




12-2012

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Cartels as Rational Business Strategy: Crime Pays, 34 *Cardozo L. Rev.* 427 (2012)

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CARTELS AS RATIONAL BUSINESS STRATEGY: CRIME PAYS

John M. Connor & Robert H. Lande†

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INTRODUCTION

Cartels have always been the highest concern of antitrust. They overcharge consumers many billions of dollars every year¹ and there is a strong consensus that they should be sanctioned heavily.² 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.³

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.⁴ Victims can sue for mandatory treble damages and attorney's fees.⁵ Judge Posner called this combination of sanctions the equivalent of dropping "cluster bombs" on defendants.⁶ This multiplicity has led to the common—but unsupported—belief that the current level of sanctions is adequate⁷ or excessive.⁸

¹ See *infra* Part III.A.

² 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).

³ 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.

⁴ *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).

⁵ See 15 U.S.C. § 15 (2000). Prevailing plaintiffs also receive filing fees and expert witness fees. *Id.*

⁶ 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).

⁷ 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

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.⁹ This assumes corporations and individuals contemplating illegal collusion will be deterred only if the expected rewards are less than the expected costs¹⁰ divided by the probability the illegal activity will be detected and sanctioned.¹¹

AMENDMENT 11–12 (2004), available at http://www.americanbar.org/content/dam/aba/administrative/antitrust_law/comments_increasedcriminalpenalties.authcheckdam.pdf.

⁸ 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 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.”).

⁹ See *infra* notes 15–22 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.

¹⁰ 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.

¹¹ 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).

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.¹²

Our optimal deterrence analysis¹³ concludes 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. 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.

¹² 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.

¹³ As explained throughout this Article, we use the best available data for each part of the optimal deterrence 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.

I. OPTIMAL DETERRENCE: INDIVIDUAL VS. CORPORATE PERSPECTIVES¹⁴

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.¹⁵ He showed that to achieve optimal¹⁶ deterrence¹⁷ the damages from an

¹⁴ 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.

¹⁵ 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.

¹⁶ 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.

¹⁷ Professor Landes was not concerned with the compensation of victims. Landes, *supra* note 15. For an analysis that takes compensation into account, see Robert H. Lande, *Are*

antitrust violation should be equal to the violation's expected "net harm to others"¹⁸ divided by the probability of detection and proof of the violation.¹⁹ 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.²⁰ The "net harm to others" from collusion, of course, includes the overcharges that result from

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.

¹⁸ 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).

¹⁹ See Landes, *supra* note 15, 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.*

²⁰ See the discussion in Lande, *supra* note 17, 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 crucial. Similar results would arise if this Article instead used a "gross harm to others" or a "net gain to the offenders" standard.

cartel pricing.²¹ They include many other—perhaps less obvious—factors, as well.²²

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.²³ The Antitrust Division’s amnesty program has resulted in a significantly larger percentage of cartels detected and proven in recent years.²⁴ Nevertheless, there is continuing evidence that, despite the enforcers’ superb efforts, many cartels still operate,²⁵ so there is significantly less than a 100% probability that a

²¹ See Landes, *supra* note 15.

²² 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 17, 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.

²³ “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).

²⁴ See Nathan H. Miller, *Strategic Leniency and Cartel Enforcement*, 99 AM. ECON. REV. 750 (2009).

²⁵ 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

cartel 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.²⁶ The required expectation knowledge, however, is impossible to obtain.²⁷ Guessing what goes on in

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
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.

²⁶ 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 20, 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.

²⁷ 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

the minds of would-be cartelists is hazardous. Nor do we know how often potential price fixers consult with their attorneys about the likely range of outcomes.²⁸ 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.²⁹ 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?³⁰ 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?³¹

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.

²⁸ See generally D. Daniel Sokol, *Cartels, Corporate Compliance, and What Practitioners Really Think About Enforcement*, 78 ANTITRUST L.J. 201 (2012).

²⁹ For this reason, we readily acknowledge that we are administering an imperfect test using a surrogate for what we really would like to measure.

³⁰ This Section draws heavily upon material in Connor, *supra* note 14, and in Lande & Davis, *supra* note 14.

³¹ 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

Consideration of optimal sanctions for price fixing can be traced to Richard Posner's analysis of optimal cartel penalties.³² According to this work, hard-core price fixing is optimally punished almost exclusively through corporate fines.³³ 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.³⁴

There are many arguments in favor of the criminalization of price-fixing offenses.³⁵ 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.³⁶ 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

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.

³² Posner, *Optimal Sentences*, *supra* note 15.

³³ *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.").

³⁴ Posner, *Optimal Sentences*, *supra* note 15. 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 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.

³⁵ See the sources cited in Connor, *supra* note 14, for a summary of the legal-economic arguments for and against individual criminal penalties for antitrust violations, including the available game theory arguments.

³⁶ See *infra* note 45 (the example of Alfred Taubman).

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,³⁷ 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 prices.³⁸

³⁷ 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>.

³⁸ See Ginsburg & Wright, *supra* note 25. 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

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,³⁹ the monetary values of these individual sanctions are, in principle, perfect substitutes for one another.⁴⁰

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).⁴¹ 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 Organisation for Economic Co-operation and Development (OECD) asserted: “There is no

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.

³⁹ 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.

⁴⁰ “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.” TEFPT 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.

