GLOBAL CARTELS REDUX:

The Amino Acid Lysine Antitrust Litigation (1996)

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INTRODUCTION

In the evening of June 27, 1995, more than 70 FBI agents simultaneously raided the world headquarters of Archer-Daniels-Midland Company (ADM) in Decatur, Illinois and interviewed a number of ADM officers in their homes. Serving subpoenas authorized by a federal grand jury sitting in Chicago, the agents collected documents related to ADM's lysine, citric acid, and corn-sweeteners businesses. Within a day or two, investigators had also raided the offices of four other companies that manufactured or imported lysine. These subpoenaed documents, together with hundreds of secret tape recordings of the conspirators' meetings and conversations, built a strong case that five companies had been illegally colluding on lysine prices around the world for three years.

The FBI raids were widely reported in the mass media and unleashed a torrent of legal actions, some of which were still unresolved seven years later.[2] The three major federal antitrust actions were the result of an undercover investigation by the U.S. Department of Justice (DOJ) that had begun in November 1992 with the cooperation of the ADM lysine-division president. The first suit was a treble-damages class action settled in the summer of 1996. A few months later, the DOJ sought and obtained convictions for criminal price fixing by the five corporate lysine sellers. Although all the corporate members of the cartel pleaded guilty and paid historic fines, not all of the executives who managed the conspiracy were willing to plead guilty. Therefore, the DOJ prosecuted four lysine executives in a highly publicized jury trial held in Chicago in the summer of 1998; three of the four were found guilty and heavily sentenced.[3] The

[2] By the end of fiscal 1996 (June 30, 1996), ADM was a defendant in an antitrust suit or target of a government investigation in 79 cases, of which 21 related to lysine. In subsequent fiscal years, the number of active suits or investigations varied from 22 to 41 (ADM 2001). In 2002, ADM was appealing a lysine-conspiracy fine levied by the European Commission and faced three indirect-purchaser suits in lysine.

[3] The transcript and exhibits of *U.S. v. Michael D. Andreas et al*. are a major source of primary information on the lysine cartel (Tr.); exhibits from this trial are labeled Tr. Ex. In late 1999, three top ADM officers were sentenced to

five corporate conspirators were later investigated and fined by the antitrust authorities of Canada, Mexico, Brazil, and the European Union.

Within a year of the FBI raids, more than 40 civil antitrust suits were filed in federal district courts by direct buyers of lysine, each suit incorporating multiple plaintiffs. In early 1996, approximately 400 plaintiffs were certified as a single federal class, and the case called *Amino Acid Lysine Antitrust Litigation* was assigned to a judge of the U.S. District Court of Northern Illinois. In April 1996, the three largest defendants offered the class $45 million to settle the damages allegedly caused by their price fixing. Final approval of the settlement occurred in July 1996.[4] Additional follow-up suits include about 15 actions filed by farmers, consumers and other indirect buyers of lysine in the courts of six states and two Canadian provinces. ADM was further distracted by derivative shareholders' suits charging mismanagement by the company's managers and board of directors.

The three federal lysine cases were important for at least four reasons. First, it was the U.S. Government's first completely successful conviction of a global cartel in more than four decades.[5] Under the leadership of Attorney General Thurman Arnold, the DOJ had obtained convictions of scores of companies that had been members of international cartels that had operated between the two world wars. These suits had been initiated in the late 1940s and had wrapped up by around 1950. Prior to the 1996 lysine convictions, the Government had attempted to prosecute only three international cartels. In all three cases, the DOJ failed to prevail at trial either because essential evidence located abroad could not be subpoenaed or

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long prison terms; Andreas got a 36-month sentence, the maximum allowed by the Sherman Act (Kanne *et al*. 1999). One defendant, a managing director of Ajinomoto of Japan, remains a fugitive.

[4] The two other defendants settled for almost $5 million about a year later.

[5] Although the Federal Trade Commission successfully prosecuted one international cartel (*Mylan Laboratories* 1998), nearly all naked cartel cases are handled by the DOJ because of the latter agency's unique authority to bring criminal cases.

because juries would not convict U.S. businessmen on the testimony of their foreign co-conspirators.[6]

Second, the conviction of the lysine cartel was the first public manifestation of a sea-change in enforcement priorities by U.S. and overseas antitrust officials. Prior to 1995, less than 1 percent of the price-fixing indictments by the DOJ involved at least one non-U.S.-based corporation or non-U.S. resident. By contrast, beginning during 1998-2000 more than half of all criminal price-fixing indictments were brought against international conspirators (Connor 2001a: Figure 1.1). The investigation of the lysine cartel led directly to the discovery and successful prosecution of 30 multinational corporations that participated in global price fixing in the markets for lysine, citric acid, sodium gluconate, and ten bulk vitamins. Since 1996, more than a score of global cartels have been uncovered and prosecuted by the DOJ, the Competition Policy Directorate of the European Commission (DG-IV), and other antitrust agencies around the world. Cartel enforcement remains a high priority for the Antitrust Division of the DOJ, which is devoting 30 percent of its resources to criminal price-fixing prosecution.[7]

Third, the lysine-cartel case demonstrated the Government's intention to employ tough, "blue-collar" investigative techniques to what had been formerly been treated as a gentle, "white-collar" activity. In the three-year investigation that preceded the FBI's 1995 raid, the DOJ showed that it was prepared to use all the tools of its profession that it habitually employs in gathering evidence against drug cartels or their forms of organized crime, including seeking the cooperation of foreign police organizations. During guilty-plea negotiations with targeted cartel

[6] Prosecutions of the uranium cartel (1978) and industrial diamonds (1994) were hampered by the absence of witnesses and documents outside U.S. jurisdiction. The DOJ lost at trial when prosecuting one member of the thermal fax paper cartel in 1995. Finally, although the DOJ was victorious in a U.S.-Canada cartel that fixed the prices of plastic dinnerware (1996) that cartel was only tangentially international in scope.

