table 5A. Median Average of *Positive* Episodic Overcharges, by Year and Type

Cartel Episode End Date	Membership		Legal Status		Bid Rigging	Classic Price Fixing	Buyers' Cartels	ALL TYPES
	National	Inter-national	Found Guilty	Legal				
	Median percent [a]							
Before 1890	20.6	74.0	24.4 [b]	17.6	16.2	22.6	36.5 [c]	22.0
1890-1919	24.8	59.8	24.4	44.0	24.5	44.0	430 [c]	36.8
1920-1945	20.0	39.5	44.9	36.7	34.0	37.0	6.4 [c]	36.9
1946-1973	18.8	42.0	28.2	17.9	14.2	23.9	47 [c]	22.5
1974-1989	16.9	43.5	20.0	9.7	20.0	21.5	23.0	20.0
1990-1999	18.9	25.1	24.6	21.5	18.9	25.0	16.9	24.0
2000-2013	23.3	20.2	20.3	18.4	18.0	21.0	17.6	20.0
ALL YEARS	20.0	27.0	23.3	30.0	19.8	26.6	21.6	25.0

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

a) Medians of the point estimates or, where appropriate, of the midpoint of range estimates. This table excludes zero estimates. On average, 94% of all episodic overcharges are above zero, and that percentage increases over time. Very few peak overcharges are zero.
b) Only three cartels (but with 47 episodes) were deemed guilty prior to 1890: *Wholesale Grain Merchants in Greece* (guilty by public trial), *Anthracite Coal* (by U.S. court), and *Newcastle Coal* (by the UK Parliament).
c) Only five peak observations before 1974, so comparisons with totals are problematic.

Table 5B. Mean Average Overcharges, by Type

Average Measure	Membership		Legal Status		Bid Rig-ging	Classic Price Fixing	Buyers' Cartels	ALL TYPES
	Nat-ional	Interna-tional	Found Guilty	Legal				
	Percent							
Mean Episodic, as Reported [a]	34.6	56.1	48.7	48.6	54.5	47.2	43.6	48.7
Mean Episodic, Corrected for Competitive Affected Sales [c]	52.9	127.8	91.6	91.1	109.7	89.4	77.3	94.9
Mean Effective (Non-Zero) Episodes	37.8	58.7	50.5	51.6	56.0	50.6	45.5	51.8
Mean Effective Episodes, Corrected for Competitive Affected Sales [c]	63.1	142.1	102.0	106.6	127.3	102.4	83.5	107.5
Mean Peak Positive Overcharges	69.0	121.7	108.5	75.9	53.9	114.1	33.1	103.5

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

a) The arithmetic mean. If they report their method at all, the large majority authors appear to divide the dollar overcharge by the cartel's dollar sales during the collusive period ("affected sales"), which leads to under-reporting of the overcharge rate Other authors do not have access to the affected sales of the cartel and instead use total market sales, which in general causes even a greater under-reporting of the overcharge rate.

b) The divisor is corrected for the inclusion of collusion-inflated sales. No adjustment is made for possible inclusion of fringe firms' sales.

c) Suppose OV% is the conventional computation of the overcharge rate (see note a) above). The the True Overcharge Rate TOV% = OV%/(100 - OV%). Note that authors that employ prices directly to derive the overcharge rate do not require this correction.

Table 6. Mean Average Episodic Overcharges by Size Category				
Percentage Range [a]	Number of Observations	Mean Average	Distribution of Observations	
			Total	Non-Zero
	Number	*Percent*		
Zero or less [b]	92	0	6.0	0
0.1-9.9 [c]	239	5.4	15.5	16.5
10.0-19.9	345	14.5	22.4	23.8

20.0-29.9	250	24.4	16.2	17.3
30.0-39.9	181	34.2	11.8	12,5
40.0-59.9	192	48.4	12.5	13.3
60.0-79.9	81	67.9	5.3	5.6
80.0-99.9	27	88.8	1.8	1.9
100.0-199.9	72	136.6	4.7	5.0
200 plus	50	563.9	3.3	3.5
Total	1540	48.7 [d]	100	100

Source: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

[a] Point estimates or midpoints of ranges.

[b] Undercharges are converted to positive numbers.

[c] Four estimates of "weak cartels" are assumed to be 1% overcharges.

[d] For effective cartels (those with positive overcharges) the mean average is 58.9%.

Table 7. Median Average Peak Overcharge Estimates, by Year and Type, Effective Cartel Episodes

Cartel Episode End Date	Membership		Legal Status		Bid Rigging [b]	Classic Price Fixing	Buyers' Cartels	ALL TYPES
	National	Inter-national	Found Guilty	Legal				
	Median percent [a]							
Before 1890	55.5	114.5	46.8	64.0	21 [b]	65	--	59.5
1890-1919	33.6	85.0	33.3	71.7	--	51.3	430.0	51.3
1920-1945	48.0	72.0	52.5	72.0	50 [b]	69.0	7.6	67.0
1946-1973	45.9	53.0	49.0	45.6	42.6	59.0	42.8	49.0

1974-1989	27.4	74.0	29.4	315 [c]	27.5	70.0	11.3	31.0
1990-1999	23.7	50.0	49.0	16.7	44.0	48.9	21.9	48.9
2000-2013	30.1	45.0	50.0	30.5	40.0	18.2	7.6	38.8
ALL YEARS	33.3	60.5	45.0	67.0	28.2	52.9	10.2	50.0

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

a) Medians of the point estimates or, where appropriate, of the midpoint of range estimates.

b) Only four peak observations before 1946, so comparisons with classic price fixing are problematic.

c) Three of the four estimates from the global *Mercury* cartel only; hazardous to compare with the guilty cartels.

Table 8. Ratio of Peak/Episodic Effective Overcharges, by Year and Type								
Cartel Episode End Date	Membership		Legal Status		Bid Rigging [b]	Classic Price Fixing	Buyers' Cartels	ALL TYPES
	National	Inter-national	Found Guilty	Legal				
	Ratio of Medians [a]							
Before 1890	2.69	1.55	1.92	3.64	1.30	2.88	--	2.70

1890-1919	1.35	1.42	1.36	1.63	--	1.17	1.00	1.39
1920-1945	2.40	1.82	1.17	1.96	1.47	1.86	1.19	1.82
1946-1973	2.44	1.26	1.74	2.55	3.00	2.47	0.91	2.18
1974-1989	1.62	1.70	1.47	--	1.38	3.26	0.49	1.55
1990-1999	1.25	1.99	1.99	0.78	2.33	1.96	1.30	2.04
2000-2013	1.29	2.23	2.46	1.66	2.22	0.87	0.43	1.94
ALL YEARS	1.67	2.24	1.93	2.23	1.42	1.99	0.47	2.00

Sources: Tables 5A and 7 above.

a) Medians of the point estimates or, where appropriate, of the midpoint of range estimates. Excludes zero estimates.

b) Only four peak observations before 1946.