⁴¹ 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 14. However, the international trend is towards greater use of incarceration for cartelists. *Id.*

systematic evidence proving the deterrent effects of sanctions on individuals, and/or assessing whether such sanctions can be justified.”⁴²

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.⁴³ Nevertheless, he criticized the DOJ for offering unduly short sentences⁴⁴ and because—with exceptions⁴⁵—the DOJ tends to prosecute mid-level sales or marketing executives rather than the most senior responsible officers of the company.⁴⁶ To the extent this is true,⁴⁷ it seriously

⁴² 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>.

⁴³ Smith, *supra* note 40, at 7–10.

⁴⁴ *Id.*

⁴⁵ 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.

⁴⁶ 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

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, we⁴⁸ were able to determine the position held during the cartel's existence for 151 of them.⁴⁹ Of those, 40 appear to have been one of the heads of the companies for which they worked;⁵⁰ 24 appear to have occupied a corporate position that was very high, but below the level of those in the former group;⁵¹ 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.⁵² Of the mid-level employees, 35 were clearly involved in sales or marketing.⁵³

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.⁵⁴ Although it is difficult to

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 40, at 9.

⁴⁷ “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 8, at 39.

⁴⁸ W. James Denvil, *What Happens to Executives Who Are Sanctioned for Their Involvement in Cartels?* (on file 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.

⁴⁹ However, job titles can be misleading and may not accurately reflect an individual's true position in the company.

⁵⁰ See Denvil, *supra* note 48. This group is comprised of individuals with the title of Chairperson, President, Owner, Co-owner, Managing Director (of a European company), CEO, or COO.

⁵¹ 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.

⁵² See *id.* This group consists of the individuals not included in the former two groups.

⁵³ See *id.* These individuals have the words “sales,” “marketing,” or “development” in their titles.

⁵⁴ 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=>

determine when or whether it would be legal,⁵⁵ 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.⁵⁶

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 managers⁵⁷ known to have received a prison sentence in cartel cases between 1995 and 2010.⁵⁸ 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.⁵⁹ The remaining 17 are either in prison, unemployed, employed in different industries, or deceased.⁶⁰ 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

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 40, at 10.

⁵⁵ 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).

⁵⁶ 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).

⁵⁷ 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.

⁵⁸ See Denvil, *supra* note 48.

⁵⁹ See *id.*

⁶⁰ See *id.*

sentence for their crime currently are working for their previous employers or in the same industry.⁶¹

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 2009.⁶² 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.⁶³

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, 2010.⁶⁴ 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.⁶⁵ 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.⁶⁶

⁶¹ *See id.*

⁶² *See id.*

⁶³ *See id.*

⁶⁴ *See generally id.* (noting that the research was conducted between July 15, 2010, and September 27, 2010).

⁶⁵ *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))).

⁶⁶ *See* Posner, *Optimal Sentences*, *supra* note 15, at 418 (“[I]f [the corporation] is liable it will find adequate 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

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.⁶⁷ There are large numbers of indicted cartel managers who are fugitives residing abroad.⁶⁸ 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.⁶⁹ 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.⁷⁰ 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:

responsible employment, and this prospect should be sufficient to deter.” POSNER, *supra* note 65, 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.

⁶⁷ 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).

⁶⁸ See *infra* Part IV.B.

⁶⁹ See Connor, *supra* note 14.

⁷⁰ See CARTEL SANCTIONS, *supra* note 42.

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,⁷¹ directly or indirectly, 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.⁷² 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.⁷³

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.⁷⁴ 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,⁷⁵ and any policy that ignores it runs a substantial risk of departing from an optimal result.

⁷¹ 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. 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 55; Note, *supra* note 55.

⁷² 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.

⁷³ See *supra* note 22; *infra* Part III.B.

⁷⁴ 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).

⁷⁵ *Id.*

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.⁷⁶ 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 anecdotes⁷⁷ and some research,⁷⁸ they often do not face significant internal sanctions for their illegal behavior⁷⁹ and might well even be rewarded for their 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.⁸⁰ 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.⁸¹ 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.⁸²

⁷⁶ 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 31, at 381, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1866285.

⁷⁷ See *supra* notes 56–67.

⁷⁸ Khanna, *supra* note 33, at 1485–86; *supra* notes 56–67.

⁷⁹ Greg Werden suggests additional reasons: "This can occur as a result of defects in the design of compensation 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 20, at 31–32 (footnotes omitted).

⁸⁰ *Id.* at 32.

⁸¹ 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.

⁸² 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.

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 position⁸³ 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.⁸⁴ The total of the individual antitrust fines imposed was \$74 million.⁸⁵ The Antitrust Division also secured the restitution of \$165 million in conjunction with criminal antitrust cases⁸⁶ (which largely or totally consisted of restitution to the federal government for overcharges it paid).⁸⁷ Its enforcement also resulted in sentences against 367 individuals⁸⁸ that total 186,393 days (510 years) in prison.⁸⁹ Antitrust enforcement also led to another 112 years of "house arrest or

⁸³ 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-aii-annual-conference>).

⁸⁴ See WORKLOAD STATISTICS 2002–2011, *supra* note 25, at 11. The yearly figures are reproduced and summed in Lande & Davis, *supra* note 14, at 33 tbl.1.

⁸⁵ *Id.* The yearly figures are reproduced and summed in Lande & Davis, *supra* note 14, at 34 tbl.2.