[7] In Fiscal 2002, the Division plans on allocating 258 full-time equivalent positions (FTEs) to this activity (DOJ 2002). However, if one adds the resources of U.S. Attorney offices and the FBI, about 3000 FTEs are devoted to fighting cartels, at an annual cost of $440 million.

conspirators, prosecutors have made deft use of a wide range of possible sanctions to instill cooperation, including threatening crippling fines, imposing significant prison sentences, and barring convicted felons from entering U.S. territory.

Finally, the lysine cases and those that followed soon thereafter showed that the sanctions for criminal price-fixing had escalated enormously in the 1990s. Not only has Congress steadily raised the statutory fine for Sherman Act violations (up to $10 million for corporations), it also in 1994 made criminal antitrust violations felonies instead of misdemeanors. Combined with the U.S. Sentencing Guidelines first promulgated in 1987, corporate price fixers are now liable for criminal penalties as high as "double the harm" caused by a cartel. That is, corporations can be fined by the government up to twice the monopoly overcharge generated by a cartel, an amount that can easily exceed the $10-million statutory cap when market sales are large (Connor 2001a: 84-88). ADM, the leader of the lysine cartel, was fined $100 million for its role in two criminal price-fixing schemes – a record amount that was twice eclipsed in the late 1990s by leaders of highly injurious global cartels.[8] In fiscal years 1998-2001, the Antitrust Division collected more than $2 billion in fines for criminal price fixing, of which more than three-fourths was from members of international cartels (DOJ 2002). The EU's DG-IV, which operates on a somewhat delayed schedule, imposed record fines of 1.84 billion euros on hard-core cartels in 2001 alone; these fines are loosely based on the cartels' overcharges to customers in the European Economic Space. Both U.S. and EU authorities are empowered to base their fines on worldwide overcharges rather than their jurisdictional injuries, and the U.S. DOJ has done so at least twice.

U.S. Government fines are mere paper cuts compared to the financial wounds that may be inflicted by plaintiffs in civil actions. Direct buyers suing in federal courts, the principal focus of

[8] ADM was the second firm to be fined above the $10-million statutory cap, but the first to be widely reported by the business press and popular media. In 1999 Hoffmann-La Roche paid $500 million for its participation in six global cartels for bulk vitamins.

this chapter, are entitled to seek treble damages. In some cases, direct buyers abroad are permitted to seek treble damage in U.S. courts.[9] However, antitrust liability does not stop there. Nearly 20 states allow their residents who are *indirect* purchasers to sue in state courts, most of which permit treble damages. In addition, state attorneys general increasingly have banded together to pursue antitrust claims in federal courts (*parens patriae* suits) to recover treble damages for their state governments and for corporate and individual indirect buyers residing in their states. For example, in October 2000, the attorneys general of more than 40 states announced a settlement totaling $340 million to be paid by the six largest members of the vitamins cartels. Not counting the losses associated with derivative shareholders' suits, legal fees, and reputational effects, corporations accused of criminal price fixing now face maximum antitrust liabilities that range from *eight to twelve times* the cartel's U.S. overcharges.[10] The fines and prison terms meted out to cartel managers have also risen.[11]

The major role played by economic analysis in horizontal price-fixing cases is the calculation of the *overcharge* on buyers in markets affected by a cartel. The overcharge is the value of purchases of a cartelized product actually made minus what the sales would have been for the same volume of product absent the cartel. Accurate estimates of conspiracy-induced overcharges are important not only because of recovery of civil damages, but also because overcharges are the basis for the calculation of government fines. In criminal price-fixing cases that are prosecuted under the *per se* standard of proof, the U.S. Sentencing Guidelines in force require federal prosecutors to impose fines on corporations and individuals that are based on

[9] A decision of the U.S. Court of Appeals for the Second Circuit gives standing to buyers of art in London auction (Katzman *et al*. 2002).

[10] The lower estimate assumes that the DOJ bases its double-the-harm fine on U.S. affected sales only; the higher estimate uses global sales, which are typically three times domestic.

[11] One German CEO, the ringleader of the graphite-electrode cartel, paid a U.S. fine of $10 million to stay out of prison. In 2002, the chairman of an art-auction house was fined $7.5 million for price fixing (Markon 2002).

overcharge calculations. For corporations, unless prosecutors have evidence that the overcharge on sales was 10% or less, the fine for criminal price fixing is double the cartel's overcharge.[12] For individuals, base fines are either figured at 1% to 5% of the overcharge, or, under an alternative statute, fines up to $25 million are assessed from a sliding scale that also depends on the size of the overcharge. In summary, both corporate and personal penalties for price fixing are in principle closely related to cartel overcharges.

The primary purpose of this case study is to illustrate the computation of overcharges in a forensic setting with data drawn from the lysine cartel of 1992-1995. Most of the issues regarding calculation arose during preparations for the private federal class-action, *In re Amino Acid Lysine Antitrust Litigation* in the summer of 1996. However, as additional time and economic date became available, more refined estimates of the lysine-cartel overcharge became possible for the sentencing phase of the criminal case, *U.S. v. Michael D. Andreas et al*. All told, four of the five recognized forensic methods of overcharge calculations can be illustrated with the lysine case. This study also illustrates the deterrence effects of the current levels of financial sanctions for criminal price fixing.

ECONOMICS AND LAW OF CARTELS

A cartel is an association of two or more legally independent entities that explicitly agree to coordinate their prices or output for the purpose of increasing their collective profits. Some cartels are organized by state agencies or government-owned corporations; other cartels have been formed by multilateral treaties to attempt to smooth commodity price cycles. This chapter is concerned only with private business cartels that operate unprotected by the cloak of national sovereignty.

[12] If the 20%-of-sales criterion is used, the base fine is raised by a complex list of factors that yields a numerical culpability multiplier. The DOJ brings 90% of its price-fixing indictments as criminal matters.

Economics views cartels as a special type of oligopoly, an extra-legal joint venture of businesses that are normally rivals in the same industry. The mission of a cartel is to increase the joint profits of its members to a level as close to that that a monopolist would earn as possible; the strategy of a cartel is to implement one or more the "restrictive business practices" popularly known as price fixing. Cartels almost always agree to raise their list prices, to lower total production, or both; they may also reinforce this basic decision by fixing market shares for each member, allocate specific customers, impose uniform selling conditions, share sales information, monitor price agreements, pool and redistribute profits, adopt a method for punishing deviants, and hide or destroy evidence of their activities. The time and management resources required to negotiate the formation of a cartel and to carry out the agreements can be substantial.

