# Optimal Deterrence

# and

# Private International Cartels

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# Introduction

The focus of this paper is on international cartels that have been uncovered by one or more of the world's antitrust authorities since January 1990.[1] In this Introduction, I show that deterrence of recidivism is the underlying objective of the world's leading antitrust regimes, and I sketch the theory of optimal deterrence in the context of market collusion. I highlight two paradoxical trends in anticartel enforcement: enhanced use of monetary penalties to punish convicted cartelists and, notwithstanding contrary voices, an increasing awareness that the higher penalties are below socially optimal levels to ensure deterrence.

## Objective

In this paper, a model of optimal deterrence will be developed for the case of companies[2] that form global cartels. Global cartels are overt conspiracies with members from at least two nations that fixed prices in at least two continents.[3] In particular, a formula is presented that takes into account the special characteristics of contemporary cartels that operate across multiple antitrust jurisdictions with varying levels and types of sanctions. Recent empirical data on international cartels are used to estimate parameters needed to operationalize

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[1] This starting date marks the beginning of the present U.S. antitrust enforcement era. The maximum statutory corporate fine for Sherman Act violations was raised from $1 million to $10 million in 1990. Perhaps more importantly, a new Presidential administration in 1991 made appointments of individuals in the Antitrust Division of the U.S. Department of Justice (DOJ) who implemented an array of policies that raised anticartel enforcement to a significantly higher level of effectiveness (Connor 2001). Three important innovations were implemented by the Antitrust Division of the Department of Justice (DOJ) in 1991-1995: the unleashing of mafia-style investigations of international cartels by the FBI in 1992, a new more effective Corporate Leniency Program in 1993, and starting in 1995 the use of the federal felony-conviction standard for setting fines ("twice the harm") that resulted in a series of corporate price-fixing fines *above* the $10-million statutory cap.

[2] 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. If the firm is a proprietorship, considering only company rewards and punishment makes eminent sense, but if there is a separation between ownership and management, then the personal motives of managers will be pertinent 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. In fact, it is generally the case that the reward structures of executive compensation contracts typically give short-term personal enrichment a greater weight in executive decisions than the long-run interests of stockholders. If the profits generated by price fixing generate personal rewards for such managers, 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-loving in their corporate decision making rather than risk-averse. For these reasons, the 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 a more complete model should incorporate.

[3] Most global cartels operated in North America, Western Europe, and East Asia. A large minority set prices in all six of the world's inhabited continents. The term "price fixing" is meant to encompass the control of industry production or agreements on participants' market shares.

the formula.[4]  A range of optimal fines is presented as a function of damages caused by global cartels.  This exercise results in practical guidelines for imposing optimal global-cartel sanctions.

## Motivation

Focusing on global cartels is justified for at least two reasons. First, global cartels tend to be the most harmful type, more harmful in the aggregate and more harmful relative to sales than national cartels (Connor 2005).  Second, antitrust authorities have historically experienced great impediments in prosecuting international cartels because jurisdictional boundaries often made it difficult to compel the production of documents or witnesses located outside the jurisdiction. Third, there is evidence of a sharp increase in the rate of formation of international cartels around the 1980s (Connor 2003).[5]

Previous attempts to analyze optimal cartel fines have generally remained at a theoretical level (Kobayashi 2001, Camilli 2005).  In the few cases where optimal fines have been empirically estimated, the studies have relied on broad point estimates of key parameters, the fines considered have been those of only one jurisdiction, and the scenarios have been generic cartel situations (Wils 2005:30).[6]

## Deterrence Undergirds Anticartel Policy

A rational policy with respect to the design of legal sanctions would follow two principal objectives: deterrence and compensation of victims.[7]  Different schools

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[4]  Appropriate data to evaluate the effects of antitrust sanctions are difficult to find and to collect. The U.S. Sentencing Commission is charged with compiling such data; its public data is maintained by the Inter-University Consortium for Political and Social Research (ICPSR) at the University of Michigan [www.icpsr.umich.edu].  However, these data are woefully incomplete and cannot be defended as a representative sample (Alexander *et al.* 2000).  For example, ICPSR data showed a decline of 59% in median sentences for the most serious corporate crimes from 1988-89 to 1992-96, whereas public data gathered by Alexander *et al.* (2000: Table 2) found an increase of 389%.

[5]  The surge in international cartels is more apparent from U.S. and Canadian prosecutions than for EU prosecutions.  The European Commission imposed fines on a cartel for the first time in 1969 (Joshua and Jordan 2004).  Slowly but steadily thereafter, the EC increased the size of fines and the number decisions against cartels.  A breakpoint in the EC's enforcement standards occurred in 1979 when the Commission began the practice of unannounced raids that prevented the destruction of incriminating evidence of hardcore price fixing (Harding and Joshua 2003:165). Later, in decisions made between 1984 and 1994, the Commission implicitly adopted the common law conspiracy theory in its treatment of cartels.

[6] Wils assumes a 20% cartel overcharge, a five-year duration, and a 33% probability of detection. His rough estimate of an optimal fine is 150% of affected sales. If overcharges are typically 20% to 30% of affected sales, then Wils' reasoning suggests that optimal fines on average ought to lie within the range of 5.0 to 7.5 times the overcharge.

[7] A third motivation is sometimes mentioned, viz., funding the costs of detection and prosecution. In U.S. law, these costs are borne by both the government and by plaintiffs' lawyers.  To the extent that these costs are incurred by plaintiffs, they may be regarded as compensatory.  These costs serve to increase the probability of discovery and conviction of secret cartels beyond the level that only public enforcement can provide; thus, they serve the goal of deterrence as well.

of antitrust give different weights to the two aims.  Where the efficient operation of markets is uppermost in the minds of the analyst, deterrence plays the starring role (Landes 1983, Breit and Elzinga 1987, Posner 2001, Baker 2004). From this Chicago-School perspective, the identity of the recipients of monetary sanctions is irrelevant, so long as the income is not transferred to the violator itself.   If the victims happen to be among the recipients, that is simply a felicitous accident.[8] Giving short shrift to compensating those injured by collusive conduct is justified by arguing that optimal deterrence would produce such low overcharges that there would be little compensation necessary.[9]  Moreover, it is argued that a system of dual uncoordinated public-private enforcement could achieve optimal sanctions only accidentally.  Legal scholars often prefer that the maximization of consumer welfare be the sole goal of antitrust laws because of the messiness that attends dealing with multiple policy goals (Hovenkamp 1999:70-76).  At worst, Breit and Elzinga (1974) present scenarios in which treble damages could promote frivolous law suits or other inefficient or perverse behavior by plaintiffs. Finally, Chicagoans take the view that if altering the distribution of wealth is a social goal, tax or other policies are instruments superior to compensatory suits.

However, dismissing concerns about the income-transfer effects of horizontal price fixing is a minority view that seems to be driven by an assumption that private treble-damage suits are too numerous and too lucrative for plaintiffs.  U.S. laws and legislative intent tend to support the compensation of victims and other goals of antitrust (Sullivan and Grimes 2000: 12-16).[10]   In the context of horizontal price-fixing conduct the allocative inefficiency generated (i.e., the dead-weight loss) is inextricably bound up with the quantitatively larger income transfer from buyers to sellers (i.e., the overcharge). Government fines on corporations in the United States are deposited in a special account maintained by the Treasury Department, which annually disperses these funds to the states to compensate victims of violent crime.