⁸⁶ *Id.* at 12. The yearly figures are reproduced and summed in Lande & Davis, *supra* note 14, at 35 tbl.3.

⁸⁷ 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.

⁸⁸ *Id.* at 12.

⁸⁹ *Id.*

confinement to a halfway house or community treatment center” for 262 individuals.⁹⁰

Now, we turn to civil sanctions secured by private plaintiffs. Cartel victims receive mandatory treble damages and attorneys’ fees.⁹¹ 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.⁹² 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.⁹³ 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).⁹⁴

⁹⁰ See U.S. DEP’T OF JUSTICE, ANTITRUST DIVISION WORKLOAD STATISTICS FY 1990–1999, at 13 (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 14 (2012) [hereinafter WORKLOAD STATISTICS 2000–2009], available at <http://www.justice.gov/atr/public/281484.pdf>; WORKLOAD STATISTICS 2002–2011, *supra* note 25, at 12. 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 45 *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 25, 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.

⁹¹ Prevailing plaintiffs also receive filing fees and expert witness fees. See *supra* note 5.

⁹² See Connor & Lande, *supra* note 14.

⁹³ 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>.

⁹⁴ Since almost all these cases were settlements, “alleged victims” would usually be a more accurate description. See Lande & Davis, *supra* note 14. These figures have not been adjusted for inflation. These cartel payouts constituted a part of a larger study of forty private cases that

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.⁹⁵ 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.⁹⁶ Admittedly, establishing the likely disincentive effect of prison in an objective, accurate, and non-

documented a total of \$18–19.6 billion returned to victims or alleged victims of antitrust violations. *Id.*

⁹⁵ 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.

⁹⁶ 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.

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 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.⁹⁷ 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.⁹⁸

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.⁹⁹ 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.

⁹⁷ 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 71 and accompanying text.

⁹⁸ See *supra* note 26.

⁹⁹ If society did this, it would be forced to accept increased risks from other sources (i.e., society cannot afford perfect safety).

We present five different approaches to the issue of how to evaluate the cost or value of time in prison.¹⁰⁰ 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.¹⁰¹ 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.¹⁰² 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).¹⁰³

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.¹⁰⁴

Third, following the September 11th tragedy, Congress created the September 11th Victim Compensation Fund to award compensation to victims' families.¹⁰⁵ 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 \$250,000.¹⁰⁶ 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'

¹⁰⁰ These presented approaches have been adapted from Lande & Davis, *supra* note 14, at 14–19.

¹⁰¹ 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).

¹⁰² 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>.

¹⁰³ See Aldy & Viscusi, *supra* note 102. For example, values typically decline with age, and we note that most price fixers are mature businessmen. *Id.*

¹⁰⁴ 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).

¹⁰⁵ 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.

¹⁰⁶ 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.

annual income exceeded \$4,000,000 per year (their estates were given average awards of \$6,379,287).¹⁰⁷ 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.¹⁰⁸ The victims potentially can recover for a variety of torts depending upon the jurisdiction.¹⁰⁹ 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.¹¹⁰ 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.¹¹¹ However, when shorter imprisonments are annualized, significantly higher awards sometimes have been made.¹¹²

¹⁰⁷ *Id.* at 97 tbl.6.

¹⁰⁸ 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).

¹⁰⁹ 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 deprivation of their civil rights. See Weaver, *supra* note 108.

¹¹⁰ See, e.g., cases cited *supra* note 108.

¹¹¹ *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.

¹¹² The extreme case was *Ramirez v. County of Los Angeles*, 397 F. Supp. 2d 1208, 1215 (C.D. Cal. 2005) (noting 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

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.¹¹³ 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.¹¹⁴ 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.¹¹⁵ 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.¹¹⁶ These figures are higher

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.").

¹¹³ See Lande & Davis, *supra* note 14.

¹¹⁴ 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).

¹¹⁵ 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).

¹¹⁶ 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. Zerbo, 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.

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.¹¹⁷

These five approaches yield estimates that are broadly consistent with one another. To be 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,¹¹⁸ 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.¹¹⁹ 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.¹²⁰ 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.

CPI Inflation Calculator, *supra* note 115. 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.*

¹¹⁷ 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.

¹¹⁸ See also the factors listed in notes 96–97, *supra*. The incremental \$4 million per year should more than compensate for these factors as well.

¹¹⁹ 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 250, which shows that only valuing a year in prison in the range of \$1 billion would make a significant difference in our results.

¹²⁰ 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 71.

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.¹²¹ The “net harm to others” from a cartel includes not only its overcharges, but also the allocative inefficiency¹²² 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 cartel manager we would ascertain what each thought their expected profits from cartelization were likely to be,¹²³ 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.¹²⁴ As a practical matter, of course, ascertaining these required figures is impossible. The 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.¹²⁵ We

¹²¹ See *supra* notes 14–22 and accompanying text.

¹²² See *supra* note 22 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.

¹²³ Their expected cartel profits, moreover, would be a distribution of outcomes with assigned probabilities.

¹²⁴ Another factor would be the opinion of each cartel manager as to their co-conspirators. Do they believe their co-conspirators are likely to turn them in under various circumstances?

¹²⁵ See Connor & Lande, *supra* note 14.

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.¹²⁶ 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.¹²⁷ Table 2 displays the medians of all average overcharges reported over time.¹²⁸ The median cartel overcharge for all types and time periods (in a data set that includes a significant number of zeros) is 23.3%.¹²⁹ 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).¹³⁰ 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.