Economic models of cartels emphasize the necessity of high concentration and of product homogeneity in an industry (Stigler 1964, Dick 1998, Connor 2001a). Without small numbers of member-sellers and reasonably standardized products, the transactions costs of forming and maintaining a group consensus would become too high relative to the anticipated increase in profits. Moreover, because there is always a profit incentive for cartel members to cheat on the cartel's agreement (i.e., to sell more or at a lower price than that agreed upon), only small numbers and homogeneity will keep the information costs of detecting cheating within acceptable bounds. Other conditions believed to facilitate the formation or successful operation of cartels include large numbers of buyers, a small amount of noncartel production capacity, equality of production costs across firms, and relatively stable or predictable demand conditions. High barriers to entry into the industry will facilitate the formation and longevity of cartel agreements.

Section 1 of the 1890 Sherman Act deems cartels *per se* illegal. That is, an explicit agreement to fix prices is a "conspiracy in restraint of trade," irrespective of the agreement's actual impacts on market prices or output. Outside the United States, the competition laws of most industrialized nations judge the illegality of a cartel under the rule of reason. In practice, however, non-U.S. competition-law agencies routinely prosecute all naked cartels that they discover. In the EU rare exceptions are made for cartels with significant benefits for consumers from technological innovation. Many countries, the United States included, permit registered export cartels to operate.

Strict enforcement of laws against overt price fixing is a public policy widely supported by economists and legal scholars of all stripes. They may differ as to the causes giving rise to collusive behavior and as to the likelihood of long-term success, but they are unified in their evaluation of the negative economic effects of cartels. Effective cartels cause unrecoverable losses in production and consumption, transfer income from customers to the stakeholders of cartel members, and often engage in wasteful rent-seeking expenditures (Posner 2001, Ch. 1).

INDUSTRY BACKGROUND

Lysine is an essential amino acid, a building block for proteins that speed the development of muscle tissue in humans and animals. Food derived from animal and marine sources normally provides humans with sufficient lysine to ensure healthy muscle development. Certain vegetables, soybeans in particular, are also good sources of amino acids; expensive pharmaceutical-grade or "natural" lysine is chemically extracted from vegetable matter.

In 1956, scientists in Japan discovered that amino acids can be produced as a byproduct of bacterial fermentation (Connor 1999). By 1960, two Japanese companies, Ajinomoto and Kyowa Hakko, were selling commercial quantities of lysine utilizing these new biotechnologies.

From the beginning, lysine was produced by fermentation at a far lower cost than chemically extracted lysine; continuing improvements in production technologies have brought the cost of so-called synthetic lysine down to less than one-fifth that of pharmaceutical lysine. The lower prices of lysine in turn made it cost-effective to incorporate manufactured lysine into animal feeds. Today, well over 90% of the world's lysine supply is made by biotechnology and is used as a supplement in animal feeds, principally swine, poultry, and aquaculture.

Evolution of the Industry

At prices generally around $1 to $2 per pound, worldwide demand for lysine by animal-feed manufacturers soared from nothing in 1960 to almost 70 million pounds in 1980. In the 1980s, global consumption of lysine grew by 16% per year; in the 1990s, volume growth was still a heady 12% annually (Connor 2001a: Ch. 7). In the early 1990s, approximately two-thirds of the demand for lysine originated in North America and Western Europe, areas with the highest levels of meat consumption and with consumers most willing to pay for lean meats.

The Japanese duopoly initially satisfied global demand by exporting from its two domestic plants. Ajinomoto made the first move abroad by building a large plant in France in 1974. Kyowa Hakko opened its first overseas lysine plant in Mexico in 1980 and its second in Missouri in 1984. Ajinomoto, which had about twice the capacity of Kyowa Hakko, responded by opening its own U.S. lysine plant in Iowa in 1986. After they were up and running, the Japanese firms implemented significant capital expansions to their plants outside Japan every two or three years.

Lysine was a Japanese duopoly until 1980, when the South Korean conglomerate Sewon opened a new plant in its home country. Sewon never expanded through direct investment abroad, instead relentlessly expanding its sole plant and exporting most of its output to Asia and

Europe. Sewon reached its goal of achieving a 20% world market share by the late 1990s, but at the cost of massive borrowing.

Because feed-grade lysine is a homogenous product, the lysine oligopoly was able to collude successfully at least three times prior to 1992 (Connor 2001a:167-169). They fixed prices in Japan in the 1970s (Tr. 908-909) and 1980s (Tr. 1670-1894) and in Europe in the 1980s (Tr. 2197-2522). From 1986 to 1990, Ajinomoto and Kyowa Hakko fixed prices and divided the U.S. lysine market 55-45% (Tr. 1670-1894). The U.S. price of lysine at times reached just over $3 per pound in the late 1980s. In brief, when the lysine biotech industry consisted of two or three Asian producers, collusive behavior was more often the norm than uncooperative or classic competitive behavior.

Entry in the 1990s

Patents on high-yielding microbes and technological secrecy largely prevented new firms from enjoying the high growth and large profits being made in the lysine industry. Leading French and German biotechnology firms attempted to form lysine joint ventures in the 1970s and 1980s, but were thwarted from doing so (Connor 2001a, pp. 169-170). With two exceptions, only very small scale entry occurred in the 1990s (*ibid.*, pp. 176-178).

In early 1991, two newcomers turned the lysine industry into a five-firm oligopoly. ADM, according to a plan finalized in late 1989, opened the world's largest lysine-manufacturing plant at its headquarters in Decatur, Illinois in February 1991. Within 18 months, ADM's plant had expanded global production capacity by 25% above year-end 1990 levels; by 1993, ADM's single plant accounted for one-third of global capacity (780 million pounds). ADM's strategic objective was to acquire a global market share equal to the industry leader, Ajinomoto. Ruthless price cutting by ADM and the sudden appearance of large excess capacity

caused lysine prices to plunge 45% in the first 18 months of the Decatur plant's operation. Global oversupply was exacerbated by the simultaneous opening of a smaller plant in Indonesia controlled by the South Korean food firm Cheil Sugar Co. ADM's aggressive entry into the lysine industry was the precipitating event in the formation of a new lysine cartel in 1992.