-- = Not available

Table 9. Average Episodic Overcharge Estimates, by Geographic Concepts				
Location of Cartel Members' Headquarters or Region of Operation	Number of Estimates	Median Overcharge	Mean Overcharge	Mean Positive Overcharge
		Percent		
Membership Composition[a]				
USA and Canada	405	21.0	40.8	43.9
Multiple Nations in W. Europe (EU) [b]	184	29.2	49.9	52.8
Single Nations in W. Europe	275	16.1	62.3	67.4
Asia and Oceania	140	20.0	41.9	44.5
Africa, Lat. America, & E. Europe	50	19.4	21.3	22.6
Global (Companies from Two or More Continents)	480	27.5	51.9	54.2

Where Collusion Took Place[a]				
USA and Canada	512	22.0	38.3	40.2
Multiple Nations in W. Europe (EU) [a]	141	25.0	38.1	39.8
Single Nations in W. Europe	292	16.1	60.5	65.4
Asia and Oceania	146	20.4	37.9	40.1
Africa, So. America, & E. Europe	61	20.0	23.4	23.4
Global (Two or More Continents)	383	30.4	65.6	71.6
Geographic Extent of Collusion				
Global (Two or More Continents)	383	30.4	65.6	71.6
Non-Global:	1152	20.1	43.1	44.0
Cross-National [c]	559	29.0	56.8	60.8
Single National:	976	20.0	44.1	46.7
of which local/regional	286	18.3	36.8	39.5
Total	**1535**	**23.0**	**48.7**	**51.8**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

a) Export cartels that drew their membership from one nation or region are counted in that geographic area. However, many national-membership cartels affected world trade; hence, their "market location" is Global.

b) Cartels that operated across several nations of the 27-Member European Union, most of them discovered and convicted by the European Commission.

c) A high proportion of these cartels are either global (69%) or EU-wide (23%).

Table 10. Cartel Episodic Overcharges Derived from Decisions[a] of Antitrust Authorities

Location: Antitrust Authority	Number of Observations (episodes)	Median	Mean
		Percent	
North America:	**156**	**17.7**	**48.4**
US, 1898-1911	9	22.5	31.2
US, 1948-1973	8	16.8	135.5
US, 1980-1999	13	18.0	155.3
US, 2000-2013	120	16.9	31.1
US, 1898-2013	150	17.7	47.5
Canada, 1945-2013	6	37.3	71.1
European Union: [b]	**117**	**25.1**	**32.2**
European Commission, 1974-1990	11	25.0	31.7
European Commission, 1991-1999	19	22.5	22.9
European Commission, 2000-2013	86	26.7	34.5

Nations of Western Europe:	**96**	**17.2**	**33.0**
Belgium	1	21.0	21.0
Denmark	3	12.0	16.0
France	16	19.5	22.1
Germany	10	11.5	20.5
Hungary	2	13.8	13.8
Iceland	2	50.1	50.1
Italy [c]	14	75.0	83.8
Netherlands	3	8.8	38.9
Norway	5	9.0	17.1
Poland	1	28.0	28.0
Portugal	4	62.5	53.1
Slovakia	1	24.9	24.0
Spain	6	15.0	13.3
Sweden	3	8.3	12.2
Switzerland	2	78.6	78.6
United Kingdom:	31	16.9	63.1
UK Monopolies Commission, 1951-57	24	13.4	74.3
OFT & Other UK, 1990-2013	7	20.6	24.7
Asia and Oceanea:	**95**	**20.0**	**36.8**
Australia	4	10.5	10.1
China	2	21.1	21.1
India	2	42.3	42.3
Indonesia	6	46.1	72.9
Israel	1	120.0	120.0
Japan	15	28.0	25.2
Korea	44	17.9	31.5
Pakistan	5	24.2	29.9
Taiwan	13	25.0	46.7
Turkey	2	115.0	115.0
Vietnam	1	20.0	20.0
Africa, Latin America, E. Europe:	**17**	**25.0**	**32.7**
Brazil	1	11.3	11.3
Egypt	3	20.9	25.6
Latvia	1	2.7	2.7
Lithuania	2	27.8	27.8
Mexico	2	32.6	32.6
South Africa	4	18.7	20.1
Total	**485**	**20.0**	**40.8**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

a) Most decisions have a single estimate reported by or interpreted by one person, but several decisions have alternative estimates (or models) by single authors, and some have single estimates by multiple authors.

b) This is shorthand for collusion across two or more of the 27 nations that form the EU today.

c) Nine observations are from the two *Infant Formula* cases. I am informed by an economist familiar with these cases that while the Authority strongly suspected overt collusion, it could not find documentary proof. Nevertheless, the participants were fined.

Table 11. Average Episodic Overcharge Estimates, by Method of Estimation Employed				
Method	Number of Estimates	Median Overcharge	Mean Overcharge	Mean Positive Overcharge
		Percent		
Unavailable/None given	74	18.3	33.2	40.3
Historical Examination of Cartel Archives	20	0	10.8	30.7
But-for Price from Before Collusion	411	26.0	40.3	41.9
But-for Price from Price War During Collusion	28	28.2	39.7	41.2
But-for Price from After Collusion	200	25.0	46.3	48.0
Cost-Based or Constant-Margin	69	21.5	50.3	52.6
Yardstick from Comparable Unaffected Market	192	28.8	78.7	81.7
Econometric Model prediction	289	19.5	31.3	33.6
Legal Decision [a]	245	17.5	35.0	35.5
Other Quantitative (Simulation, etc.) [b]	7	670	1277	1277

Total	**1535**	**23.0**	**48.7**	**51.8**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated October 2013.

a) No specific method mentioned by court, jury, or commission issuing decision. May be a monetary amount or a percentage. Also includes judgments about what amounts constitute adequate compensation or restitution for victims. See Table 10 for details.
b) Four of the seven observations (and the highest) are from Normann and Tan (2011).