Our search for verdicts in cartel cases proved to be extremely difficult,¹³¹ however, because overcharges are not calculated in criminal

¹²⁶ *Id.* at 555–57.

¹²⁷ See JOHN M. CONNOR, GLOBAL PRICE FIXING (2d ed. 2007).

¹²⁸ 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*.

¹²⁹ 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%.

¹³⁰ 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.

¹³¹ 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

enforcement against cartels¹³² and because almost every private antitrust suit for damages settles¹³³ 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 commission¹³⁴ calculated an overcharge¹³⁵ 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%.¹³⁶

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.¹³⁷ For the economic studies' post-2000 sample, the national and international cartel median overcharges averaged 20% and 25.8%.¹³⁸ 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).¹³⁹ 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

contain useful information. See Connor & Lande, *supra* note 14, at 555–56.

¹³² 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.

¹³³ *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.*

¹³⁴ Connor & Lande, *supra* note 14, at 551–52.

¹³⁵ 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.

¹³⁶ *Id.*

¹³⁷ See *id.* at 561. The mean figures are significantly higher than the median figures due to the effects of extremely high overcharges.

¹³⁸ *Id.* at 541.

¹³⁹ For a definition of the allocative inefficiency effects of market power, see *supra* note 22.

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 effects are 50% as large as overcharges on average.¹⁴⁰ 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. Sølgaard computes a DWL/overcharge range of from 37% to 48% for a Norwegian cement cartel,¹⁴¹ and Monke et al. find a 25% ratio for a Portuguese flour cartel.¹⁴² 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.¹⁴³ 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,¹⁴⁴ and one very interesting

¹⁴⁰ See Easterbrook, *supra* note 23, at 455. From a theoretical standpoint, 50% is in fact the *maximum* possible percentage given a linear demand curve.

¹⁴¹ Lars Sølgaard, 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.

¹⁴² 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).

¹⁴³ Gallo et al., *supra* note 116, at 25–71.

¹⁴⁴ 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

ratio calculated by the Canadian enforcement authorities in a merger case.¹⁴⁵

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 usually are heuristic illustrations not intended to be realistic representations of markets.¹⁴⁶ 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.¹⁴⁷ 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).¹⁴⁸ Following Posner's lead, a good range to consider initially is -1.0 to -2.0 .¹⁴⁹ But we can do better by considering cartel and monopoly studies analyzing good data with the most advanced techniques.¹⁵⁰ We will highlight one monopoly and five cartel studies.

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.*

¹⁴⁵ 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).

¹⁴⁶ See, e.g., SCHERER & ROSS, *supra* note 144, at 662.

¹⁴⁷ 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.

¹⁴⁸ 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.”).

¹⁴⁹ Posner, *Social Costs*, *supra* note 147.

¹⁵⁰ 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.

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%.¹⁵¹ Second, the heavily studied Joint Economic Committee Eastern U.S. railway cartel yields DWL ratios of 26%.¹⁵² Third, a well regarded study of the U.S. cane sugar cartel of 1890–1914 implies a DWL ratio of 12% to 13%.¹⁵³ Fourth, a 1923–1968 Norwegian cement cartel has a DWL ratio of 19%.¹⁵⁴ Fifth, an excellent dynamic simulation model of the U.S. lysine cartel suggests a DWL ratio of 21% to 27%.¹⁵⁵ 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 transfer.¹⁵⁶ 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 overcharge¹⁵⁷ and combine it with the aforementioned -0.95 and -1.64 elasticity of demand range.¹⁵⁸ These parameters result in a DWL ratio of 6% to 20%.¹⁵⁹ Using the median overcharge of 22%¹⁶⁰ instead, the DWL ratio range is reduced to

¹⁵¹ Posner, *Social Costs*, *supra* note 147, at 820. The overcharge was 75% and the elasticity was 1.45. *Id.*

¹⁵² 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).

¹⁵³ 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%).

¹⁵⁴ 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).

¹⁵⁵ 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).

¹⁵⁶ 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).

¹⁵⁷ In addition to the material in this Section, this figure is based upon Connor and Lande, *supra* note 14, 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.*

¹⁵⁸ 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 14; Table 7 shows that the mean overcharge for all cartels is 46%, including many with zero price effects).

¹⁵⁹ Applying the formula, we have $1/2 \times 0.45$, which is then multiplied by 1.0 or 1.65.

¹⁶⁰ In addition to the material in this section, this overcharge percentage is based upon

3% to 10%. Combined, these alternative calculations produce range extremes from 3% to 20%.¹⁶¹ 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.¹⁶² 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

Connor and Lande, *supra* note 14, 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.*

¹⁶¹ This is a conservative resolution of the issues.

¹⁶² Iwan Bos & Joseph E. Harrington, Jr., *Endogenous Cartel Formation with Heterogeneous Firms*, 41 RAND J. ECON. 92, 92–93 (2010).

private settlements. For this 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.¹⁶³ 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.¹⁶⁴ Since it is impossible to know the actual expectations of the "average" would-be cartel member, 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.¹⁶⁵

¹⁶³ This subsection is based upon John M. Connor, *Deterrence Power of Penalties on International Cartels* (Aug. 6, 2009) (unpublished study) (on file with authors).

¹⁶⁴ 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.