Cartel Behavior 1992-1995[13]

Ajinomoto, Kyowa Hakko, and Sewon began meeting as early as April 1990 to try to forge a plan to cope with ADM's entry, but they were fatalistic about ADM's impending success. After ADM entered production, the Asian manufacturers repeatedly signaled their willingness to raise lysine prices, but ADM appeared to be steadfast in its drive toward sharing global dominance. By mid-1992, ADM had captured an impressive 80% of U.S. sales, and it was exporting more than half its production. Ajinomoto and Kyowa experienced large operating losses in late 1991 and early 1992. In June 1992, the U.S. transaction price reached $0.68 per pound, which was $0.10 per pound below the long-run marginal cost of ADM (see discussion of costs below).

By early 1992, the Asian incumbents were considering asking ADM to join them in a more cooperative arrangement. It must have seemed something of a godsend when in April 1992 the President of ADM's lysine division showed up in Tokyo with another more senior ADM officer to propose the formation of a lysine "trade association."[14] Under the cover of establishing such a trade group, Ajinomoto, Kyowa, and ADM officers met in Mexico City in June 1992. This was the first of 25 multiparty price-fixing meetings among the five corporations that joined the cartel; dozens of supplementary bilateral meetings by regional sales managers and hundreds of telephone calls cemented agreements on prices in as many as 13 countries or regions. The

[13] Details may be found in Connor (2001a ,Ch. 8) and Appendix A of Connor (2000). Many of these facts were corroborated by testimony or exhibits from the 1998 criminal trial (Tr.). For popular accounts of the cartel, see Eichenwald (2000) and Lieber (2000). The final legal decision is Kanne *et al*. (2000).

[14] A year or two later, the International Amino Acids Manufacturers' Association was formed and recognized as a "working party" of the Agriculture Directorate of the European Commission.

price agreements covered only dry feed-grade lysine.[15] In early 1993, a brief price war broke out among the conspirators, mainly because of ADM's insistence that the participants had to agree to global market shares. After a top-level meeting in October 1993 resolved the issue, the cartel displayed a high level of harmony and consensus. Cheating was restrained in part by largely accurate monthly reporting of each company's lysine sales volume to all the members of the cartel.

The lysine cartel ended with the FBI raid on cartel offices in June 1995, almost exactly three years after the first price-fixing meeting had occurred. During that time, the average U.S. transaction price of lysine (manufacturers' delivered price) rose from $0.68 per pound when the cartel began operating to a plateau of $0.98 (October-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 (Figure 1). Prices in the European Union closely tracked those in the United States, albeit at a level $0.10 to $0.25 higher.[16] Target prices were also higher than the U.S. target price in Latin America, Japan, Oceania, and most parts of Asia (Connor 2001a, p. 238). However, in the rest of this chapter, only U.S. prices will be analyzed.

The Costs of Collusion

As mentioned above, there is considerable sentiment among some economists that the costs of forming and maintaining a collusive contract are so high that the incidence of cartels is low and

[15] In the U.S. market ADM sold a somewhat diluted aqueous version delivered in tanker trucks to nearby customers. On an active-ingredient basis, liquid lysine was less expensive but highly correlated in price movements to the powder form. Liquid lysine accounted for well under 5 percent of the U.S. market.

[16] The correlation in prices is even higher when one compares the U.S. price in dollars to the EU price in Deutschmarks. That is, that U.S. $/DM exchange rate, which is rather unpredictable, introduced more variability into the European price because the conspirators used the dollar to fix prices quarterly.

their lives fleeting.[17] The history of the lysine cartel and related global cartels prosecuted in the late 1990s does not support this sanguine view.

Internal memorandums and extensive trial testimony by cartel participants confirm that the conspirators reasonably anticipated that the rewards from price fixing would far outweigh the costs of operating the cartel (Connor 2001a, Ch. 8). At a key meeting in late 1992, a top ADM official expressed the expectation that their recently concluded agreement would generate $200 million in joint profits in a global market for lysine that varied from $500 to $700 million in annual sales. His prediction, from ADM's perspective, was spot on; ADM would earn just about $200 million in profits from the cartel over three years with its one-third share of sales in the worldwide lysine market. Direct management costs of operating the cartel were modest. During the four years of preliminary negotiations and actual cartel operation, each of the four (later five) companies sent two men to meetings held on average once every three months. Late in the conspiracy, regional sales managers became involved, but the total number of conspirators never exceeded 40 (Connor 2000, App. A). Counting the monthly production reports submitted by each firm and other communications, it appears that each corporate member of the cartel managed the conspiracy with an input of 15 to 25 man-days per year. Total labor costs for all corporate conspirators could not have exceeded $1 million for the entire conspiracy period.

It is certainly true that the cartel members squabbled frequently and that the two smallest members, both South Korean companies, were strongly inclined to cheat on the price and market-share agreements. Infighting led to one sharp price war for a few months in 1993, the

[17] An accessible treatment of the inherent instability of cartel agreements may be found in Posner (2001, pp. 60-69). Among the obstacles to agreement are an own-price elasticity of demand that is too high at the competitive price, uneven costs of production among potential cartel members, product heterogeneity, a steeply rising marginal cost curve, a large fringe of suppliers that will not join the cartel, lower costs of production by the fringe producers, and the difficulty of apportioning reductions in output among the cartelists. After the cartel is formed each member has an incentive to cheat by either cutting price or offering an improved product; cheating is difficult to detect; and virtually the only way to punish deviants is through expensive, self-destructive trigger mechanisms such as price wars. Many newer textbooks in industrial economics (e.g., Martin 2002) practically ignore cartels.

second year of the conspiracy. However, a number of techniques adopted by the cartel and the impressive diplomatic skills of the cartel's dual leaders, ADM and Ajinomoto, kept the effects of cheating to tolerable levels.