In the United States, treble damages (i.e., judicial awards following from final decisions at trial equal to three times the victims' economic losses plus reasonable legal fees) were explicitly instituted in the 1914 Clayton Act to compensate buyers from cartels as well as to deter firms from forming cartels *ex*

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[8] Earlier Becker and Stigler (1974) argued that the individuals or firms that discovered the violation (most of them buyers from cartels) would be the ideal recipients of the fine, but their view seems no longer to have broad acceptance among Chicago-oriented writers.

[9] Under the optimal sanctions model, there is always a positive "efficient" amount of crime.

[10] Section 7 of the 1890 Sherman Act explicitly authorizes private parties the right to seek treble damages generated by a cartel through civil law suits.  This right was clarified and reinforced by Section 4 of the 1914 Clayton Act ("Any person injured … by reason of anything forbidden in the antitrust laws may sue…and shall recover three-fold the damages…sustained and…a reasonable attorney's fee" 15 U.S.C.A. §15).  At the time the Clayton Act was passed, the maximum criminal fine was $5,000, so it is reasonable to infer that Congress intended private treble-damage suits to be the primary mechanisms of cartel deterrence. Other goals include promoting technological progress, protecting business targets of market power (especially or possibly only if such harm is a side-effect of harm to consumer welfare), and decentralized economic power.

*ante*.[11]  That is, in principle treble-damage awards include a compensatory portion of single damages and a punitive portion of double damages. Private antitrust suits were infrequent in the United States prior to 1950, but since the 1970s have accounted for more than 90% of all federal antitrust suits.[12]  More than 95% of private antitrust suits are resolved through settlements rather than final decisions from a trial, making them a small drain on federal judicial resources.  In the context of international cartels that operated globally, out of 36 cases during 1990-2003 in only 5 (14%) have corporate defendants gone to a full-blown trial (Connor 2003: 39-40).[13]

Concerns about excessive awards to plaintiffs seem to be unwarranted. In practice, it appears that historically private plaintiffs typically have received less than single damages (Lande 1974).[14]  More recent empirical research by Connor (2005) shows that public and private U.S. sanctions on international cartels have ranged from 0 to 263% of affected sales.  Moreover the concerns raised about the perverse incentives for private plaintiffs that treble damages provide have not been supported by subsequent research.  In response to Breit and Elzinga (1974, 1985), Besanko and Spulber (1990) developed a game-theoretic model that demonstrates that under a couple of reasonable assumptions[15] the perverse incentives disappear and multiple damages result in welfare improvements.

The EC's cartel decisions are explicit in mentioning deterrence as the main objective[16] of its determination of fine levels. These fines are used to defray the EU budget, which implies that European consumers are at least indirectly compensated through a net reduction in EU tax revenues.[17]  The mean sanction for 23 non-global EU cartels was about 22.5% of affected commerce; for 46 sanctioned in other jurisdictions, the mean was 18.4%. However, because of their larger sales, global cartels have received more lenient treatment: the mean sanction in 26 cases was 13.0% of sales.

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[11] Most private price-fixing suits are resolved prior to trial or prior to a final decision at trial through negotiated settlements between plaintiffs and defendants.  This is true even in "follow-on" cases in which a prior criminal guilty plea by the defendants is by law *prima facie* evidence of the fact of injury.

[12] A defining event was the launching in 1960-1961 of at least 1800 private suits by electric power companies against General Electric et al. for price fixing in the markets for heavy electrical equipment.  Soon thereafter, 1966 changes in federal court rules permitted greater use of more efficient class-action suits.

[13]  The cases with trials are *Aluminum Phosphide* (case filed 1993), *Fax Thermal Paper* (1994)*, Choline Chloride* (1999)*, Graphite Electrodes* (1998)*, and USAID Wastewater Plant Construction* (2000). Usually only one member of the cartel went to trial, so the proportion of all defendants is less than 5%.

[14] There are several reasons for this claim: the absence of prejudgment interest, the four-year statute of limitations, plaintiffs' lawyers' contingency fees, the umbrella effects of cartel overcharges, and the inability to recover allocative efficiency losses.

[15]  The cartel has better information about its own costs of production than do its customers.  The welfare benefits increase with the probability of cartel detection and the number of multiples.

[16] Article 81 (3) explicitly recognizes that competition law should promote the benefits of technological progress for consumers, but innovation is rarely an issue in cartel cases.

[17] In the peak year of 2001, EU antitrust fines amounted to 2 percent of its annual budget.

**Optimal Deterrence Theory**

The theory of optimal deterrence in antitrust law enforcement has become nearly universally accepted in the legal-economic literature since a classic article by Landes (1983). Quick to be accepted among North American scholars as the most appropriate framework for analyzing cartel enforcement, in more recent years optimal deterrence theory has become unexceptional among Western European scholars as well (Harding and Joshua 2004, Wils 2005, Camilli 2005, Baks *et al.* 2005). A more recent exegesis is given by Polinsky and Shavell (2000).[18] The triumph of optimal-deterrence thinking in criminal-law scholarship is an outstanding example of the imperialist tendencies of economics in related fields.[19]

In the version of the deterrence model presented below, I assume that only corporate costs and benefits drive cartel decisions. This assumption seems reasonable because the involvement of top officers in these cartels suggests no principal-agent problem. Moreover, in recent decades many companies linked managerial rewards closely to corporate financial performance. Many cartels had weak boards of directors, as their restructurings after price-fixing episodes demonstrate. Personal fines are very low in the United States, and practically nonexistent elsewhere. Prison sentences are difficult to monetize.[20]

Case evidence supports the view that potential conspirators are adept at calculating the quarterly or annual profits from an effective cartel, though they might have uncertainty about the scheme's longevity.[21] As to the probability p that a cartel will be discovered, most evidence seems to suggest a 10- to 20-percent chance (Bryant and Eckard 1991, Feinberg 1985, Connor 2001, Cohen

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[18] Polinsky and Shavell (2000) survey more than 200 academic papers. Most of their examples are drawn from individual criminal acts. The model presented immediately below has two features not mentioned in the survey: the probability of conviction after apprehension and consideration of violations that inherently involve multiple geographic jurisdictions with varying sanctions and multiple geographic harms caused.

[19] In the Preface to Posner (2001), the author explains that the subtitle of the book's first edition ("An Economic Perspective") is no longer necessary because "In the intervening years, the other perspectives have largely fallen away" (p. vii). However, Jacobs (1995) takes the view that the Post-Chicago school of antitrust economics has restored some elements of populism.

[20] Focusing solely on corporate benefits and costs runs counter to repeated public statements of DOJ officials, who assert the primacy of prison sentences in deterrence of cartels (e.g., Pate 2003). If individual sentences are important, then the fines on companies for optimal deterrence will be lower. Ignoring individual fines and prison sentences is controversial. The standard optimal-deterrence approach recommends only personal fines (Shavell 2003). However, Werden and Simon (1997) offer strong views on the necessity of imprisonment for price fixers. They argue that imprisonment is even justified by the Beckerian theory of deterrence because the optimal fines for price fixing, using 1975-1980 data in 1981 dollars, are about $1 billion. When individuals are too poor to pay fines, Becker seems to favor imprisonment. They also argue that optimal deterrence theory is inappropriate for price fixing.