Table 12. Summary of the Characteristics of the 50 Highest-Overcharge Observations, by Year Cartel Began

Cartel Market [Number of estimates above one]	Years	Over-charge [a]	Source of Estimate (s) [b]	Quality Assessment [c]

		%		
Cordage, sisal or hemp, Eastern U.S.	1878-81	350.0	Dewing (1913) book	Very good
Borax, European-based	1890-94	223.5	Pierce (1913), Holt (1907) books	Very good
Steel Tubes, US	1899-14	227.0	Jones (1921) popular book, academic author	Very good
Steel, barbed wire, US	1900-08	233.0	Jenks and Clark (1929) popular book, academic authors	Very good
Telephone service, home and office, NY City [2]	1908	433-620	Demarest (1910), an opinionated book on evils of monopoly by an author considered one of the pioneering „muckrakers“	Perhaps poor yardstick if Bell Co. had no competition
Radium, global	1912-18	243.0	Government of Canada (1945) research report	Excellent
Raisins, US	1913-22	257.0	Jenks and Clark (1929) popular book, academic authors	Very good
Phosphate Rock, US, World Exports	1919-49	254.0	Dick (1992a) referreed article	Excellent
Rare books auction, bidding ring, country estate in Surrey, UK	1919	430.0	Pdickorter (1992) referreed article	Excellent
Sulfur, global [2]	1922-40	201.8 – 203.0	MacKie-Mason and Pindyck (1987) academic book chapter	Excellent
Electric Light Bulbs, world price	1924-39	222.0	Stocking and Watkins (1946) classic book	Excellent
Electric Light Bulbs, world price [4]	1924-39	214-322	UK Monopolies Commission (1951)	Very good
Tungsten Carbide [2]	1928-36	800.0-836.5	Berge (1944) DOJ prosecutor’s book	Very good
Tungsten Carbide [3]	1928-36	243.0-1329.0	Government of Canada (1945) research report	Excellent
Tungsten Carbide [2]	1928-36	886.0	U.S. Court Decision	Very good

Tungsten Carbide	1928-41	429.0	Suslow (2005) referreed academic journal	Excellent
Tungsten Carbide [2]	1936-41	302.0-310.0	Government of Canada (1945) research report	Excellent
Tungsten Carbide [2]	1936-41	200.5-612.0	Stocking and Watkins (1946) classic book	Excellent
Mercury	1951-70	239.9	MacKie-Mason and Pindyck (1987) academic book chapter	Excellent
Cable, high voltage power, Germany, experimental laboratory market [3]	1902-90 [d]	1255.0-4918.0	Fonseca and Normann (2012) refereed academic paper	Excellent
Coconut Oil, Philippines	1959	739.0	Buschena and Perloff (1991) refereed academic paper	Excellent
Antiques Auction, UK (One Week)	1964	480.0	Cassaday (1967) academic book	Very good
Uranium Metal, US Market	1974	200.0	Davis and Garcés (2009) advanced textbook on damages methods	Very good
Uranium Metal, US Market	1974	244.0	U.S. Congress (1977) report	May not incorporate the highest scientific standards
Banks, credit-card interchange fees, Spain	1990-05	200.0	Valverde et al. (2011) Working paper	Very good
Banks, debit-card interchange fees, Canada	1990-95	infinity	Valverde et al. (2011) Working paper	Very good
Tobacco, leaf, procurement, Italy	1995-2002	211.0	EC Decision 10/20/2005	Very good
Currency conversion fees, charge cards, US	1996-2005	200.0	Complaint 1/22/2002	Suit has not been sucessful, so estimate in doubt
Natural gas pipeline bid to Calif. "El Paso"	1996-2003	378.0	Lande and Davis (2007)	Excellent
Anti-anxiety drugs, US	1998	1800.0	FTC (1998) widely cited, well documented report	Excellent

Euro-Zone Fees, Banks in DE & NL	1999-2001	800.0	Guersent (2004) report by EC expert	Good but method a bit vague
Mobile Telephone Fees, UK & Germany	2000-02	450.0	Connor (2003) working paper	Possibly questionable yardstick
Distribution, Liquefied Petroleum Gas (LPG), southern Taiwan	2000-01	200.0	Taiwan FTC (2001) report to OECD (2001)	Good
Air passengers, Transatlantic routes, US-UK	2004-06	470.0	Antitrust Division DOJ (2008) report on increase in fuel surcharge increase compared to spot jet fuel prices	Very good
Potash exports from Canada, Russia & Belarus	2005-12	348.5	Jenny (2010) newspaper opinion piece by well informed economist	Good
River boats, Phonom Penh to Siem Reap, Cambodia	2005-05	400.0	Bhatia (2006) government report	Good
Glass, flat, Korea	2006-09	270.0	Yoon (2009) reporting on KFTC analysis	Very good
Avg. 50 High-Overcharge Cases	**1949-1958**	**577.3** [e]	**Duration 10.0 years**	**39% excellent, 36% very good**
1398 Other Effective Cases	**1962-1969**	**32.6**	**Duration 8.1 years**	**Not rated**

Sources: Appendix Tables 1 and 2, summarized in J. Connor, *Price Fixing Overcharges Master Data Set*, spreadsheet dated March 2013.

a) Similar estimates from similar sources are sometimes combined in one row.
b) Single source may provide alternative models or methods, hence multiple estimates.
c) The author's subjective assessment weighed according to the quality of the data employed, care used in applying the method of analysis, reputation of the authors (if known), and evidence of care in presentation of results (including peer or editorial review)
d) This cartel, when discovered by tthe German Federal Cartel Office, had archives extending back to 1902, but as Gernany's current version of its competition law was enacted only in 1958, the overcharge analysis covers only this latter period.
e) Using the mid-ranges, the average for the 28 very good- and excellent-rated cases is 522%.

APPENDIX:

DATA SOURCES AND COLLECTION METHODS

Selection Criteria

I have made every attempt to locate and extract all useful information on *private, hard-core* cartel overcharges available from *serious*[495] published sources. A private, hard-core cartel is one that by contemporary U.S. standards could be criminally indicted under the Sherman Act.[496] *Private* cartels are those not protected by treaties or national sovereignty. *Hard-core* or "naked" cartels are those that made explicit agreements on horizontal restraints to control prices or limit quantities to be produced or sold. Price agreements may cover list prices or transaction prices; the transactions prices may be floor prices, target prices, or, if a common sales agency is employed, actual transactions prices. Prices may refer to sales of goods or services, procurement of inputs, or bids in auctions or tenders. Quantity restrictions most commonly involve fixed

[495] Some readers have overlooked this selection criterion. For example, Bergman (2008) has said the following:

> "Connor's results are based on all estimates of price effects that he has been able to find, irrespective of the quality of the underlying analysis...[M]any of the studies are unsubstantiated claims by competition authorities."