Among the most important practices that cemented cartel harmony was the tonnage quotas agreed upon in late 1993. Combined with accurate monthly sales reports and politic concessions of additional quotas to the two Korean firms, the market-share agreements would be honored with impressive precision throughout 1994 and 1995. The formation of an amino acid trade association under European Commission sponsorship provided excellent cover for the group's illegal meetings in Europe and elsewhere. A compensation system was adopted to punish members that exceeded their quotas, but it was never necessary to implement the scheme. ADM, with its new efficient plant and ample excess capacity, frequently reminded the cartel of its willingness to flood the market with lysine; its threats were credible because it had twice driven the world price of lysine to below its own average total cost of production, inflicting the others with operating losses. Moreover, ADM had taken the rare step of inviting its rivals in the lysine market to an intimate tour of its capacious production facilities. Finally, it should be recalled that for the three largest Asian companies in the 1992-1995 cartel, they had had a great deal of experience in organizing price-fixing schemes for two decades. ADM too, it is now known, was a serial price fixer.[18]

MEASURING THE OVERCHARGE

The monopoly overcharge is the difference between what a buyer has paid for a cartelized product and what a buyer would have paid absent the cartel. Under the U.S. antitrust laws, a successful plaintiff is entitled to treble the dollar overcharge, which is then multiplied by the

[18] ADM conspired to fix prices in the markets for sodium gluconate and citric acid; highly possible cases include corn sweeteners, monosodium gluconate, methionine, other nucleotides, carbon dioxide gas, and wine alcohol.

number of units purchased.[19] Information on actual transaction prices and quantities sold is usually readily available from the parties in such cases, but the unobserved "but-for" price must be inferred using economic reasoning.[20] Enter the economists.

Methods of Calculation

There are five generally recognized methods of calculating an overcharge (Page 1996, Hovenkamp 1998). Proving an antitrust injury requires the preponderance of the evidence in the case, but the amount of damages is decided according to a lower standard, that of reasonableness. Each of the five methods of computation probably meets the legal standard of reasonableness.

The *yardstick* approach involves the identification of a market similar to the one in which prices were fixed but where prices were unaffected by the conspiracy. A yardstick market should have cost structures and demand characteristics highly comparable to the cartelized market, yet lie outside the orbit of the cartel's influence. Typically, the yardstick method is applied to cases of geographically localized price fixing. Because the lysine cartel was global in scope, the yardstick method could not be applied.

There are four feasible methods of estimating the lysine cartel's overcharge in the U.S. market. Two of them, the before-and-after method and the oligopoly-model method, were employed by economists acting as experts for the two sides in the civil treble-damages suit. Opinions and rebuttals were exchanged during May-July 1996 prior to a fairness hearing for the federal class of plaintiffs and after the defendants provided monthly prices for 1991-1995. Two other methods of analysis, one using costs of production and the other a time-series econometric

[19] Equivalently, one may compute the *percentage* increase in price for each time period during the conspiracy, and then multiply these percentages by the *value* purchased in each period.

[20] Single damages under the law in most court circuits are precisely equivalent to the income transfer due to the exercise of market power. Single damages are slightly higher than the stream of monopoly profits accruing to the cartel members, because operating the cartel requires the expenditure of some management resources. In some circuits, the dead-weight loss may be permitted as an additional source of damages (Page 1996). Some legal theorists argue that a buyer's lost profits is a conceptually superior measure of damages (Hovenkamp 1998, p. 658).

market model, were carried out in 1999 with the benefit of data from exhibits filed in the Chicago criminal trial.

The Before-and-After Method

This method has been used to calculate antitrust damages in U.S. civil cases since at least the 1920s (Hovenkamp 1998, p. 661), and it was one of the methods used in the treble-damages lysine case. "Before-and-after" is something of a misnomer because the "before" period is really any nonconspiracy period -- whether before, after, or during an intermediate pause in price-fixing. It is important that the "before" period be one that is quite comparable to the conspiracy period with respect to demand and supply conditions. Shifts in buyer preferences, appearance or the disappearance of substitutes, or changes in the cost of production of the cartelized product during the affected period can cause overstatement or understatement of the overcharge.

A precartel price is often presumed in legal settings to be the competitive price. "Cartel members . . . enjoy no presumption that they already had market power before the illegal act was committed" (Hovenkamp 1998, p. 660). However, even if a precartel period was arguably one of oligopolistic pricing conduct, the precartel price is still a reasonable benchmark so long as the determinants of pricing conduct did not change when the cartel was formed. That is, the before-and-after method is free of assumptions about the nature of the industry's noncartel competitive behavior. Prices during the postcartel period or during an intracartel price war might also serve as reasonable benchmarks. However, postcartel benchmarks may be affected by learning during the conspiracy; that is, when a cartel is formed in a competitive industry, its members may learn how to price tacitly after the cartel breaks up. If true, the overcharge would be understated. If prices fall to short-run marginal cost levels during a price war, the overcharge may be overstated.

In April 1996 ADM, Ajinomoto, and Kyowa offered the federal class of lysine direct purchasers (about 400 companies) $45 million to settle the suit. This offer came at a time when the DOJ's criminal investigation appeared stalled. Indeed, a rather unusual feature of the civil suit is that the settlement offer was made *four months before* the government obtained the first of its guilty pleas. Normally, treble-damages suits are follow-on actions that are settled out of court or go to trial well after guilty pleas are made in a government case, pleas that are by law *prima facie* evidence in following civil actions. Moreover, civil plaintiffs can benefit from facts admitted in the pleas (e.g., conspiracy dates) or even the more extensive information gathered from a closed grand-jury investigation. In this case, plaintiffs were provided with two slim bits of information: average U.S. monthly selling prices of lysine for the years 1990-1995 and annual sales of the four largest sellers (Cheil Sugar did not participate). From public sources the only other potentially useful data were list prices of lysine, international trade in lysine (value and volume), and U.S. prices for corn and soybeans. Corn prices drove most of the variability in the cost of manufacturing dextrose, the principal feedstock and largest input for making lysine.[21]

The decision faced by the judge in July 1996 was whether the $45-million proposed settlement was fair and reasonable (Connor 2001a, pp. 451-54). The proposed settlement had been hammered out behind the scenes in about three months by the lead class counsel and the law firms representing the lysine makers. In the interests of expediency, the judge had awarded the role of lead class counsel on the basis of a fixed-fee auction that provided the class counsel with ". . . little incentive to maximize the recovery for the class" (Coffee 1998, p. B6).[22] Many of the larger lysine plaintiffs were dismayed at the small size of the award and what they

[21] Dextrose was the foundation for fermentation in Ajinomoto's and ADM's U.S. plants; Kyowa Hakko's Missouri plant used sucrose. Dextrose accounted for 38% of variable costs of manufacturing lysine in ADM's plant and 32% of total manufacturing costs (Connor 2001a, p. 257).