[21] Historically the average global cartel lasted about eight years, with a range of two to 18 years.

and Scheffman 2000, Adams 2002, Werden and Simon 1987).[22] Levenstein and Suslow (2002) note that government anticartel actions accounted for only 10% of some of the best documented cartels operating in the interwar period (p.16). Moreover, even if cartelists are indicted by the U.S. DOJ, the chances of being convicted are less than 100 percent. The DOJ likes to boast that more than 80 percent of its indictments end in guilty pleas, which is true because the *per se* evidence is so damning in most cases that defendants usually negotiate a guilty plea. On the other hand, when accused price fixers choose to litigate a criminal price-fixing case, the government wins their cases less than half the time. Thus, cartelists adept at covering up their clandestine meetings or able to afford the best legal defense teams might well judge their chances of conviction to be in the 50 to 75 percent range.[23]

The decision facing a firm trying to decide whether to form a cartel or join an existing cartel may be explained using a benefit-cost framework. Let E(B) be the expected financial benefits, that is, the net present value of the expected monopoly profits accruing to the firm from an effective cartel. Let E(C) be the expected monetary costs of forming or joining the cartel, where the managerial costs are assumed to be negligible. Then the firm will opt to enter an existing cartel or create a new cartel agreement if

[1]             $E(C) < E(B)$ ,

but will opt to stay out if the inequality sign in equation [1] is reversed. If $E(C) = E(B)$, then the costs are deemed privately optimal.

In the simplest version of this decision model, one used by Richard Posner (2001),

[2]             $E(C) = p \cdot F,$

where p = the probability of antitrust-authority discovery and conviction and the only sanction is F, the fine imposed for the violation.[24]

An optimal fine is

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[22] The highest rate is suggested to be 0.33 by Cohen and Scheffman (1989). The lowest rate of less than 10% is suggested by Werden and Simon (1987). The most rigorous study of this issue, Bryant and Eckard (1991), find in the 1980s in the United States that the rate of discovery is between 13% and 17%. Polinsky and Shavell (2000) note that for some of the most common felonious property crimes (burglary, auto theft, and arson), U.S. arrest rates vary from 13.8% to 16.5%, well within the range adopted here.
[23] Connor (2001: 60-61, 68-69).
[24] Posner (2001: 47). This formulation assumes that the justice system is costless and errorless, that offenders and victims are risk-neutral, and that the conspiracy was condoned by the company's top managers.

[3]        $F = E(C)/p$.

   A more complete version of this model is

[4]        $E(C) = p \cdot c \cdot E(F)$,


where p is the probability of detection and c is the probability of conviction or settlement.  E(F) depends on the culpability factors and the size of the affected sales or overcharge (a range known with near certainty from the U.S. Sentencing Guidelines) and the firm's timing in applying for leniency.  E(F) could be zero if the firm is granted amnesty, but even then the expected private settlement costs, E(S), are not zero.  Moreover, the firm may incur significant legal defense costs and related managerial time losses as well as post-indictment reputational costs, E(R).  Thus, in the case of a domestic conspiracy,

[5]        $E(C) = p_g \cdot c_g \cdot E(F) + p_p \cdot c_p \cdot E(S) + E(R)$,

where subscripts g and p refer to *government* and *private* legal actions.  In the usual follow-on suit, $p_p = 1$ and $c_p$ will be very high (close to 1), but in some cases where the government does not indict, $p_p$ and $c_p$ are low positive numbers, much closer to zero than to 1.



## Anticartel Penalties Are on the Rise

The corporate fines and personal sanctions handed out to global price fixers in the past decade were far above historical levels.  Cohen and Scheffman (1989) provide a useful historical benchmark for U.S. price-fixing fines. From 1955 to 1974, the average fines amounted to only 0.4% of the cartel's affected commerce.[25]  During 1974-1980, when the maximum corporate fine was raised to $1 million, the average price-fixing fines rose to 1.4% of affected commerce.  A comparable survey of 1988 fines reported that average U.S. price-fixing fines were only 0.36% of the overcharges (Sheer and Ho 1989: 34).[26]  In the United

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[25] "Affected commerce" is the amount of sales revenues during the admitted conspiracy period received by the members of a cartel in the geographic region over which the antitrust prosecutors have authority.  This is a conservative notion of such commerce, because nonmembers may engage in umbrella pricing, lagged price effects may persist after a cartel is formally disbanded, and price effects may spill over into adjacent regions.

[26] Sheer and Ho (1989) was an internal DOJ study whose methods of calculating the overcharges are not known; the study's five cases were the only ones with such data available. Cohen (1989) also studied corporate fines imposed in U.S. federal courts in the late 1980s and found a much higher level. He concluded that the fines alone equaled 33% of the harm caused by the companies. His analysis predates the U.S. Sentencing Guidelines (USSG 1997) and ignores nonmonetary penalties, restitution, civil penalties, and tort suits. Even with certainty of discovery, such fines cannot deter price fixing.

States, criminal penalties were increased significantly in 1987 and 1990.[27] The promulgation of stiffer new federal guidelines for price fixing in 1987 seems to have been one of the principal causes of a five-fold increase in median corporate fines in the United States from the late 1980s to the mid 1990s (Alexander *et al.* 2000: Table 2). Another change that may account for the increase in U.S. cartel fines is that prior to the mid 1990s nearly all prosecuted cartels were domestic affairs, whereas after 1995 convicted cartels were mostly international [28] conspiracies (Connor 2001). International cartels typically achieve long-run price effects that are much higher than national cartels (Connor and Lande 2004). Moreover, international cartels that are global[29] in geographic scope display even greater effectiveness in raising prices (*ibid.).*

In the European Union (EU), fines for cartel infringements also increased. The first 15 cartels to be sanctioned by the European Commission (EC) during 1969-1984 paid on average fines of € 2.4 million; during 1998-2002 the EC fined 32 cartels an average of €117 per cartel (Burnside 2003:Annex 1). Moreover, EC cartel fines rose in terms of the sales involved. Prior to 1979, EC fines were invariably below 2% of one recent year's total sales of the infringing firms (Geradin and Henry 2005:4). From 1979 to 1998 EC fines of 2% to 4% of one year's sales in the European Economic Community of the cartelized product (*ibid. p. 5).*[30] The latter sales definition is more restrictive than global company sales except for the smallest specialized firms. Similar upward trends in cartel fines can be observed in Canada, Australia, and Korea.[31] Although the laws authorizing cartel fines in these jurisdictions did not change in the 1990s, the proportion of international cartels sanctioned did rise.

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[27] In 1974, price fixing violations became a felony under federal law, and in 1987 the U.S. Sentencing Commission issued mandatory guidelines that permitted prosecutors to propose corporate fines up to twice the harm caused (double damages); in 1990, the maximum statutory sanctions for Sherman Act violations became $10 million for companies (up from $1 million) and $350,000 for individuals (Connor 1994).

[28] By international, I mean cartels with corporate participants from two or more nations; this is the DOJ's definition. Most international cartels are also international in a geographic sense, but a minority operated solely within the borders of a singe country.

[29] Global cartels fix prices in at least two continents, and most operated in all three of the industrialized regions that marketing specialists call the "triad" (viz., North America, Western Europe, and Eastern Asia).

[30] I have seen reference to only one EC decision, *Eurocheque – Helsinki Agreement (1992),* that claimed to base the fine on the harm caused rather than sales or some other proxy (Geradin and Henry 2005: note 20). In 1998 the EC issued new fining guidelines for cartel infractions (EC 1998). Using sales as the basis of fine calculations is sometimes justified as a proxy for harm. In what Joshua and Camesasca (2004:5) call a "doctrinal shift of massive proportions," the new guidelines purport to sever any link between any concept of sales and the size of fines.