"Serious" studies are identified primarily by form of publication. Books, monographs, academic journals, and government publications that are written by professionals and show attention to detail nearly always make the cut. Working papers by scholars that seem to have publication potential are included. Newspaper articles, editorials, and opinion pieces; essays in popular magazines; and blogs are rarely included, unless they happen to be cited approvingly by academic experts. Statements by antitrust officials about overcharges are included only if their methods are explained and are methods normally accepted by U.S. courts. To my knowledge, other than a well regarded OECD (2003) survey, there are no unfiltered assertions by antitrust officials – or any other parties to cartel legal suits -- in this survey. I have, however, omitted a very small number of egregiously methodologically flawed studies (See Appendix Table 3 for the brief list of excluded studies and the reasons for their exclusion).

Admittedly, and by design, seriousness and professionalism is not a high bar, but when authors attempt to pick a sample of studies according to some subjective criterion of "quality," excluding data points opens them to reasonable suspicion of tilting results to fit their inevitable prior beliefs (and lose friends). Indeed, Bergman's analysis itself may be criticized for basing his paper on a sample of 13 overcharges when so many others available; he displays a strict preference for econometric studies that I have argued may be the counsel of perfection in practical competition enforcement (Connor 2007c). Meta-analysis is one appropriate method for dealing *ex post* with heterogeneous quality; minimal, harmless heterogeneity has been detected in this paper's (see Connor and Bolotova 2006).

[496] In the United States, bringing criminal indictments for *only* hard-core cartels is a matter of custom, not law. Some hard-core cartels are brought as civil matters because prosecutors judge that the criminal burden of proof cannot be met. Since the 1980s, the EU and most other other civil-law jurisdictions have abandoned requiring an effects test and now follow more or less the same conspiracy approach used in common-law countries (Joshua and Jordan 2003).

market shares for each participant, but may also include territorial exclusivity, customer allocations, production-capacity, or fringe-boycott agreements. Cartels that focused *exclusively* on collective action regarding vertical restraints, advertising, patent pooling, technical standards, R & D, and the like are not considered hard-core.

Classifying the sampled cartels at times requires judgment. Some cartels operated prior to 1890, after which passage of the Sherman Act made participation by U.S. companies illegal, but many 20th-Century cartels headquartered in Europe predate the beginnings of effective European anticartel laws. If these cartels were not formed by means of a legally enforced government monopoly, they are generally considered *private* schemes.[497] However, if a government simply required registration or chartering of a cartel but left its management in corporate hands, they are included in the data set. Beginning in 1918 in the United States and in most European countries in the interwar period, domestic producers were permitted to register and operate export cartels with no or minimal supervision; I consider these private cartels, unless they were compulsory by law. Similarly, if a government-owned national monopoly or commodity association voluntarily joins an international cartel, the latter may qualify as a private cartel. Thus, the mere fact that governments tolerated or turned a blind eye to cartels does not disqualify them from inclusion in the data set. However, commodity agreements known to have been initiated, actively sponsored, or intentionally protected by national sovereignty are not included in this paper.[498] In these "public" cartels the active involvement of governments are signaled by the signing of a treaty, government ownership of stocks or commodities, or the appointment of civil servants to cartel-management positions. There are many fine studies of such agreements, but the inclusion of government-sponsored or -enforced cartels would tend to bias upward the overcharges in the sample (Suslow 2001). Moreover, public cartels are beyond the reach of antitrust law.

With very few exceptions, this paper reports on every scholarly or serious study that contained quantitative information on the price effects of hard-core private cartels. Writings by economists, political scientists, economic historians, and legal scholars are included. Written decisions or detailed reports of decisions of antitrust authorities everywhere in the world were

[497] Wallace and Edminster (1930: Appendix A) provide a convenient chronology of most government-sponsored export-control monopolies throught the late 1920s. The Japanese camphor monopoly of 1899, the Italian citric acid monopoly of 1910, the Greek currant monopoly of 1895, and the New Zealand kauri-gum monopoly of 1927 are examples of clearly public, government-managed cartels.

[498] In some cases particularly in the early 1930s, the earlier phases of an international cartel were controlled by national producers' organizations of private firms that negotiated voluntary quota reductions; when cheating threatened the effectiveness of the cartel, colonial or metropolitan governments stepped in to pass mandatory supply-control legislation. The early phase of the cartel I deem private, but not the latter.

examined. While no time limit was placed on the literature search, the large majority of the sources consulted were written after 1945.[499]

I have examined more than 1000 English-language books, journal articles, working papers, reports, and other shorter analyses looking for evidence of cartel price effects. Many were written primarily as historical case studies or are focused on demonstrating a new method. Some mention price effects only in passing. The great majority of the cartel studies were written by economists, typically by North American academics using cartel episodes that affected commerce in the United States or Canada. The small number of empirical studies by European or Asian academics is striking.[500] In addition, countless hours were spent reading press releases, decisions, etc. at the Web sites of antitrust authorities.[501]

In general, I aimed at collecting the largest possible body of reasonably professional, quantitative estimates of cartel overcharges, and avoided applying possibly subjective quality screening. In the vast majority of cases, the writers themselves provided the overcharge calculations. In a small minority of cases, I made inferences from price data contained in the works, following the judgement of and the facts supplied by the author, such as dates of collusion. The bases for my

[499] Unless available in translation, I have mostly confined this survey to English language sources. Many antitrust authorities now translate their press releases, decisions, and annual reports into English; moreover, members and some nonmembers submit summaries of their annual reports in English to the OECD. The preponderance of sources published after 1945 is explained by the growth of the field of industrial-organization economics and the passage of effective anti-cartel legislation worldwide.

[500] One might speculate as to why this is so. The supply of well trained industrial economists in Europe is unlikely to be an explanation. The principal European organization for industrial economists (EARIE) equally active in sponsoring meetings the past decade than its U.S. counterpart (IOS), and the EARIE meetings had a good proportion of empirical and legal-economic papers. The structure of academic departments at European and Asian universities may be one explanation of the paucity of useful studies. Compared to U.S. departments of economics, European departments tend to be smaller (perhaps falling below the threshold necessary for collaborative teamwork on large-scale data sets), more focused on IO theory, and have different expectations for Ph.D. dissertations. Perhaps a more important factor is the inability of academics to obtain access to the price data needed to calculate overcharges. Civil antitrust damages cases are unusual in Europe, so the little work being done on cartel overcharges is done in-house by antitrust authorities. Unlike North America, there is little mobility between the staffs of European antitrust authorities and universities or think tanks. Finally, a survey of European and North American industrial-organization economists reveals that there are very few attitudinal differences between the two groups on economic theory, but the former were less inclined to expect economists to influence competition policies (Aiginger *et al.* 2001).