[22] The fee was capped at $3.5 million for any settlements above $25 million. The firm hired no economists to analyze the overcharge issue. The legal fees, at 7% of the settlement, were very low by historical standards.

perceived to be unassertive legal representation. They had to weigh two options: (1) stay in the class and take a riskless 3 cents on the dollar or (2) opt out of the class and face the uncertainty of either a higher settlement or nothing at all. Naturally, it was in the interests of the potential opt-outs to persuade the judge to reject the proposed settlement.

The main issues with respect to calculating the overcharge were the length of the time period of the affected period and the but-for price. It is conventional to use the conspiracy period for the affected sales period, but recall that the defendants had not yet agreed to plead guilty. Consequently, the opt-out plaintiffs had to depend on press reports that the conspirators had first met in June 1992 and had continued colluding until the FBI raid in June 1995. Because there appeared to be lags between the time the cartel set a list price and the time the transaction price fully responded, August 1992-December 1995 was chosen to be the affected sales period.[23]

The hypothetical nonconspiracy benchmark price was the most contentious judgement that had to be made. Given the paucity of price observations (only 71 months), three periods seemed to be the leading candidates: (1) average prices prior to August 1992; (2) a nadir in prices in mid-1993 caused by a disciplinary price war; and (3) prices after June 1995. Ideally, but-for prices should be long-run equilibrium prices, averaged over fairly long periods, perhaps one to three years. However, prices from the February 1991-July 1992 period were affected by an earlier lysine cartel as well as ADM's massive entry. Not only was market structure shifting, but also costs were changing because of ADM's learning-by-doing. ADM's new plant suffered a number of contamination incidents during its first year, but very few thereafter. That is, most of the early precartel period appeared to be in disequilibrium.

[23] Lags were created by 30- to 45-day price protection clauses in most sales contracts, by delivery chains (particularly overseas deliveries), and information lags. In fact, the observed lags were mostly between 2 to 4 months except for minimal spot sales. The lags appeared to be asymmetric: longer when prices were declining and shorter when responding to upward changes in list prices by the sellers.

Like the summer of 1992, the summer of 1993 also seemed to be a return to a regime that exhibited highly competitive pricing conduct; journalistic sources, later confirmed by memoranda of the cartel's meetings around this time, reveal that bickering among cartel members resulted in a return to aggressive pricing behavior (Connor 2001a, p. 224-229). When they later became available, ADM's production records would show a surge in output in early 1993 that probably triggered the crash in lysine prices (Tr. Ex. 60-67). In consideration of these factors, the opt-out plaintiffs chose May-June 1992 and April-July 1993 as the but-for periods. Perhaps accidentally, prices averaged $0.70 per pound in both periods.

However, the third candidate period did not appear to be useful for competitive benchmarking. First, only six data points were available for the post-cartel period, and the effects of cartel behavior might well lag for several months after the cartel was exposed. Second, the shadow price of lysine had forced the cartel to drop its prices in early 1995, but then, just after the FBI raid, it climbed precipitously for the rest of 1995.[24] One might hazard that the former cartel members had learned how to tacitly collude by following movements in the shadow price, because other demand and supply factors did not seem to explain the late-1995 rise in prices.

ADM's main line of defense was to criticize the simple before-and-after analysis (White 1996, 2001). The major flaws in the plaintiffs' method were alleged to be: (1) the benchmark price would have been generated by noncooperative oligopolistic behavior rather than purely competitive conduct; (2) the price increases observed after the summers of 1992 and 1993 could have been seasonal rather than conspiratorial; and (3) the affected period chosen by the

[24] The shadow price of lysine was governed by a technical rule-of-thumb followed by the animal-feed industry. Three pounds of lysine and 97 pounds of corn were nutritionally equivalent to 100 pounds of soybean meal. Thus, when the price of the complementary corn rose and the price of the substitute, soymeal, fell far enough, feed manufacturers could stop buying manufactured lysine (Connor 2001a, pp.210-211).

plaintiffs' expert was too long. As a matter of legal strategy, it is worth noting that because the lysine defendants had not yet admitted guilt, their experts would not be expected to present alternative overcharge estimates to the judge. Thus, demonstrating weaknesses in the plaintiffs' case was virtually the only option available to obtain a fairness ruling favorable to the defendants.

All three of these criticisms are logical possibilities. All of the economists working on the case agreed that the U.S. (and indeed global) lysine industry was a classic oligopoly. Sales concentration was high (Herfindahl index above 3,000), buyer concentration was low, the product is perfectly homogenous, and several barriers to entry were present. "In sum, the lysine industry had virtually all the characteristics of an industry in which *implicit* oligopolistic coordination of some kind would likely have arisen in the absence of the *explicit* conspiracy" (White 2001, p. 28). If true, the but-for equilibrium price would, according to most oligopoly theories, be above the competitive price, and the overcharge significantly lower.

However, a few features of lysine industry may have prevented the sellers from forming an oligopolistic consensus. Chief among them is the fact that two of the five sellers (ADM and Cheil) were brand new to the industry; in other words, the major players did not have a sufficiently long history of strategic interaction to form *conjectures* likely to yield a stable implicit agreement. Prior to its entry into the lysine industry, ADM had no overlapping markets with any of the three incumbents (Connor 2000, app. E). Moreover, we now know that the principal form of oligopolistic conduct among the incumbents prior to the 1992-1995 cartel was explicit price fixing. Finally, internal contemporaneous documents show that ADM fully intended to put at least one of the incumbents out of business in order to achieve its announced goal of market-share parity with Ajinomoto (Connor 2001a, Ch. 8). Predatory conduct by ADM,

most likely to be effective in the U.S. market, could have driven the but-for price down to and even below the long run competitive price in 1992 and 1993. Had the Asian manufacturers not agreed to join an ADM-dominated cartel, ADM might well have continued predatory pricing well beyond June 1992.