¹⁶⁵ 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

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 scholars¹⁶⁶ and is approvingly cited by at least eight subsequent writers on antitrust enforcement who made their own detection estimates.¹⁶⁷

Two subsequent empirical studies replicated Bryant and Eckard's approach.¹⁶⁸ Golub et al. sampled convicted U.S. price fixers for a period after 1988; their estimated range for p is identical with that of Bryant and Eckard.¹⁶⁹ 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.¹⁷⁰ 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.¹⁷¹ 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).¹⁷² 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.¹⁷³ His sample

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.

¹⁶⁶ A Google Scholar search on February 9, 2011, found fifty citations.

¹⁶⁷ See *infra* Appendix tbl.3.

¹⁶⁸ 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.

¹⁶⁹ 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>.

¹⁷⁰ 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>.

¹⁷¹ Their point estimate of p is close to 13%.

¹⁷² 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>.

¹⁷³ Nathan H. Miller, *Strategic Leniency and Cartel Enforcement*, 99 AM. ECON. REV. 750 (2009).

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.¹⁷⁴ A possible limitation of Miller's study is that, in his sample, only 9% of the observations were international cartels.¹⁷⁵ 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.¹⁷⁶ Many have prosecutorial experience; others have worked extensively with alleged cartel defendants.¹⁷⁷ Those who have provided specific estimates are listed in Table 3.¹⁷⁸ The opinions and conclusions of these twenty-five authors predominantly suggest a 10% to 25% chance of detection, although some go as high as 33%.¹⁷⁹

It is clear that some of these estimates are meant to be purely illustrative,¹⁸⁰ while others are from surveys or are intended to be true depictions of reality.¹⁸¹ The three writings that are clearly illustrative average 29%.¹⁸² 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.¹⁸³

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

¹⁷⁴ *Id.* at 760–61.

¹⁷⁵ 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.

¹⁷⁶ See *infra* Appendix tbl.3.

¹⁷⁷ See *id.*

¹⁷⁸ See *infra* Appendix tbl.3.

¹⁷⁹ See *id.*

¹⁸⁰ See Landes, *supra* note 15, at 656.

¹⁸¹ E.g., Alan R. Beckenstein & H. Landis Gabel, *Antitrust Compliance: Results of a Survey of Legal Opinion*, 51 ANTITRUST L.J. 459 (1982).

¹⁸² See POSNER, *supra* note 65, at 47; Landes, *supra* note 15; Werden, *supra* note 20, at 27–29.

¹⁸³ See *infra* Appendix tbl.3.

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.¹⁸⁴ 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.¹⁸⁵ 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.¹⁸⁶ 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.¹⁸⁷

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.¹⁸⁸

¹⁸⁴ 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.*

¹⁸⁵ DELOITTE & TOUCHE LLP, *THE DETERRENT EFFECT OF COMPETITION ENFORCEMENT BY THE OFT* (2007), available at http://www.of.gov.uk/shared_of/reports/Evaluating-OFTs-work/oft962.pdf.

¹⁸⁶ See Sokol, *supra* note 28.

¹⁸⁷ See *id.* at 239 tbl.14.

¹⁸⁸ 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 studies, and concluded that 25% was their best estimate as to the rate of cartel detection. See Ginsburg & Wright, *supra* note 25, at 8.

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.¹⁸⁹ Indeed, the evidence is so damning in most cases that nearly all defendants negotiate a guilty plea.¹⁹⁰ 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.¹⁹¹ 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.¹⁹²

From 2005 to 2009, of the 87 individuals charged with international price fixing, 64 pled guilty and 4 were found guilty.¹⁹³ On the other hand, 7 were acquitted, 11 became fugitives, and 1 indictment was dismissed.¹⁹⁴ 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%).¹⁹⁵ 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.¹⁹⁶ We believe it is reasonable to presume that it is more likely

¹⁸⁹ See WORKLOAD STATISTICS 1990–1999, *supra* note 90, at 7; WORKLOAD STATISTICS 2000–2009, *supra* note 90, at 8.

¹⁹⁰ Connor, *supra* note 14, at 328.

¹⁹¹ *Id.* (finding that only fifteen of twenty-eight indicted individuals were convicted).

¹⁹² See *id.*

¹⁹³ See Connor, *supra* note 14, at 539 tbl. 3. The Antitrust Division's official statistics, reported *supra* note 25, 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 trump the number of fugitives.

¹⁹⁴ *Id.*

¹⁹⁵ *Id.*

¹⁹⁶ *Id.*

that a fugitive is a price fixer who fled, rather than an innocent person who could not prove their innocence.¹⁹⁷ 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.¹⁹⁸

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.¹⁹⁹ This is a 95% success rate; 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.²⁰⁰

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.²⁰¹ 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

¹⁹⁷ Innocent people sometimes flee. This is why one can only presume that fugitives actually fixed prices.

¹⁹⁸ 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.

¹⁹⁹ *Id.*

²⁰⁰ 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.

²⁰¹ 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.

he or she is more likely to let personal motives affect what is best for the owners.²⁰² 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.²⁰³

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%.²⁰⁴ Note that the probability of a cartel being detected (25% to 30%) *and* 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:

$$\text{Net harms to others} \div (\text{Probability of detection} \times \text{Probability of conviction})$$

²⁰² 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).

²⁰³ 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).

²⁰⁴ 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 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.