[501] The term “antitrust authority” has gained currency in recent years to cover any national or supra-national government agency empowered to enforce criminal or civil antitrust laws or competition-law rules. Thus, it encompasses, the U.S. DOJ Antitrust Division, the Fair Trade Commissions of many nations, the EC, and the many administrative authorities modeled on the aforementioned. Courts supervising antitrust trials or damages litigation are acting as antitrust authorities.

inferences are briefly outlined in Connor (2007c).[502] Overcharge claims appearing in newspapers, magazines, and newsletters are avoided because such assertions are usually from anonymous sources who may not be disinterested parties in an ongoing law suit or in some public policy debate, roles that may color their assertions. In some cases, overcharge estimates may originate from information in industry trade journals, but if they were cited by economists, historians, or legal scholars with some background in cartel studies, such estimates are reported in the present survey (e.g., Demaree 1969). Estimates found in a small number of book-length, years-lon investigations by journalists, public servants, or other professional nonfiction writers are included (e.g., Berge 1944, Taylor and Yokell 1979).

Clearly this catholic approach to data-gathering will create concerns in the minds of many readers about the reliability and precision of the overcharges. There may be substantial variation in the quality of the price data, the methods used, degrees of judicial scrutiny, and the professional orientation of the sources that could affect reliability as perceived by any individual. I noted above the lack of clarity among professional writers about the essential characteristics of the cartels until at least the 1920s. Consequently, some readers may wish to dismiss scholarship before that decade, while others will be untroubled by semantic differences. Economists may well give greater weight to writings by professionals in their own field than to opinions reached by judges, commissions, or juries, whereas legal scholars will often give greater credence to the latter. Legal professionals may have strong preferences for high court decisions over state or district courts, or they may have strong opinions about European versus American antitrust jurisprudence. Similarly, many economists might trust results published in refereed scientific journals more than other publication outlets that receive less peer scrutiny, prefer modern quantitative methods to deep historical case studies, or express skepticism about the analyses of economists writing before the Age of Game Theory.

To contend with the disparate preferences of readers, I have chosen to cast my net widely, but look across the sources for evidence of systematic bias. In addition, the data are displayed across several time periods, data sources, and methods of computation so as to permit readers to choose the combinations they prefer. Indeed, the analysis of these data by source, time period, or method

[502] If a credible study of a cartel concludes that it was "ineffective," I have coded this comment as a zero price effect and included this observation in the averages. Likewise, conclusions that the impact of collusion was "overwhelmed" by natural market forces are interpreted as a zero overcharge. However, vague conclusions that a cartel episode was "effective" in controlling prices are not tabulated in the quantitative summaries.

may provide useful insights in itself. I hope to provide the interested reader with enough information to make up his or her own mind about reliability.[503]

Social Science Studies

The first block of sources consists of archived materials: books, monographs, reports, and refereed journal articles written by specialists in many fields: economists, historians, political scientists, lawyers, and in a few instances journalists.[504] Newer publications were located by using various bibliographic search engines, by noting the references cited by authors in the works themselves, and by searching on-line library catalogs. These studies vary substantially in terms of depth and the degree of professional commitment to the study of cartels. Some economists and historians have spent substantial portions of their careers specialized in cartel analysis, but most of the publications quoted herein are by social scientists for whom cartels were just a passing interest.

There are several methods used by social scientists to derive the effects of cartels on prices. Older economic studies tended to use a rather informal method of price analysis that now comes under the rubric of the "before-and-after method" (Connor 2007c). That is, armed with knowledge of when overt collusion occurred, the author would compare prices during the affected period with prices before the cartel began or after it ended; in some cases, the basis of comparison would be a price war that erupted during the affected period. The base price was typically assumed to be the long-run competitive equilibrium benchmark price (now rather succinctly, if inelegantly, termed the "but-for price") . Although some were careful to take such factors into account, in many cases the possibility that shifts in demand or supply conditions could have caused the benchmark price during the affected period to depart systematically from the before or after price was ignored; moreover, the idea that price wars could generate

[503] The influences of types of publications and methods of computation are formally analyzed in Connor and Bolotova (2006).

[504] I have confined journalists' accounts of cartels primarily to book-length treatments of cartels, in the belief that such monographs are in-depth accounts of a cartel collected from many sources, some of them anonymous, over a period of time sufficient for the author to provide a balanced account of conflicting claims. Books by journalists typically do not focus on the quantitative economic aspects of the case at hand, so in practice there are relatively few overcharges drawn from these sources in the present study. I rarely include overcharge estimates embedded in newspaper or magazine articles, though some specialists may judge such assertions to be sufficiently reliable to include in their published studies. For example, Elzinga (1984) cites Demaree (1969), and Carlton and Perloff (1990) cite Smith (1963).

unsustainably low prices was not often recognized. Some economists of the time realized the importance of averaging before or after prices for periods long enough to eliminate the influence of transitory disturbances in markets, but others were satisfied to identify one month's prior price as the but-for price.

A second way of calculating a benchmark price is the yardstick method. In this type of analysis, an economist would collect prices for analogous markets that were believed to be free from cartelization. For a localized conspiracy, the competitive yardstick could be prices in a nearby city or an adjacent state with similar demand or cost conditions. If prices before or after collusion are highly correlated, then the trend in cartel prices could then be compared to the trend in the yardstick-market prices during the collusive period. Yardstick price movements can also be constructed for a noncartelized product made in the same region that is made with the same inputs, utilizes a similar technology, and is consumed by the same customers.[505] If a cartel colludes against only some of its customers, then the discounts offered to other similarly situated customers could yield a yardstick.

Third, sometimes the costs of production and the margins earned by firms in the relevant lines of business may provide collateral indicators of variations in the degree of competitiveness of a firm or market. Absent significant changes in production technology, constant long run marginal costs or constant operating margins may be assumed before, during and after alleged collusion; if they are not constant, collusion may be the cause Cost-based estimates are relatively uncommon because detailed internal business records are needed. The before-and-after, yardstick, and constant-margin methods require expert judgment about the market or industry in question, but all are acceptable methods used in courts of law or commission hearings to determine the fact of injury or the amount of damages.

Fourth, since the 1970s the rigor and precision displayed in deriving estimates of cartel overcharges have made several advances (Baker and Rubinfeld 1999). Driven by developments in oligopoly theory, statistical methods, and the increasing availability of detailed company and market data, increasingly it is econometric models of the alleged collusive market that are specified and fitted to the available data.[506] Game theory has influenced contemporary concepts

[505] The danger with this method is that the product yardstick may be a substitute for the cartelized product, and, hence, price-responsive to a cartel overcharge.