Seasonality of demand for lysine was well recognized by the managers of the cartel (Connor 2001a, pp. 211-212). It arises from swine feeding practices of producers in the temperate zones. With less than six full years of price data for lysine and no price series for comparable feed ingredients, it is difficult to be precise about how strong seasonal effects are.[25] Taking the simple average of prices at the seasonal peak to prices at the seasonal trough (about 14 percent) would cause the calculated overcharge to decline by 10% from an estimate that ignores seasonality (Connor 2001a, p. 269).

In most forensic settings, the affected period and conspiracy period are treated as identical. Both sides acknowledged that changes in transaction prices lagged changes in posted prices, the latter being the conspirators' direct price-fixing tool. In a retrospective evaluation of the cartel, a defendant's expert contends that a 17-to-19-month period is the appropriate affected period (White 2001). He bases his position on the "unusual and suspicious" pattern of "uncharacteristic stability" in transaction prices from September or October 1993 to February or March 1995 (see Figure 1). The plaintiff's expert, on the other hand, continues to insist that information revealed by the Chicago trial provides additional support for a 42-month affected

[25] Seasonal effects are symmetric. The autumn run-up in lysine prices was followed by a spring decline, except in 1994 when the cartel was at its most effective. Because most lysine was consumed by farms in the Northern Hemisphere, peak demand in December-March was only slightly negated by the winters in the Southern Hemisphere.

period (Connor 2001b). Without the luxury of additional time for more formal analyses it is not possible to determine the affected period definitively.[26]

The Cournot Method

The defendants provided a second rebuttal to the plaintiffs' before-and-after analysis. They asserted that a noncooperative form of collusion was more probable than perfect competition had the cartel not operated (Warren-Boulton 1996). Further, the defendants specified the homogenous Cournot model as the most appropriate one, because of its long-standing acceptance and widespread analytical use economics. Over certain ranges of market conditions, that model predicted equilibrium prices that fell within the range of actual market prices observed during the cartel period. That is, the Cournot model implied that the cartel had been ineffective raising prices by *explicit* collusion above prices generated by *implicit* (and legal) pricing coordination. Thus, the overcharge was zero.

Predictions from specific oligopoly models require structural parameters. In particular, the Cournot formula for calculating the profit-maximizing price needs three pieces of market information: the Herfindahl index of concentration, the own-price elasticity of demand, and the marginal cost of production. About the first item there was no disagreement; the Herfindahl index for three domestic manufacturers and two importers during the conspiracy was about 3,500.[27] The other parameters were borrowed from the plaintiffs' own opinion, namely that

[26] White's after-the-fact speculations do offer an insight into why the defendants offered a settlement consistent with a $15-million overcharge. Taking the 19-month affected period and the average prices for one year prior to September 1993 ($1.10 per pound) results in almost exactly a $15-million overcharge (Connor 2001b:269). Again recall that the defendants' legal strategy may have discouraged them from presenting even minimal overcharge calculations because that would have been tantamount to an admission of guilt.

[27] Implicitly this assumes that a global cartel was viewing the U.S. market as geographically distinct from others. Internal records of the cartel's pricing decisions and its efforts to prevent geographic arbitrage tend to support this view. Global concentration was about 2,500 in 1994 (Connor 2001a, tbl. 8.A.3).

document's assertion that $0.70 was the marginal cost (or close to it) and that the elasticity was around –0.5 to –1.0 during the cartel period.[28]

One problem with the Cournot model is that the formula can, under some assumptions, predict impossible prices. In layman's terms, the model can "blow up." For example, if the demand for lysine is highly inelastic (less than –0.35), then Cournot oligopolists would be predicted to set negative prices, no matter what the cost of production. Negative prices are rarely observed in natural markets, because prices generally must be set above the variable costs of production, and these costs are always nonnegative. Another problem with Cournot is that it is only one of many plausible oligopoly models; its popularity with economists rests more with its mathematical tractability than its consistency with the organization of natural markets. Given the lysine parameters just discussed, other equally plausible models such as price leadership by ADM produce equally untenable market price predictions. Moreover, the model that many economists would agree is the second most popular, the homogeneous Bertrand model, predicts *competitive* prices when there are two or more sellers. Finally, although possibly allowable as evidence in antitrust cases, the degree of econometric literacy required to comprehend formal oligopoly models greatly restricts their use in forensic settings.

The Cost-Based Approach

This method and econometric modeling (discussed below) were not available to the economic experts doing battle in the 1996 federal civil proceeding, but they do shed light on the accuracy of the before-and-after method. The disparity between the two sides was an order of magnitude. Plaintiffs considering opting out of the federal class had a $150-million overcharge calculation

[28] Connor (1996) opined that feeds were manufactured under fixed proportions, which implied poultry, swine, or meat elasticities of –0.10 to –0.50. These are retail-level elasticities calculated from precartel, more competitive periods; at the higher cartel-period prices, the elasticitiy will be higher in absolute value. This discussion took place in the context of his analysis of the dead-weight loss from cartel pricing.

before them, whereas the defendants' settlement offer of $45 million implicitly supposed a $15-million overcharge by the lysine cartel. Even were the plaintiffs to concede that seasonality was partially responsible for rising prices at the beginnings of the two phases of the conspiracy, their overcharge calculation would still have been about $140 million.

During the 1998 criminal trial of three ADM executives for lysine price fixing, prosecutors introduced the confidential production and sales records of ADM's lysine department as exhibits (Tr. Exhibits 60-67). These internal records provided ADM managers with monthly plant output and several costs (labor, energy, dextrose, other chemicals, overhead expenses, transportation, storage, and sales-office expenses) during the five years 1991-1995. Figure 2 plots these costs of manufacturing and distribution against monthly physical plant output using regression analysis.