[31] In Canada the absolute size of fines has risen mainly because of the increasing volume of affected sales, because Canada's Competition Bureau for the past two decades has recommended fines equal to about 20% of sales.

Anticartel enforcement toughened in the 1990s. Beginning in the early 1990s North American and European[32] antitrust authorities adopted more effective enforcement techniques and displayed a growing impatience with price fixers, particularly those engaged in international conspiracies (Connor 2004, Joshua 2004: 677-679, and Low 2004). A remarkable convergence of enforcement practices can be observed: unannounced raids on suspects' offices[33], information sharing between antitrust authorities, and the adoption of corporate leniency programs that effectively exploit the Prisoners' Dilemma. Corporate cartelists, when they are unmasked by antitrust investigators, are now routinely paying fines that exceed their monopoly profits earned in North America and in Western Europe. Indeed, in North America, when the private treble-damages suits of buyers or the state attorneys general are factored in, prosecuted price fixers are nowadays normally disgorging close to double their illegal "earnings" (Connor 2001:469-476).

**Are Antitrust Sanctions too High (in Theory)?**

The advent in 1987 of the double-the-harm standard ($2xB_u$)for setting U.S. government price-fixing fines has led some legal writers to criticize cartel sanctions as having reached *supra deterrent* levels (Easterbrook 1986, Kelley and Savyed 2000, Cohen and Scheffman 2000, Kobayashi 2001, Baker 2004).[34] In fact few, if any U. S. sentencing memoranda that are submitted to judges when a company accused of criminal price fixing registers its guilty plea cite the double-the-harm law. On the contrary, these memoranda almost inevitably use the "20% rule" contained in the U.S. Sentencing Guidelines.[35] Large monetary awards and settlements since the late 1990s to private direct buyers in a few high profile international cartel cases have added to the charges of

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[32] Joshua and Jordan (2004) chart how the Anglo-Saxon common law concept of conspiracy began to take hold in decisions of the European courts (i.e., the Court of First Instance and the European Court of Justice) around 1975 but was solidified by the 1993 *Woodpulp* decision. These authors also cite (in footnote 2) five EC cartel decisions in 1985, 1986, 1989, 1989, and 1994 that showed a willingness to impose cartel fines on companies above $10 million. See also note 1 above.

[33] In the United States, the FBI can interview suspects in their homes and can obtain warrants to search homes. Canadian law is similar. However, until 2003 EU "dawn raids" were restricted to offices.

[34] Fines can equal up to double the cartel's overcharges or double the illegal profits, but the former is larger than the latter. The double-the-harm standard was instituted when naked price fixing was made a felony for corporations and individuals, but the threat of double-damage fines seems not to have been regularly raised by the DOJ in negotiations about plea bargains until the early 1990s.

Supradeterrence is frequently alleged in the context of treble damages. However, some legal commentators have specifically cited the increased global cartel fines and penalties as excessive. Some also argue that the first U.S. sentencing guidelines caused a serious overdeterrence problem. For an economics-and-law model suggesting supradeterrence of government cartel fines, see Kobayashi (2001).

[35] Many of these sentencing memoranda are searchable on www.usdoj.gov.

overdeterrence. For example, in 2003-2004, buyers of bulk vitamins settled for more than $2 billion. Defendants' lawyers have expressed alarm about these trends: were even more alarmed.

> "What is….troubling is that the company fines...have risen astronomically – to levels far higher than the fines for other serious economic crimes and in amounts that can be unrelated to the economic harm caused by the violations (Adler and Laing 1999:1)."

More recently, Denger (2003) too decries the prevalence of excessive price-fixing fines and private settlements.  He places the blame for excessive fines on the Corporate Guidelines base fine calculation, which is 20% of the volume of affected commerce (p. 3).

It is true that the *theoretical* maximum fines and private settlements faced by prosecuted cartelists have reached surprisingly high multiples of cartel overcharges in the U.S. legal system.  A domestic cartel successfully prosecuted in the United States is liable to pay up to *double* the cartel member's overcharge to the federal government and *triple* the overcharge to direct buyers who file civil suits.[36]  In addition, the cartel can be sued by the state attorneys general or by the indirect purchasers themselves for another set of *treble* damages incurred by indirect buyers.[37]  Thus, domestic cartels are liable to pay as much as *six or seven* times their illegal monopoly profits if they are found guilty. Indirect-purchaser suits are permitted in about 24 states comprising about half the U.S. population.

Moreover, suppose the cartel is a global one with a typical one-quarter of its sales in the United States.  Then, the U.S. DOJ has the option of calculating its fine on the basis of global overcharges (which are likely to be three or four times the domestic overcharges).  In this case the federal fine could rise to *six or eight* times a cartel's U.S. overcharges.  It is the possibility of fines and settlements totaling *six to twelve times* a cartel member's U.S. monopoly profits that leads critics to make claims of overdeterrence.

In the case of global cartels, significant additional sanctions are likely to be imposed on convicted firms in Canada and the EU. Canada's fines hew closely to

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[36]  Under the legal theory of "joint and several liability," each member of the cartel is liable for the full amount of the cartel's damages. However, when the defendants settle as a group, each pays the settlement amount in proportion to its affected sales in the jurisdiction. If some defendants are more intransigent than others in settlement negotiations, the last companies to settle may pay more than their market share would suggest.

[37] Suits by the attorneys general are called *parens patriae* actions.   In 2000, 45 states joined together to sue the six largest companies in the vitamins cartels.  Indirect buyers may also sue in about 24 state courts that represent about half of the U.S. population and economic activity. Indirect buyers include both corporate and consumer purchasers. Pass-on by direct buyers is no defense for these actions.

a rule that multiplies affected Canadian sales by 20% (0.2xCS). In addition, since 1992 Canadian law has permitted private suits that compensate buyers for single damages on Canadian transactions ($1 \times B_c$). In the EU since 1960, the Commission has had the authority to impose fines on convicted cartelists up to global revenues of the convicted company in the year before the Commission issues its decision (0.1xGR). For large multinational companies, the maximum EU fine can be a very large number.[38]

To summarize, for members of global cartels the theoretical upper limit of corporate liability is a rather messy expression:

$$[6] \qquad E(C) \leq 6B_u + 0.2\ CS + 1B_c + 0.1GR.$$

Perhaps a somewhat realistic numerical example can illustrate the type of liabilities facing a global cartelist. Consider Archer Daniel Midland's leading role[39] in the lysine conspiracy of 1992-1995 (Connor 2001: 161-276). The lysine cartel generated $200-$250 million in global overcharges and $80 million in U.S. overcharges, of which half was accounted for by ADM. Because ADM's portion of $B_u = \$40$ million, the company's maximum U.S. liability was $240 million. Canadian affected sales were about $32 million and damages about $5.5 million, for a total ADM liability of $0.5(0.2(32) + 5.5) = \$6$ million. With global sales of about $15 billion in 1999, the year before the EC's decision, ADM's liability for US fines could have reached $1.5 billion. Therefore, ADM's worldwide antitrust sanctions could have totaled as much as $1.746 billion, almost 20 times its global monopoly profits of at most $90 million.[40]

It is probably examples of these kinds that have been driving assertions that cartel sanctions are supra-deterrent.[41]

**Are Cartel Penalties Supra Deterrent?**

Those who take that position seem to draw upon anecdotes like the ADM example above. However, there is a more fundamental logical flaw in claims of supra-optimal sanctions. These criticisms seem to confuse the *ex post* liabilities faced by discovered cartel members with the *ex ante* decision making process

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[38] For all fines and settlements, a firm's ability to pay supercedes any other considerations in imposing sanctions. However, most jurisdictions permit installment payments to alleviate the financial burden of a large fine.