[506] These data are often proprietary facts revealed during the discovery phase of litigation or submitted to an antitrust authority under compulsory legal processes. In addition to transaction prices of the defendants, production and marketing costs of details of business contracts may be handed over on a confidential basis.

of collusion, the design of competition policies, and empirical modeling of oligopolies (Werden 2004). One type of econometric modeling is an elaboration of the before-and-after method. A structural model of the market before or after the conspiracy can be estimated and used to predict the competitive benchmark price during the conspiracy (Brander and Ross: 17-20). A second type of econometric model can specify demand, supply, and an oligopoly model (usually Cournot or Bertrand) and fit the model to data from the collusive period (*ibid.* pp. 21-23). An early example of this approach is Dick's (1992a) study of 16 U.S. Webb-Pomerene cartels.[507] The most common approach is a reduced-form model. These models usually specify the demand and supply conditions in the relevant market as a function of the observed market price before, during, and after a conspiracy; the analyst then investigates through statistical tests whether and to what extent changes in prices or output fail to respond to normal, competitive market forces (*ibid.* pp. 23-29).[508] Because these models can simultaneously incorporate multitudinous factors that explain prices, economists tend to regard overcharge estimates from such models as more accurate than analyses that depend on more informal ways of accounting for such factors.[509]

Defining Episodes

Like most natural phenomena, most cartels are born and die only once, and the dates of those events are known with precision. A cartel's birth and death describe one episode and one cartel.

The birth of a cartel ("formation") is marked by the day a collusive agreement is adopted.[510] Cartel deaths are more varied and sometimes more difficult for observers to pinpoint. Cartels can die "natural" deaths if changes in market conditions make collusion unsustainable; natural deaths may be quiet events marked by a consensus among the cartelists to close shop (e.g., if fringe

[507] Dick (1992a) interprets his results as identifying only two cartels that either significantly raised prices (*Crude sulphur*) or caused quantity to contract (*Carbon black*). However, I add *Pebble Phosphate* to this list because I believe a one-tail test of significance is warranted.

[508] Either a dummy variable is included for the assumed collusive period, or the model can forecast or backcast benchmark prices from a noncollusive period.

[509] On the other hand, if a cartel operated during a span in which cost conditions (input prices, expansion of capacity, inventories, and technology) were steady and demand conditions (consumer preferences, disposable income, available substitutes, and the like) did not shift, then elaborate econometric models and the more traditional methods will yield the same overcharges. For durable cartels, constancy of all these factors is unlikely.

[510] This event may be marked by the signatures of the cartelists on a written contract, by the adoption of a verbal agreement and handshakes all around, or by some similar less formal method of communication.

entry becomes large, a new superior substitute product appears, or warfare among nations makes business as normal impossible), or they may end in convulsion (e.g., if cheating or defections become excessive or if major players engage in open warfare) (Levenstein and Suslow 2010). Cartels may also die "unnatural" deaths if cheating or defections are caused by the presence of effective anti-cartel laws (e.g., an antitrust authority's decision to investigate suspiscious prices being charged to buyers, signals from a screening program that market prices are incredibly steady or significantly less variable, or an application by a participant in the cartel to a government leniency program).

However, some cartels have led charmed lives, dying and being reborn. Indeed, some cartels are formed, disband, reform, and disband several times. Each collusive cycle is an episode. Overcharges are computed for episodes rather than cartels, so the dates of those episodes are critical parameters for analysts.

Consistent with contemporary empirical studies of cartels, in this study each cartel episode is treated as a unique observation.[511] The reasons for analyzing episodes rather than one cartelized market over time are fairly straightforward. When a new episode appears, the cartel may have new members, a different territory, or simply a revised agreement. Pauses between episodes are often quite lengthy. Because the agreement or the players are different, in effect a new cartel is launched. Changes in these contracual factors will generally affect price outcomes.

The period between the termination of one episode and the rebirth of the next episode is known in economic game theory as a "reversion to competition." During this interim, the cartelists cease to observe and enforce the contract, cease to have harmonious multilateral contacts, may engage in open warfare, and typically suffer lower prices and profits than previously. During reversion prices may fall from near-monopoly levels to levels associated with noncooperative oligopoly (Cournot equilibrium, for example), purely competitive prices, or even sub-competitive prices. Price wars are not necessarily signs of failure, rather, they may be opportunities for a cartel to reorganize and adopt better rules for price-setting, profit-sharing, compensation and the like (Levenstein and Suslow 2006).

[511] Some early writers were fuzzy about this notion, but Sweezy (1938) and his successors like Eckbo (1976) and Griffin (1989) were meticulous in identifying temporal episodes carefully.

Sometimes there are practical impediments to measuring episodic dates. In a forensic setting, the dates marking an episode may be obvious or uncontroversial; both sides stipulate the dates, and fines or damages can be computed with the stipulated dates. However, particularly for more durable cartels, the beginning date of an episode may be debatable, because written records have been lost or destroyed, cartel managers have retired or moved on, or memories faded.[512]

Ending dates should be better documented because in modern times most cartels end with publicly reported raids. However, cartel deaths are quite varied and some are difficult for observers to pinpoint. Cartels can die "natural" deaths if fringe supply grows too large, if cheating becomes excessive, or if defections (including leniency applications) occur; or cartels can die sudden "antitrust" deaths from raids resulting from tips[513] to an antitrust authority (Levenstein and Suslow 2010: Table 2). Of these causes of death, only the dates of raids can be objectively recorded. Moreover, in the case of global cartels, various antitrust authorities often cite different dates.

To assist forensic economists in objectively identifying the existence and dates of collusion, a quantitative technique called a *variance screen* has been developed and implemented. Statistical analysis of price distributions begins with determining when the mean average price deviates from the but-for price. The mean is the first moment of the distribution, and there are three higher moments: variance, skewness, and kertosis. Connor (1985) was probably the first to suggest the rationale for the notion that higher moments could be used to identify cartel price effects. Abrantes-Metz et al. (2006) found that price variance declined during collusion by frozen fish sellers. Connor *et al.* (2008) also successfully tested the variance as a screen for cartel behavior. Blanckenburg *et al.* (2012) test for the effects of cartelization on all four moments of price distribution. Abrantes-Metz *et al.* (2011) applied Benford's Law to demonstrate how LIBOR rates differed from the expected non-collusive distribution of digits, suggesting that bid rigging could have been detected.

[512] Beginning dates may be reported by government antitrust authorities as later than the true dates because the standard of proof is high or because they are only interested in dates after their laws take effect. In the United States, the DOJ can make plea bargaining more expeditious by moving forward a provable starting date as a concession to a defendant. Frequently, follow-on private plaintiffs are able to secure damages from a longer episode than that written in a plea agreement.