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 1990.²⁰⁵ 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.²⁰⁶ 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.²⁰⁷ 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.²⁰⁸ 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.²⁰⁹ His prediction turned out to be astonishingly accurate.²¹⁰

²⁰⁵ 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.

²⁰⁶ See Connor, *supra* note 56. As will be apparent from the Conclusions, *infra*, the lysine cartel was one for which actual sanctions were relatively close to the optimum.

²⁰⁷ 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).

²⁰⁸ *Id.* at 12.

²⁰⁹ *Id.* at 13.

²¹⁰ *Id.*

Ultimately the lysine cartelists pled guilty, and in late 1996 incurred U.S. fines that totaled \$95.55 million.²¹¹ The DOJ also prosecuted four lysine executives in a highly publicized jury trial held in Chicago in the summer of 1998.²¹² Three of the four were found guilty and were heavily sentenced, to a total of ninety-nine months in prison.²¹³ The fourth defendant, a managing director of Ajinomoto of Japan, remains a fugitive.²¹⁴

Within a year of the FBI raids, more than forty civil antitrust suits were filed in U.S. federal courts.²¹⁵ 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.²¹⁶ The two other defendants settled for almost \$5 million about a year later.²¹⁷ 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.²¹⁸

2. Optimal Fine Calculations for the Lysine Cartel

What should the overall level of sanctions have been, ex-ante, for the Lysine cartel?²¹⁹ 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 cost²²⁰) of money.²²¹ Because we are

²¹¹ *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.

²¹² Connor, *supra* note 207, at 1.

²¹³ *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.

²¹⁴ *Id.* at 2.

²¹⁵ *Id.*

²¹⁶ *Id.* The settlement was approved in late 1996, before the federal fines were announced, which is very unusual. *Id.*

²¹⁷ *Id.*

²¹⁸ *Id.*

²¹⁹ 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.

²²⁰ “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.

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 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.²²² For simplicity, we will use as our initial year the midpoint year of the cartel,²²³ and as the fine year the year in which the first corporate defendant plead guilty.²²⁴ The

²²¹ 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 17.

²²² 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.

²²³ 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 cartel, 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.

²²⁴ 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

terminal year for settlements in private suits is the year in which the federal class settlement or other private case receives preliminary judicial approval.²²⁵ 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.²²⁶ 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:

- The net harms to U.S. direct purchasers were \$80 million, expressed in 1993–1995 dollars.²²⁷ 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,²²⁸ 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.²²⁹

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.

²²⁵ 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.

²²⁶ See *CPI Inflation Calculator*, *supra* note 115. 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.

²²⁷ See Connor, *supra* note 207, at 302.

²²⁸ 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.

²²⁹ For an explanation of the allocative inefficiency adjustment, see *supra* Part III.B.

- The average probability of cartel detection, the evidence shows, is 25% to 30%.²³⁰
- The average probability the enforcers will be able to prove that the cartel violated the law has been estimated to be 80%.²³¹

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

$$\begin{aligned}
 &(\$119.8 \times 1.03) \div (0.30 \times 0.80) \text{ (low estimate)} \\
 &\quad \text{or} \\
 &(\$119.8 \times 1.20) \div (0.25 \times 0.80) \text{ (high estimate)} \\
 &= \$514\text{--}719
 \end{aligned}$$

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) ²³²
+ 50	Prison-Equivalent for ninety-nine months of U.S. prison time at \$500,000 per month ²³³
\$263	Total Sanctions

Thus, even though the lysine cartel was heavily sanctioned in the United States in three ways (by fines, prison for top executives, and by private litigation), the combination of the sanctions that were imposed is only 37% to 51%²³⁴ as large as the overall amount of sanctions that should have been imposed from the perspective of optimal deterrence.

²³⁰ See *supra* Part IV.A.

²³¹ 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.

²³² 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.

²³³ For the analysis of the monetary equivalent of prison sentences, see *supra* Part II.

²³⁴ Depending upon when and how the figures involved are rounded, this range could also be expressed as 37% to 49%.

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.²³⁵ 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.²³⁶

One outlier, E-Rate Federal Internet Program, may have been sanctioned more than the optimal amount (our results show 125% to 175% of optimality).²³⁷ 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

²³⁵ Data employed and calculations are available at <http://www.cardozolawreview.com/content/34-2/Connor.Lande.34.2/AntitrustStudyRawData.pdf>.

²³⁶ 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).

²³⁷ 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.

seventy-five cartels were optimally or excessively sanctioned due to circumstances unique to those firms.²³⁸ From a deterrence perspective, however, would-be cartelists are unlikely to focus upon 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.²³⁹

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.²⁴⁰ 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

²³⁸ Even if individual firms appear to have been sanctioned more than the amount calculated under the overall 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 234, 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.

²³⁹ 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 231. 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 119. 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>.

²⁴⁰ 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).

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.²⁴¹ 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.²⁴² 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%.²⁴³ 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 Easterbrook²⁴⁴

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.²⁴⁵ In other words, only if, on average, cartel sanctions were approximately five times as large as they are today,

²⁴¹ See *supra* note 2.

²⁴² 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>.

²⁴³ See *id.* at 59–62.

²⁴⁴ See Easterbrook, *supra* note 2, at 95.

²⁴⁵ 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.

and if these higher amounts were imposed by the courts on price fixers,²⁴⁶ 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).²⁴⁷ Similarly, as noted, we have attempted to ascertain every relevant piece of data for every cartel in our study as accurately as possible.²⁴⁸ 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.²⁴⁹

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 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

²⁴⁶ 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.