[39] ADM did not qualify for amnesty.

[40] In fact ADM actually paid $70 million in U.S. fines, about $60 million in U.S. settlements, $8 million in Canada, and $47 million to the EU, a total of $185 million.

[41] I have been unable to find published sources that lend credible empirical support for supra-deterrence in the case of contemporary international cartels. Privately, defendants' attorneys when pressed for details plead attorney-client confidentiality.

that deterrence-fines are supposed to affect.  Deterrence effects of anticartel policies must be evaluated *ex ante*, that is, from the perspective of a company considering forming or joining a global price-fixing conspiracy.  Such a company must evaluate the probable additional profits from the cartel relative to the *probable costs* associated with being discovered and prosecuted.

**Why Deterrence is Sub Optimal**

Despite the evident rise in cartel sanctions, serious doubts remain that even the heightened penalties observed since 1995 are sufficient to reduce cartel recidivism. There are at least eight reasons why current practices regarding the imposition of corporate monetary penalties imposed on international cartels can result in sub optimal deterrence.[42]

First of all, nearly all the government fines imposed on international cartels have been confined to only three competition-law jurisdictions.  U.S., EU, and Canadian fines accounted for 81% of all corporate monetary sanctions imposed on international cartels during 1990-2003 (Connor 2004: Table1).   Of the remaining fines, nearly all were imposed by *national* antitrust authorities of the Member states of the EU.  Thus, cartel violations in Asia, Africa, and South America go unpunished.[43]  It is reasonable to assume that when global cartels are formed, the conspirators expect negligible fines in three large continents

Second, the guidelines that the world's antitrust authorities use for cartels are either unrelated to cartel damages or are based on flawed damages assumptions.  The 1987 U.S. Sentencing Guidelines assume that the mean cartel overcharge is 10% of affected sales and to achieve deterrence double it to start with a base fine of 20% of affected U.S. sales.  While this assumption may be based on a small sample of actual cartel overcharges in the years before 1987.  Connor and Lande (2004) show that the true historical overcharges are several times higher than 10%.   Canadian fines also seem to assume a mean 10% overcharge. In the EU and most of its Member States, the fine guidelines have been excoriated as "linguistically vague" (Geradin and Henry 2005:12) and the sum that is the "start point" for cartels fines has been termed arbitrary and random figure (*ibid.,* Joshua and Camesasca 2004:7).

Legal and economic scholars tend to agree that in an ideal regulatory world, cartel fines should be computed as a function of damages rather than proxies like sales.  Indeed, Wehmhöner (2005) and Giudici (2004) specifically

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[42] In this paper the effects of imprisonment are ignored, primarily because it is difficult to monetize the opportunity cost of a felony conviction and the typical 4 to 15 months of incarceration meted out to senior executives of major violators.

[43] Australia has fined members of half a dozen international cartels, and Mexico, Korea, Taiwan, and, Japan two or three each. However, these agencies overwhelmingly concentrate their enforcement resources on local price-fixing violations.

recommend the establishment of damages-based fine guidelines. The failure of antitrust fines to be tied closely to damages seems to be rooted in a preference for the administrative convenience of a "one size fits all" guidelines policy. In particular, the perceived difficulty of calculating damages on a case-by-case basis is frequently mentioned as a stumbling block.  Outside the United States and Canada, enforcement agencies tend to be staffed almost exclusively with legal experts rather than economists.  However, the fact that hundreds of private price-fixing cases – in which the main issue is the size of damages -- are filed and resolved each year in the United States tends to suggest that the claim of insufficient economic expertise is not a valid argument.

It is true that both the USSGs and the EC (1998) pay lip service to *company-specific* deterrence, but it is also true that adjustments in fines to capture differences demanded by the principles of optimal deterrence are crude at best.[44]   However, in both jurisdictions, the *total* fines paid by members of the cartel are in principle unrelated to the damages caused by the cartel as a whole.[45]

Third, the leading antitrust agencies tend to offer large concessions on the fines that could be sought in litigation to cartelists that agree to plead guilty, fail to oppose administrative proceedings, offer inculpatory information their fellow conspirators, or cooperate in other ways with prosecutors.  This practice, which often results in quick bargains to plead guilty and eliminates the costs and uncertainty of a litigated outcome, is an old habit of the U.S. DOJ. On average, corporations received 86% discounts from the base fine in 1974-1980 (Cohen and Scheffman 1989). Even more recently in the case of U.S. fines on high profile global cartels, there is evidence that the DOJ negotiated large discounts from the maximum fines specified by Sentencing Guidelines.  The government settled for fines that were 75% to 85% below the maximum possible in the lysine, citric acid, and vitamins cartels (Connor 2001: 360-373).  Similar but smaller discounts were awarded by the European Commission in the same cases.

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[44]  The USSGs calculate a company's base fine using its U.S. affected sales, which effectively makes U.S. fines closely correlated with a violator's U.S. market share.  The European Commission's 1998 fine guidelines have a provision for applying a "deterrence multiplier" of up to 2.5 to specific companies (Geradin and Henry 2005: 9). In the *Carbonless Paper* decision, for example, the 3 largest of the 11 companies fined had their fines doubled for "deterrence" purposes (*ibid.* p. 11). However, the deterrence multiplier is explained to be based on the company's "size and resources," and the EC already takes size into account by sorting the participants in a cartel into up to 5 size groups; in *Carbonless Paper* the top company's start point was 100 larger than the 3 smallest participants. In some important decisions such as *Lysine* the EC has been criticized for imposing no deterrence multiplier on ADM (Joshua and Camesasca 2004: 7).

[45]  The USSGs specifically permit prosecutors to apply the "alternative sentencing statute" (fines up to double damages) if they have reason to believe that the overcharge is significantly higher than 10%, but I know of no cartel cases that have used the alternative statute. It may well be the case that during plea-bargain negotiations the DOJ mentions its resolve to litigate under the alternative sentencing provision; this was the only way to obtain a fine above $10 million during 1990 to 2004.

Corporate leniency programs now in force in a dozen jurisdictions may exacerbate the tendency of governments to offer fine discounts to guilty parties.[46] These programs should reduce the costs of investigating and prosecuting cartels. However, promises of large reductions in fines (as much as 100%) could make cartels more effective by facilitating the cartel's ability to punish deviants, or the programs could destabilize cartels by increasing the rewards for defecting.[47]

Fourth, the availability of treble damages suits is confined to purchases made by buyers in the United States, actual payouts are well below three times the harm (Lande 1993, Connor 2004). Outside the United States private compensatory suits for single damages have been brought by injured parties in Canada and Australia since the mid 1990s (Goldman *et al.* 3003). In Europe and elsewhere private damages suits are rare or not permitted as a matter of law. As a result, significant private sanctions on cartels cover only a minor portion of the affected sales of non-U.S. and global cartels.