[513] The main source of tips is disaffected directors or employees of cartel participants, the secondary source is outgrowths of other investigations (including Amnesty-Plus applications), and the tertiary source is customer complaints.

Decisions of Antitrust Authorities

The second big block of information includes the printed reports and Web pages of scores of antitrust agencies, lists of court and commission decisions, and multilateral organizations concerned with competition issues. Data collection began by trying to collect verdicts in collusion cases, namely, final decisions antitrust cases involving horizontal collusion, broadly defined to include bid rigging and related practices, where a judge, jury, or commission calculated the damages.

Starting with the United States, in theory reserchers should be easily able to determine how high cartels raise prices by a straight-forward examination of a statistically significant sample of the thousands of U.S. antitrust cases that involved cartels. However, for many decades in U.S. government cases, resolution of these numerous cases has involved fewer than ten trials per year, most of them of individuals, not corporations. Moreover, the amount that prices changed, or even whether prices were affected at all, is not relevant to the issue of whether a defendant violated U.S. criminal antitrust law.[514] In U.S. criminal antitrust cases it is unnecessary for prosecutors to present evidence of the extent of any overcharges or undercharges. Even at the sentencing phase of criminal price-fixing trials, prosecutors rarely offer information on damages. Guilty-plea statements and sentencing memoranda often mention affected sales and culpability factors that were used to calculate the sentencing guidelines ranges. Only a few contain stipulated damages as percentages of affected sales, and these percentages are probably minimal overcharge rates.[515]

In civil damages cases, however, the damages awarded to a successful plaintiff are equal to three times the overcharges, so in these cases plaintiffs must demonstrate how much prices increased or decreased due to the actions of the cartel. Finding overcharge rates in judicial decisions in civil actions also proved to be extremely difficult, because almost every private antitrust suit for damages settles or is dismissed before an overcharge can be calculated by a neutral observer and made part of the public record of the case. As a consequence, final verdicts involving cartels where a judge or jury calculated an overcharge are surprisingly rare. This approach yielded less than 30 episodic overcharges (Connor and Lande 2005).

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[514] See the discussion in Sullivan and Grimes (2000:165-233), which shows that in *per se* cases the plaintiff does not have to prove whether prices rose (or even whether defendants had market power). The issue of whether prices rose can be an element of a rule of reason case, but rule of reason cases do not give rise to criminal fines, so are not the subject of this paper.

[515] What the documents say is that the percentage of what the defendant and the Government both agree is the amount of damages that prosecutors could prove beyond a reasonable doubt had a criminal trial been held. This is a higher standard of certainty than economic statistical reasoning can usually provide.

Besides U.S. court decisions, the Web sites of many foreign antitrust authorities were examined.[516] In the jurisdictions employing Common Law, most cartels are sanctioned after government negotiations that result in guilty pleas or by monetary settlements with private parties out of court. When this is the method of resolution, the press releases practically never mention the degree of harm caused by the cartel. Very few cartels defend themselves in court, and very few of the trials result in published decisions that reveal the overcharges.

Altough judicial decisions themselves may not mention an overcharge rate,there are other ways to obtain overcharges from some of the decisions. Three sources were explored: computer assisted searches of data bases, reading through a large number of articles and treatises on cartels and on antitrust damages, and messages to groups of knowledgeable antitrust professionals. For example, inquiries were made on the antitrust list serves of the ABA Antitrust Section, the National Association of Attorneys' General, and of the American Antitrust Institute.Every qualifying final collusion verdict is included.[517] The small sample size of overcharges from U.S. decisions is disappointing.

In other legal systems, antitrust commissions hold confidential hearings to determine guilt and impose sanctions. These decisions are announced in press releases that seldom mention the extent of cartel damages. Italy, the Netherlands, and Korea are exceptions to this rule; these overcharges are collected in Connor (2003). Moreover, these antitrust authorities and some others have reported a few of their decisions and overcharge estimates to the OECD (2003). However, in some jurisdictions a detailed report is released a year or two after the decision, and some of these reports have prices that can yield useful overcharge information, though that is not

[516] The most useful sites were: The European Commission (EC); the Australian Competition and Consumer Commission (ACCC); the Canadian Competition Bureau (CCB); the German Bundeskartellamt (BKA); the Fair Trade Commissions of Japan, Korea, and Taiwan; and the competition authorities of Finland, Sweden, Norway, Denmark, the Netherlands, France, Italy, Portugal, and Israel. Many of these authorities seem committed to reminding taxpayers of precisely how harmful the cartels they ensnared have been.

In past decade, the large majority of the authorities' Web sites translate summaries of their decisions and their annual reports into English. However, I also read some earlier, untranslated documents in French, German, Spanish, and Italian. In recent years, (using browsers with the names of punished cartelists, for example) I have found short press releases from antitrust authorities or news bureaus written other languages and obtained sensible on-line translations.

[517] Many of the verdicts found were only expressed in monetary amounts, which could only be translated into percentages if trade sources could be found for the often narrowly defined cartelized products. Other decisions gave good or at least minimally acceptable price change data for the affected markets.

often the case.[518] Additionally, commission decisions can be appealed to a court that renders a decision with a recitation of the facts of the case.[519]

Laboratory Market Experiments

The overcharges reported in this paper are derived from studies that use a wide variety of analytical methods (see Connor 2007c). The majority of these methods are not controlled scientific experiments in the strictest sense. Some come from econometric studies, which are quasi-experimental results derive from observations taken from natural markets.

Since at least 1948, economists have been reporting on prices generated by controlled, small-scale laboratory market experiments. The supply sides of these games are oligopolies, and the treatments consist of changes in the number of players, supply conditions, available information, trading rules, and seller communication protocols. Goods are almost always homogeneous and bought by anonymous buyers. All laboratory experiments allow the players to "communicate" tacitly through observed transaction prices or quantities, but a smaller number permits sellers or buyers to talk. Only the latter type opens up the possibility of cartel behavior.

A classic survey of laboratory experiments with homogeneous-product monopoly and oligopoly can be found in Plott (1989: 1142-1159). The predictions of pure monopoly theory are verified by these controlled experiments. One laboratory experiment finds that "[W]hen the monopolists post prices, market behavior is … accurately captured by monopoly theory" (*ibid*. p. 1144). That is, buyers end up paying the monopoly price.[520] More apropos this survey are oligopoly experiments that simulate cartels. A central conclusion of oligopoly experiments is that "market participants almost always recognize a harmony of interests" and that where direct communication is not permitted, observation of bids, offers, or transaction prices is one way that tacit agreements are realized (*ibid.* p. 1149). In other oligopoly experiments that allowed traders

[518] I read almost 100 EC decisions that imposed fines on cartels (listed in Burnside (2003: Annex 1) and others published since 2003). The UK Monopolies Commission also released detailed reports, and I read about 40 of the ones that declared the cartel was "not in the public interest."