²⁴⁷ 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 14, made low assumptions about the recoveries from private cases, a methodology that tended to understate the magnitude of the benefits from private litigation.

²⁴⁸ 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.

²⁴⁹ 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.

assumed to have the same deterrence value as an outlandish \$4.4 billion to \$6.3 billion fine would our overall conclusion change.²⁵⁰ 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.²⁵¹ A second cartel was probably optimally sanctioned.²⁵² 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.

²⁵⁰ 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.

²⁵¹ See discussion of the E-Rate Federal Internet Program cartel *supra* Part V.B.

²⁵² See discussion of the PVC Window coverings cartel *supra* Part V.B.

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 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.²⁵³

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 sanctions²⁵⁴ 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.²⁵⁵ 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

²⁵³ 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.

²⁵⁴ 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.

²⁵⁵ 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 31 for why this is appropriate.

to commit to bring more cases where they were less than certain of victory.²⁵⁶

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.²⁵⁷ 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.²⁵⁸ 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.²⁵⁹ Similarly, convicted price fixers should 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.²⁶⁰

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.²⁶¹ It is unclear how often this occurs, but it should never happen.²⁶²

²⁵⁶ For example, in 2010, the DOJ won forty-one cartel cases and lost only one. *See supra* note 25. 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.

²⁵⁷ *See supra* notes 48–64. 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.

²⁵⁸ *See supra* note 48.

²⁵⁹ 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.offt.gov.uk/OFTwork/competition-act-and-cartels/competition-law-compliance> (last visited Sept. 26, 2012).

²⁶⁰ Some believe that the loss of one’s job often can be even a more powerful sanction than imprisonment. *See supra* note 84. 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.

²⁶¹ 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.

²⁶² 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 25. 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

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.²⁶³ 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.²⁶⁴ The lynchpin of this formula is its estimate “that the average gain from price-fixing is 10 percent of the selling price.”²⁶⁵ 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.²⁶⁶ A conservative, yet quite important, step the U.S. Sentencing Commission could take²⁶⁷ 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 change also should result in average corporate fines that are much larger than their current levels.²⁶⁸

Seventh, the DOJ could require stricter corporate compliance programs. Some, for example, have advocated the use of corporate monitors for convicted defendants.²⁶⁹ 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

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.

²⁶³ *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).

²⁶⁴ U.S. SENTENCING GUIDELINES MANUAL § 2R1.1(d)(1) (2005).

²⁶⁵ *Id.* § 2R1.1 application n.3. For an explanation how this 10% presumption results in the current fine levels, see Connor & Lande, *supra* note 14, at 522–24.

²⁶⁶ See *supra* Part III.A (quoting Connor & Lande, *supra* note 14, 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.*

²⁶⁷ Technically, Sentencing Commission changes to the Guidelines are subject to Congressional approval, but historically, these resolutions have been approved unanimously.

²⁶⁸ 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.

²⁶⁹ 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).

use of corporate monitors could help deter collusion.

Eighth, legislation could add prejudgment interest to both private treble damage actions and criminal fines.²⁷⁰ 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 Easterbrook²⁷¹ and Posner,²⁷² 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.²⁷³ 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.²⁷⁴ If this approach is not successful, some have advocated that it be introduced on the corporate level.²⁷⁵ 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).²⁷⁶

²⁷⁰ The U.S. Sentencing Commission could add prejudgment interest to current cartel penalties without new legislation.

²⁷¹ 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.

²⁷² 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 . . .").

²⁷³ The UK's Office of Fair Trading and the Korean Fair Trade Commission already have these policies in place for individuals.

²⁷⁴ 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).

²⁷⁵ See Giancarlo Spagnolo, *Leniency and Whistleblowers in Antitrust*, in HANDBOOK OF ANTITRUST ECONOMICS 259 (Paolo Buccirossi ed., 2008).

²⁷⁶ 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

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.²⁷⁷ The majority of states reacted by enacting "Illinois Brick Repealers" to permit injured indirect purchasers to sue for damages.²⁷⁸ It often is asserted that these state laws lead to six-fold damages²⁷⁹ (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.²⁸⁰ Many believe

cartel to the amnesty recipient!

²⁷⁷ *Illinois Brick Co. v. Illinois*, 431 U.S. 720 (1977).

²⁷⁸ 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).

²⁷⁹ 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.").

²⁸⁰ 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 274, at 173–75.

that a fear of over-detering 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.²⁸¹ Similarly, in otherwise close private 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.

²⁸¹ *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).

APPENDIX

Table 1
Summary of Economic Surveys of Cartel Overcharges

		No. Cartels	Mean %	Median %
1.	Mark A. Cohen & David T. Scheffman ²⁸²	5-7	7.7-10.8	7.8-14.0
2.	Gregory J. Werden ²⁸³	13	21	18
3.	Richard A. Posner ²⁸⁴	12	49	38
4.	Margaret Levenstein & Valerie Suslow ²⁸⁵	22	43	44.5
5.	James M. Griffin ²⁸⁶	38	46	44
6.	OECD (excluding peaks) ²⁸⁷	12	15.75	12.75
Total (simple average)		102-104	30.7	28.1
Total (weighted average)		102-104	36.7	34.6

²⁸² Mark A. Cohen & David T. Scheffman, *The Antitrust Sentencing Guideline: Is the Punishment Worth the Costs?*, 27 AM. CRIM. L. REV. 331 (1989).