Fifth, it is widely acknowledged that p, the probability of secretive price-fixing agreements being discovered by antitrust authorities or private parties, is quite low. There is only one economic study of the probability of detection of cartel activity, a widely cited paper by Bryant and Eckard (1991). This study concludes that the probability is between 13% and 17%, but is based on U.S. domestic cartels convicted in the 1960s and 1970s. Other subjective and opinion-survey evidence has the probability ranging from less than 10% to 33% (e.g., Feinberg 1985). Most analysts have assumed that the probability of cartel detection is a parameter, but some theorists have suggested that p is a positive function of the changes in price level and in price dispersion that accompany the formation of a successful cartel; also, if the increase in p is large, cartel stability will increase (Hinloopen 2004). The lower the probability p, the higher the expected fine must be to deter optimally cartel formation.

Sixth, in most jurisdictions fines and private settlements are paid without regard to pre-judgment interest.[48] If fines are related to damages or affected sales, the amount of the fine is based on nominal values that have become debased by the passage of time. That is, when general inflation is eroding the

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[46] Corporate leniency policies give automatic amnesty (a 100% fine waiver) to the first company (and its officers) to apply that meets certain objective conditions (Connor 2004). These programs are available to any participant that was not the "mastermind," "ringleader," or principal enforcer of a cartel agreement.

[47] Theoretical analyses of leniency programs have ambiguous conclusions about the effects on deterrence (Spagnolo 2004). Effective programs might require positive rewards to the first defector (Aubert, et al. 2005). A rare empirical study of leniency programs finds that the EU's first (1996) corporate leniency program finds that the effect on prosecution costs was small and that the effect on deterrence is neutral (Brenner 2005). However, the EU's new 2001 revised leniency program was not studied.

[48] After a fine is levied, most jurisdictions require payment within about three months. In the case of private settlements, the courts impose payment schedules that add interest from the day the settlement amount is approved. The lack of prejudgment interest is a factor that reduces the value of treble damages in private U.S. suits (Lande 1993).

purchasing power of money, it is in the interest of fined defendants to employ tactics to delay payment. An ideal antitrust policy would convert affected sales or damages to present value, i.e., the value of money at the time the government or private plaintiffs receive payment. Deterrence is subverted by legal systems that allow violators to expect to pay monetary penalties in depreciated currency.

Seventh, even if government fines were, like private damages suits, based on the overcharges caused by a cartel and its corporate members, other types of social harm are generated by collusive conduct. When demand is normal, an overcharge is always accompanied by deadweight social losses. Neither fines nor damage suits can recoup these losses.[49] It is this reasoning that has justified both the *per se* rule for price fixing under U.S. law and the application of multiple damages for fines and private settlements. In addition, if a cartel does not corral every supplier into its ranks, outside firms can engage in umbrella pricing, which generates damages and deadweight losses. However, these losses cannot be recouped through monetary penalties, because under the conspiracy-based legal theory of price fixing the fringe firms did not actively conspire with members of the cartel.

Finally, many jurisdictions have official fining guidelines or juridical practices that place upper limits of the size of fines. The 1987 U.S. Sentencing Guidelines (USSGs) for criminal price fixing have an upper limit of 80% of the guilty firm's U.S. affected sales. Although at first blush 80% sounds harsh enough to punish the most flagrant violators, under the simplest models[50] of *ex ante* cartel deterrence only national cartels with overcharges below 15% to 25% will be deterred. However, a significant body of evidence suggests that half or less of all historical cartels exhibit long run price effects below 25% (Connor and Lande 2004). The proportion of global cartels below the 25% threshold is even smaller. Moreover, the upper bounds on government cartel fines are more restrictive outside the United States. Canadian courts only rarely permit fines to exceed 20% of Canadian affected sales (Low 2004). In Japan, the JFTC is

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[49] Deadweight loses can be equal to as much as 50% of the overcharge, but empirical studies tend to find that deadweight losses are from 10% to 20% of the overcharge (Peterson and Connor 1995). Legal reasoning for excluding deadweight losses is based on two grounds: that the victims are difficult to identify (e.g., consumers that stopped buying the cartelized product because of the price increase) and that calculating the loss is even more difficult because one must have estimates of own-price elasticity of demand. A minor exception to the rule that deadweight losses cannot be compensated is whistle-blower suits.

[50] The simplest models, as in Landes (1983) and Posner (2001), assume that the criminals are risk-neutral. As elaborated by Polinsky and Shavell (2000), a more comprehensive approach to optimal deterrence requires attention to the risk attitudes of perpetrators. Baks *et al.* (2005) argue convincingly that cartelists are risk-loving (p.8). If so, then the ratio of expected penalties to the expected monopoly profits must be higher. Present systems of calculating monetary penalties do not take into account the risk attitudes of defendants.

Another simplifying assumption concerns Type II error in adjudication, i.e., the probability that the innocent are convicted Giudici (2005:3). Direct harm to the innocent increases with the harshness of penalties (Bebchuck and Kaplow 1992).

limited to 6% of Japanese affected commerce in the few cases where cartels are fined (First 1995).

The lowest fine limit is found in the EU and many of its Member States. After a corporate fine is calculated, the amount must be shown to be less than 10% of the global sales of the company in the year before the decision is rendered.[51] The obscurity of the rule's origins and its conflict with the deterrence objective of the EU's antitrust policy are matters of concern to legal-economic analysts.[52] Moreover, the upper limits on fines are unjust because they violate the juridical principles of equivalence and proportionality (Maks *et al.* 2005:2). In particular, when the 10%-of-sales limit is invoked violators with small sales in a single line of business are more likely to pay fines that are a larger proportion of the harm they caused than are large diversified firms. The degree of discrimination increases with the duration of the cartel. This upper bound has in fact reduced some cartel fines in recent years.

Upper limits on fines of any kind (except those tied to the size of damages) can actually *induce* behavior that will increase cartel formation, stability, and endurance.[53] As soon as a cartel participant calculates that the upper limit of a fine has been reached, then all future gains from collusion will be fully appropriated by the company. Moreover, even if an antitrust regime increases fines for recidivism, after passing the upper limit a firm can enter into as many new cartel agreements as it likes without fear of increased liability. To draw an analogy, mandatory sentences for a first murder mean that serial killers will not be deterred.

On the whole, the arguments that present cartels fines are sub optimal seem to me to be more persuasive than the reverse. The remaining empirical part of this paper supports the sub optimal view.[54]


# Optimal Deterrence for Global Cartels

In the context of global cartels, the decision-making model shown in Equation [5] above has added geographical components:

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[51] EC decisions take about three years after a formal investigation is opened by the commission or typically two years after a cartel agreement is abandoned.
[52] The 10% limit was issued without explanation in 1962 as Commission Regulation 17 after years of secret political discussions.
[53] Obviously this point does not apply to antitrust environments with private damage suits.
[54] Another empirical approach is taken in Connor (2005).

[7]     $E(C) = p_{gu} \cdot c_{gu} \cdot E(F_u) + p_{pu} \cdot c_{pu} \cdot E(S_u) + p_{gc} \cdot c_{gc} \cdot E(F_c) + p_{pc} \cdot c_{pc} \cdot E(S_c) +$
         $p_{ge} \cdot c_{ge} \cdot E(F_e) + p_{gr} \cdot c_{gr} \cdot E(F_r) + E(R),$

where u = U.S., c = Canada, e = EU and r = Rest of the world.[55]

Several simplifications can be made to Equation [7]. Because of the absence of effective private damages suits outside of North America, it is not necessary to include $E(S_e)$ or $E(S_r)$ (First 1995, Harding and Joshua 2003). Because most companies are listed on one principal stock exchange, $E(R)$ refers to stock-price effects in the firm's home country. Unlisted cartel members suffer little $E(R)$, and in my view the reputational effects for public companies, if any, are very small and seem to dissipate within five years or less. A more formal analysis of reputational losses from antitrust convictions confirms that such losses are ephemeral (Alexander 1999).[56] Thus, from a long-run perspective, $E(R) = 0$. Finally, weak enforcement in Asia and Latin America implies that $E(F_r) = 0$.