[519] Occasionally, the commission reported an absolute overcharge, and the size of affected sales needed to be estimated.

[520] When the exchange mechanism is the double oral auction, buyers pay prices slightly below the full monopoly price (Plott 1989: 1143).

to talk among themselves (but prohibited profit-sharing or side payments), traders "discussed conspiracy almost immediately and they had no difficulty in articulating an agreement" (*ibid*. p. 1150). When the few sellers post prices and have full information about each other (i.e., perfect monitoring within the collusive group), prices are supra-competitive (*ibid.* p. 1154). Long periods of interaction also facilitate collusion. Similarly, bid riggers who post their offers are able to reach infra-competitive prices (ibid. p. 1157).[521] Perhaps because profit-sharing, side payments, and punishment for cheaters are not allowed (all common features of cartels), collusion experiments result in prices below the full monopoly (above the monopsony) price.

More recent experiments reinforce the importance of information and transparency among sellers in a cartel in achieving pricing effectiveness (Haan *et al.* 2009). Under tacit collusion, information about other sellers cannot be shared and sellers cannot talk to each other before or during trading. Experimental markets with tacit collusion generally result in competitive prices, except for homogeneous-product duopolies, which usually achieve Cournot-level prices. First, access to rival sellers' information can be collusive. If private information about current sellers' costs or market shares is made available voluntarily, through a trade association for example, experiments with repeated games produce collusive effects. Revealing information about all past outputs and profits of rival sellers usually increases collusion. Second, with posted pricing, explicit collusion among sellers who can easily detect cheating typically results in near-monopoly prices. Third, if sellers explicitly collude on *list* prices but buyers can also communicate and ask for secret discounts, *transaction* prices are still well above competitive levels; collusion ends only if sellers compete on both list and transaction prices.

A meta-analysis of 154 oligopoly publications reporting on 512 controlled experiments focusing on the collusive price effects of sellers' oligopolies under various treatments (Engel 2007). These oligopoly price effects are reported using a measure of pricing *efficiency* that I will call the *monopoly index* (MI).[522] The monopoly index divides the observed equilibrium overcharge by the maximum possible (monopoly) overcharge, expressed as a percentage.[523] Without specifying the type of collusion, the efficiency of collusion increases with the fewness of sellers; MI is highest for duopoly experiments (MI=62%), lower for triopolies (MI=43%), and lower still for

[521] However, like monopoly, both buyers' and sellers' cartels showed weaker price effects when the trading system was a double auction.

[522] Engel also presents two other pricing efficiency indexes, but little is lost by focusing on only MI.

[523] MI= (P-Pc)/(Pm-Pc), where P is the observed average outcome price, Pm the monopoly price, and Pc competitive benchmark price. The same indexes can be computed for quantity experiments. MI cannot be converted into Lerner or overcharge indexes.

quadropolies (MI=14.6%).[524] (*ibid.* pp. 504-506); similarly, the use of posted prices intensifies collusion relative to other pricing systems (*ibid.* pp. 537-538).

There are three experimental designs that shed light on collusion with overt communication. First, some experiments permit communication among sellers *before* trading begins (the classic Prisoners' dilemma with "cheap talk"), and this may permit either misleading posturing or a degree of trust to develop among sellers. Collusion *with* prior communication seems to instill trust, because it generally results in more efficient collusion than when communication is prevented (*ibid.* pp.521-525). The efficiency of price collusion when communication occurs depends strongly on certain interactive factors. When the choice variable is quantity (i.e., a Cournot game in which price is an outcome, not a choice variable), cartels achieve higher pricing power (MI=74%) than do tacitly colluding sellers (MI=47%); experienced sellers that are allowed to talk (possibly a proxy for trust) achieve much higher pricing efficiency (MI=73%) than inexperienced participants (MI=24%); and price effects are stronger when sellers have good *ex ante* information (MI=61% to 64%).

Second, a necessary feature of cartels is that sellers can conclude an enforceable agreement. In laboratory experiments, the availability of an enforceable agreement significantly increases price effects under certain conditions: when concentration is high (with duopoly MI=87%), when buyers are anonymous (MI=84%)[525], when the game is Cournot (MI=79%), when sellers are symmetric (MI=93%), and when their capacity is unconstrained (*ibid.* pp. 523-528). Thus, when an enforceable agreement is concluded, high seller concentration, seller symmetry, low buyer concentration, homogeneous products, or excess capacity resulted in Monopoly Indexes above 70%.

Third, one experiment shows the profound price effects that result when sellers can communicate after bidding begins (Fonseca and Normann 2011, 2012). The MI with a duopoly averages 94%, and it declines when the number of sellers increases from 2 to 4 (MI=81%), to 6 (MI=65%), and to 8 (MI=55%). However, compared to tacit collusion, explicit agreements result in smaller price gains under duopoly and when N=8 than when N is 4 or 6 (*ibid.* p. 11). Similarly, when sellers expect a fine that is high (half of the monopoly gains), the sellers choose to cartelize more than half of the time when N= 2 to 8, whereas in a duopoly tacit collusion is chosen two-thirds of the time (*ibid.* p. 12). This study is unique in studying the content and purposes of messages sent

[524] However, MI does not decline from N=4 to N=5, and the pattern for more than five sellers is irregular.

[525] By "anonymous" is meant that sellers face a computerized demand curve, which seems to me equivalent to a large number of buyers. With face-to-face human buyers (i.e., small numbers of buyers), MI is below 14%.

between sellers; the authors conclude that explicit communications help raise prices by implementing more sophisticated pricing strategies, assisting in dispute mediation (e.g., after a defection is observed), and, if permitted before trading begins (but not after), instilling greater trust that improves pricing effectiveness (*ibid.* pp. 29-30).

In summary, laboratory market experiments are a promising way to study cartel price effects using the utmost scientific rigor. Unfortunately, none yet incorporate most or all of the salient characteristics of real-world cartels. In particular, only a small minority of market laboratory experiments permits overt communication among suppliers. Nevertheless, when limited pre-play communication or during-play agreements is permitted, monopolistic pricing conduct is observed. Collusive prices on homogeneous goods approach monopoly levels when buyers are many and sellers are few, symmetric, experienced, have excess capacity, post their prices, and chose output as the strategic variable. While it is tempting to include the price results of market experiments, the sample reported herein covers only prices from natural markets.

The 50 Highest-Overcharge Observations