²⁸³ 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.

²⁸⁴ POSNER, *supra* note 65.

²⁸⁵ Margaret Levenstein & Valerie Suslow, *What Determines Cartel Success?* 16 (Univ. of Mich. Bus. Sch., Working Paper 02-001, 2002).

²⁸⁶ 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).

²⁸⁷ 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			
	<i>Median percent^a</i>						
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 ²⁸⁸	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 ²⁸⁹	0.33	Merely an illustration, but a seminal work on optimal deterrence that may influence many adherents of optimal deterrence theory.

²⁸⁸ Alan R. Beckstein & Gabel H. Landis, *Antitrust Compliance: Results of a Survey of Legal Opinion*, 52 ANTI TRUST L.J. 459, 487-516 (1982).

²⁸⁹ Landes, *supra* note 15, at 657.

R.M. Feinberg ²⁹⁰	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 ²⁹¹	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 ²⁹²	Less than 0.10	Appears to be a general, subjective opinion of Antitrust Division professional prosecutors.
Mark A. Cohen & David T. Scheffman ²⁹³	0.33	No hint as to the source, but may have been influenced by Landes (1983).
Jean-Claude Bosch & E. Woodrow Eckard Jr. ²⁹⁴	0.13-0.17	A quantitative estimate derived from an event study of U.S.-prosecuted cartels 1961-1988.
Mitchell A. Polinsky & Steven Shavell ²⁹⁵	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.

²⁹⁰ Feinberg, *supra* note 184, at 379.

²⁹¹ *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).

²⁹² Gregory J. Werden & Marilyn J. Simon, *Why Price Fixers Should Go to Prison*, 32 ANTITRUST BULL. 917, 926 (1987).

²⁹³ Cohen & Scheffman, *supra* note 282.

²⁹⁴ 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).

²⁹⁵ Mitchell A. Polinsky & Steven Shavell, *The Economic Theory of Public Enforcement of the Law*, 38 J. ECON. LITERATURE 45, 70 (2000).

Office of Fair Trading ²⁹⁶	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 ²⁹⁷	0.25	An illustration of an optimal deterrence calculation by a leading antitrust jurist.
Organisation of Economic Co-Operation and Development ²⁹⁸	0.13-0.17	OECD accepts Bosch and Eckard (1991).
Emmanuel Combe et al. ²⁹⁹	0.129-0.133	Replicate Bosch and Eckard's (1991) method using data from EU-prosecuted cartels from 1969 to 2002.
Bush et al. ³⁰⁰	0.10-0.33	A summary of most of the sources in this table above.
Alla Golub et al. ³⁰¹	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 ³⁰²	0.13-0.17	In an Article on cartel enforcement an experienced antitrust official cites Bosch and Eckard (1991) with approval.

²⁹⁶ DELOITTE, THE DETERRENT EFFECT OF COMPETITION ENFORCEMENT BY THE OFT 20 (2007), available at http://www.oft.gov.uk/shared_oftr/reports/Evaluating-OFTs-work/oft962.pdf (prepared for OFT).

²⁹⁷ POSNER, *supra* note 65, at 47.

²⁹⁸ ORG. OF ECON. CO-OPERATION & DEV., *supra* note 287, at 18-19.

²⁹⁹ Combe et al., *supra* note 170.

³⁰⁰ Brief for Bush et. al. as Amici Curiae Supporting Respondents, *F. Hoffman-LaRoche v. Empagran*, 542 U.S. 155 (2004) (No. 03-724).

³⁰¹ Golub et al., *supra* note 169.

³⁰² 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).

Wouter P.J. Wils ³⁰³	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 ³⁰⁴	0.15	Cites only Bosch and Eckard (1991), but considers it “controversial as well as dated.”
Maurice E. Stucke ³⁰⁵	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 ³⁰⁶	0.15	The author’s “prudent” assumption for their simulation analysis.
J. Chen & J.E. Harrington ³⁰⁷	0.1–0.3	In illustrating the effect of detection probability of cartel formation, the authors chose this range.
Office of Fair Trading ³⁰⁸	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.”

³⁰³ Wouter P.J. Wils, *Is Criminalization of EU Competition Law the Answer?*, 28 WORLD COMPETITION 117, 130 (2005).

³⁰⁴ 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>.

³⁰⁵ Maurice E. Stucke, *Morality and Antitrust*, 2006 COLUM. BUS. L. REV. 443, 457.

³⁰⁶ Buccirossi & Spagnolo, *supra* note 15, at 95.

³⁰⁷ 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 15, ch. 3, at 76.

³⁰⁸ DELOITTE, *supra* note 296, at 50–54.

Nathan H. Miller ³⁰⁹	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 ³¹⁰	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 ³¹¹	0.25	Part of an illustration of optimal fines for typical EU cartels.
Peter Ormosi ³¹²	10–20%	Calculations for Europe based on a large number of factors.

³⁰⁹ Miller, *supra* note 24.

³¹⁰ Renato Nazzini & Ali Nikpay, *Private Actions in EC Competition Law*, 4 COMPETITION INT'L POL'Y 111, 111 (2008).

³¹¹ Gregory J. Werden, *supra* note 20, at 27–29 (2009).

³¹² 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.