A second way of simplifying Equation [7] is to substitute $p_{ij}$ for $p_{ij}c_{ij}$. That is, $p_{ij}$ may be interpreted as the combined probability of detection and prosecution. While it is conventional to treat p as a parameter, it is important to note that beginning in the 1990s they became dependent upon one another. In particular, Canadian and U.S. authorities began to cooperate very closely. Nearly all international cartels prosecuted by the DOJ were prosecuted by the Canadian Competition Bureau about six months later (Connor 2005). Similarly, the EC frequently opened investigations of global cartels within weeks of parallel investigations in the U.S. or Canada.[57] In the late 1990s, cooperation became even more intense as the three authorities began to implement joint raids and when Canada and the EU adopted corporate leniency programs similar to the U.S. program. Often, a cartel member would try to apply for leniency almost simultaneously in all three jurisdictions.[58] Therefore, under present practices $p_g$ is essentially identical across the three leading jurisdictions.

The chance of being sued for private damages in North America to a large extent depends on a grand jury investigation being launched. While private price-fixing suits are often described as following the first guilty pleas, increasingly

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[55] Equation [5] ignores the possibility of government antitrust fines in Mexico, South America, Africa, and Europe outside the EU. These areas could be added if anticartel sanctions become more severe.

[56] Reputational effects may be nonlinearly related to the size of a fine, especially if the fine represented a new record amount. ADM's $100-million fine assessed in October 1996 certainly fits this description. It was only beginning in 2000 or 2001 that financial profiles of ADM or its top executives failed to include references to ADM's 1996 price-fixing convictions. Alexander's empirical study finds, for five publicized price-fixing convictions between 1984 and 1990, no reputational effects for the corporate defendants.

[57] However, EC decisions typically took three years to be announced after similar North American actions.

[58] The "race for amnesty" now includes eight or more capitals.

such suits are filed on the basis of information about the opening of U.S. or Canadian investigations. Indeed, some private plaintiffs have prevailed after the DOJ or CCB closed their investigations (e.g., methionine), and a few private suits were filed before governments began investigations. Thus, it appears that $p_p$ is similar to but possibly slightly higher in size to $p_g$.

Equation [7] can be rewritten as

[8]    $E(C) = p_g \cdot E(F_u) + p_p \cdot E(S_u) + p_g \cdot E(F_u) + p_p \cdot E(S_u) + p_g \cdot E(F_e)$.

An important step in this analysis is to convert the right side terms of Equation [8] into functions of B. When that is done, the algebraic expression can be solved for $kE(C)$, where k is a constant or a range. It is true that most DOJ fines are based on "20% of sales" base fine together with culpability multipliers, but as Tables 13.1 to 13.3 of Connor (2001) show, the difference in dollar fines are small between that method and the double-harm approach. Therefore, the maximum U.S. corporate fine is double the cartel's U.S. overcharges.

**Estimating the Parameters *ex post***

Because this analysis is *ex post*, $p_g = p_p = 1$ and $E(C) = C$. Given the standards that have evolved for corporate sanctions for global cartels, C can be converted to a function of the private financial "benefit" of price fixing, where B is the global overcharge paid by direct buyers during the conspiracy period. For simplicity, the overcharge rate is assumed to be equal in all regions of the world. For a convicted cartelist, the actual *ex post* costs C of global collusion will be

[9]        $C = F_u + F_c + S_u + S_c + F_e$.

Drawing upon the pattern of actual fines and settlements applied to global cartels since the late 1990s, one can calculate the three expected costs in [9] in terms of B, where the firm assumes the most pessimistic legal outcomes. The U.S. DOJ imposes the maximum double-the-overcharge fine on domestic sales with no leniency discounts, but the DOJ bases the fine on only the 25% of the typical cartel's affected sales that accrued in the United States. Then the CCB adds its 6% to the U.S. fines. Thus, $F_u + F_c = (1.06)(.25)(2B) = 0.53B$. Similarly, EC fines on the same cartels are 72% of the U.S. (Connor 2003: Table 16). Therefore, $(F_e) = (0.72)(0.53B) = 0.38B$. If direct buyers in the U.S. and Canada won full treble damages and legal costs of 25%, then $S_u + S_u = (0.25)(1.25)(3B) + .06(0.25)(1.25B) = 0.96B$.

Substituting these conversions into equation [7], one obtains

[10]   $C = 0.53B + 0.38B + 0.96B = 1.87B$.

On the basis of equation [10], a firm might expect to pay as much as 1.87 times its global monopoly profits in fines and settlements.[59] Because C>B, one might expect that cartels will be deterred.

## Estimating the Parameters *ex ante*

In the case of a more appropriate *ex ante* analysis, F(C) will be considerably lower than 1.85B because p is less than unity. In this analysis it is appropriate to use a range of likely parameters rather than point estimates. As discussed above, a consensus estimate for $p_{gu}$ is a value between 0.10 and 0.33, with the higher value due to the recent success of the leniency programs adopted by most antitrust agencies. Given the improved degree of international cooperation in anticartel enforcement, it is reasonable to assume $p_{gu} = p_{ge} = p_{ga}$. For conviction, the DOJ's conviction record suggests that $0.5 < c_{gu} < 0.9$ is a reasonable range, and because most U.S. treble-damages suits are follow-on actions, $c_{pu} = 1$ is not unreasonable. Actual fines paid in the United States and EU can be used to derive expected fines, and these can be converted to an overcharge basis (B).[60] DOJ practice suggests that for the *average* cartel participant $F_u = 0.18B$ to $0.64B$; in the EU, $F_e = 0.2B$ to $0.7B$. Ringleaders of cartels have paid relatively high U.S. fines per dollar of overcharge (.6B to .7B), and small followers low fines (.2B to .3B). In North America, private suits against global cartels have yielded settlements of from 1.0 to 2.0 jurisdictional overcharges.

These parameters, when substituted into Equation [7], imply that *ex ante*:

[11]        E(C) = 0.17B to 0.25B < E(B).

Thus, sub-optimal deterrence is the norm.

## Conclusion

The range of expected antitrust costs using realistic, historical enforcement practices results in a range that is far below the theoretical maximum costs calculated in Equation [11]. Thus, highly cooperative follower-participants in global cartels can reasonably expect to incur fines and settlements far below their expected cartel profits. Even under the most optimistic assumptions about

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[59] In certain cases, the U.S. DOJ can calculate its *base* fines on a world-wide sales basis; as the typical global cartel makes one-fourth of its revenues in North America, assuming that overcharge rates are equal in all regions, E($F_u$) = (1.06)(2B), then E(C) = 2.12B+ (1.06)(1.25)(3B) + 1.44B = 7.5B. In fact, the DOJ has never exercised this authority, though global sales have been used to adjust culpability factors (Kovacic 2002).

[60] U.S fine practices can be found in Tables 13.1 to 13.3 of Connor (2001), and for the EU Table 14.1 (*ibid.*) suggests that $F_u = 0.35B$ to $0.74B$. For the U.S., $F_u$ was 0.33B for lysine, 0.30B to 0.64B for citric acid, and 0.18B to 0.44B for vitamins.

discovery, lenience, and prosecution rates, the average conspirator can reasonably expect to make a profit on the typical global price-fixing scheme. Only under certain special circumstances, such as ringleaders of cartels that resist cooperating with prosecutors and are the last to settle private suits, do cartelists risk expected financial costs in excess of their expected profits.

To ensure optimal deterrence of global cartels, total financial sanctions should be *four times* the expected global cartel profits (the overcharge). In the case of followers, deterrence would require penalties in all geographic regions to be equal to *eight times* global cartel overcharges.  Even in cases widely regarded as exemplary prosecutions, antitrust sanctions historically have failed to approach optimal levels.[61]  These extraordinary multiples demonstrate that, from a purely benefit/cost approach, even the theoretical maximum U.S. legal sanctions of eight times U.S. overcharges is insufficient to deter recidivism in global cartels.[62]  Additional coordination among antitrust authorities or a multilateral approach may be required (Atkas 2005).

This study is hardly the first to conclude that current fine structures are suboptimal.  Cohen (1989) studied corporate fines handed down in U.S. federal courts in the late 1980s. His analysis predates the U.S. Sentencing Guidelines (USSG 1997) and ignores nonmonetary penalties, restitution, civil penalties, and tort suits.  Nevertheless, he concludes that the fines alone equaled only 33% of the harm caused by the companies.  Even with certainty of discovery, such fines cannot optimally deter.


# Caveats

This analysis has a number of limitations.  First, 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.  If the firm is a proprietorship, considering only company rewards and punishment makes eminent sense, but if there is a separation between ownership and management, then the personal motives of managers will be pertinent in evaluating the effectiveness of sanctions.  The simpler versions of optimal deterrence theory assume that there are no principal-agent problems.  In fact, it is generally the case that the reward structures of executive compensation contracts typically give short-term personal enrichment a greater weight in executive decisions than the long-run interests of stockholders. If the profits generated by price fixing generate personal rewards for such managers, then the

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[61]  The global vitamins conspiracy of 1989-1999 is often mentioned in this context.  However, in a forthcoming study, I show that even *ex post* the monetary penalties imposed by five antitrust jurisdictions amounted to no more than 60% of the cartels' illegal gains (Connor 2006).

[62] It also shows that the full force of U.S. law is quite capable of deterring purely domestic cartels.

optimal ratio of sanctions to illegal profits must be higher for large corporations than for proprietorships.

Second, the straightforward versions of optimal deterrence theory also assume that the managers or firms are risk-neutral. Similarly, a higher ratio will be required if managers are risk-loving 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 we would like to incorporate.

Third, this paper ignores all nonmonetary corporate antitrust sanctions. Other possible corporate sanctions not included in the model are restructuring, restitution, injunctive relief, legal defense costs, and reputational losses. Although omission of the factors could lead to overdeterrence if there are also fines and settlements, in practice these sanctions are either small or rarely imposed in the United States and are almost unheard of abroad. Thus, ignoring them has a negligible effect on this paper's analysis.

Fourth, the model ignores the expected sanctions that may be imposed on individual managers of cartels. Criminal punishments for executives include imprisonment and personal fines. Laws permitting individual convictions of price fixers are on the books of nearly a dozen jurisdictions, but enforcement of these laws remains spotty outside the United States.[63] From 1990 to 2004 the Sherman Act authorized maximum individual penalties of $350,000 and three years' imprisonment; in April 2004 the maximum penalties were raised to $10 million. Monetary fines imposed by the U.S. Government on executives convicted in international price-fixing cases have a median average of $50,000, which is negligible in comparison to the violators' incomes or assets. Among the international cartels that have involved U.S. fines during 1990-2003, the personal fines amounted to less than 1% of the corporate fines (Connor 2003). Moreover, non-U.S. companies regularly pay these fines for their employees.[64] Therefore, omitting *individual* monetary fines from the deterrence equation seems to be justified as a *de minimus* exclusion.

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[63] The EU has no power to sanction individuals. Imprisonment is possible in France, Norway, the UK, and Japan but has not occurred in modern times. Israeli courts have sent a few cartelists to jail, but none so far involved in international conspiracies. Canada convicted the ringleader of the international choline chloride cartel, but his prison sentence was served doing community service. However, Australia and Canada regularly fine cartel managers in amounts ranging from US$25,000 to $100,000.

[64] Unless they are fined or imprisoned, the fate of most cartelists is not known publicly. However, out of about 200 executives mentioned in the press as personally involved in international schemes, fewer than a dozen have been identified as fired or forced to resign. Perhaps many more have suffered blows to their careers. One might think that employers serious about their antitrust training programs would want to include such information in the reassuring press releases they put out when concluding a guilty plea or paying a civil fine.

That leaves U.S. imprisonment.[65] In repeated public pronouncements, DOJ officials have asserted that this particular sanction weighs more heavily in deterring cartels than the sum total of the corporate sanctions (e.g., Hammond 2001). While it is perilous to ignore the statements of experienced antitrust officials, these assertions seem to be of the nature of anecdotal evidence. Nevertheless, an ideal sanctions analysis would incorporate prison time by amplifying the corporate deterrence equation. The most satisfactory step may be to monetize executive prison time. Years ago Gallo (19XX?) placed a value of about $2 million per year on the opportunity cost of a year in prison. This estimate is woefully out of date today because the real earnings of cartel leaders have risen significantly. In one cartel case, the German CEO of the largest member of the cartel paid $10 million to avoid what would probably been 6 to 12 months in prison.[66] Trade-offs of this kind are the surest indicator of the opportunity cost of prison time.

A final issue that needs to be addressed is the practical implementation of the fine-setting standards just proposed. In particular, the legal-economic literature is split on whether to base fines on damages calculations or surrogates like affected jurisdictional sales. Economists tend to assume that reasonably defensible overcharge estimates can be calculated on a case-by-case basis (Wehmhöner 2005). In contrast, cartel fining guidelines for legal experts working for antitrust authorities or supervising judges tend to be designed in ways that avoid the necessity of estimating particular overcharges. Such guidelines incorporate surrogate indicators of damages that are at best crudely related to the degree of injury to buyers. A tailored approach to setting cartel fines would require greater prosecutorial resources[67] on each case than the present one-size-fits-all guidelines. Concentrating administrative resources on fewer allegations may well be justified by the reduction in cartel formations under an optimal-deterrence framework.

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[65] The United States is virtually the Global Jailor for Antitrust Criminals. Except for Israel, which has regularly imprisons price fixers, other jurisdictions seem content to make extradition of international cartel managers to the United States easier.

[66] It is not clear whether the fine was paid by the executive or his company.

[67] The DOJ's procedures are very efficient in terms of time and labor. While plea bargaining may require several days' commitment, the DOJ's announcements and sentencing memoranda are pithy, formulaic documents nearly devoid of anything other than the minimum necessary information about the cartel's offenses. At the other extreme are protracted treble-damages suits, which have historically rewarded plaintiffs' lawyers and their experts about 25% of the settlement amounts as contingency fees. In the 1990s this ratio fell to the 10% to 15% range for many of the bigger cases (Connor 2001: 504-507). In one celebrated case (*Fine Art Auctions*) plaintiffs' counsel won an auction conducted by the supervising judge that brought legal costs for the federal class down to 5% of the settlement. Perhaps the most analogous model for tailored enforcement practices is the European Commission's full decisions. These reports contain highly detailed renditions of the cartel's structure and conduct, as well as a legal analysis and fines computations. I would hazard that each report requires one to two person-years to produce.

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