The plot appears to show considerable "scale economies" for levels of output up to 10 or 11 million pounds. In fact, the diagram really captures strong learning-by-doing effects, because all of the observations below 11 million pounds are drawn from the pre-cartel period (February 1991-June 1992). Abundant testimony and the manufacturing records themselves support the fact that nearly all of the high-cost months were ones with "yield failures" due to contamination of fermentors.[29] As ADM learned how to sanitize its plant's fermentation reactors, contamination episodes ceased and the costs of spoiled-product disposals disappeared. To a minor extent, unit costs also declined with increasing levels of output because fixed costs were being spread over larger units of production.

The most important feature of the average-total-cost curve shown in Figure 2 is the portion above 10 or 11 million pounds per month. During the conspiracy, plant output always

[29] In every case when costs jumped above about $0.80 per pound, the lysine/dextrose yield ratio dropped below 30%. Such episodes became rare after June 1992 or when production was above 10 or 11 million pounds.

exceeded 10 million pounds. Statistically, this portion is completely flat. It is true that manufacturing costs were affected by short run changes in the price of dextrose, which in turn was closely related to the market price of corn. Nevertheless, total manufacturing costs hewed quite closely to the average of $0.63 per pound whenever production exceeded 10 million pounds. As plant output edged closer to the maximum 18-million-pounds level, unit fixed costs dropped a bit. However, the decline in fixed costs was nearly perfectly balanced by higher selling costs incurred as ADM shipped higher shares of its U.S. production to overseas destinations. Thus, after June 1992 (the likely cartel period), average total accounting costs of manufacturing and sales varied only within the $0.73 to $0.78 per pound range and were statistically unrelated to the quantity produced. Adding a fairly generous return on investment of 6% of sales brings the average total *economic* costs to $0.77 to $0.83 per pound of lysine.[30]

In competitively structured industries, profit-maximizing firms accept prices that are equal to their long run marginal costs. Because ADM's total costs were effectively constant during the cartel period, it follows that the but-for competitive price would have been just about $0.80 during the affected period. This observation is reinforced by the fact that ADM's costs of production were equal to or lower than all four of its rivals in the lysine industry (Connor 2001a, p. 217). At a but-for price of $0.80, the lysine overcharge for August 1992 - July 1995 becomes $78 million, or 17.0% of U.S. sales of dry lysine (Connor 2001a, p. 444).

Econometric Modeling

With sufficient time and access to detailed price and cost information, statistical modeling is often the preferred analytical approach of forensic economists in estimating antitrust damages (see, e.g., Slottje 1999). With a rigorous model that is shown to fit the market's actual

[30] This is generous because it is ADM's own rate of return during fiscal 1990-1995 when its profits were bloated by several commodity cartels (Connor 2000, app. A). It is also well above the average return earned by publicly traded companies in similar industries.

performance over time, the legal goal of isolating the effects of a defendants' illegal conduct from all other market forces would appear to be achievable. Econometrics seems ideally suited to identifying ". . . the only casual factor accounting for the difference between plaintiff's actual experience in the damage period and its but-for period. . ." (Page 1996, p. 36). Law journals and handbooks for lawyers in the antitrust field frequently include material on regression analysis for damages calculations (e.g., Fisher 1980, Page 1996, Hovenkamp 1999).

Morse and Hyde (2000) developed and tested an econometric model of the lysine industry using 1990-1995 monthly information. The main idea of this model is to incorporate a sufficiently detailed list of market demand and supply factors so that most competitive market forces are accounted for; then variables are added to the model to capture the influence of a suspected conspiracy period. They then test for and measure computed price differences that were (arguably) due to the conspiracy rather than to competitive market forces. For mathematical reasons, it is usually impossible to capture all of the factors that might affect market prices. As a result, modeling involves a degree of judgment about which factors have the highest priority for inclusion in the model; these decisions are informed by economic theory, knowledge about the industry, and data constraints. Initial testing of a model sometimes reveals statistical estimation problems that require the researcher to alter the regression equations.

Morse and Hyde (2000) managed to incorporate a fairly complete list of determinants of lysine demand: the number of hogs needed by U.S. slaughter houses, red meat and poultry export demand, the price of a complement and a substitute (the shadow price discussed above), and seasonality of lysine demand. On the supply side, an equation related ADM's U.S. production to the cost of three principal inputs: dextrose, other variable costs of manufacture, and capital. Both of these equations fitted the five years of data quite well, and the signs were the ones predicted

by economic reasoning. Finally, an innovative feature of the model is an equation that permits the researcher to measure the degree of competitiveness ("conjectural variations") between ADM and its four rivals. Unlike the cost-based method, this modeling approach makes no assumptions regarding the intensity of competition before, during, or after the conspiracy.

In brief, results of testing the econometric model show that during the year and one-half prior to the cartel's formation, ADM behaved in a highly (if not perfectly) competitive fashion relative to its rivals. While falling short of pure monopoly, ADM's conduct was calculated to have become distinctly more monopolistic after July 1992. Using the parameters that measure the degrees of market power, Morse and Hyde find that the lysine cartel's overcharge was $71 million.

CONCLUSION

One of the hallmarks of a rigorous scientific discipline is the ability to measure parameters of interest with precision. From this perspective, the highly variable estimates of the lysine cartel's U.S. overcharges could be interpreted as reflecting badly on empirical economics. After all, the overcharge estimates presented in this paper did vary by as much as ten-to-one as of the summer of 1996 when the first suit was being resolved. Plaintiffs in the class action had only a few weeks to decide whether to remain in the class and take a guaranteed immediate share of the $45-million settlement offer or to opt out of the class and take a chance on either a larger settlement many months in the future or possibly no compensation at all. A more sanguine view of the damages estimates presented above is that of a progressive movement toward greater precision, a movement made possible by additional information and the time to apply more complex analytical methods. If this later view has more validity, then it implies that lysine

buyers in the federal class were seriously disadvantaged when faced with the decision to accept or reject the proffered settlement.

In July 1996, the trial judge approved the $45-million offer as fair and reasonable. His decision seems to have been made for reasons unrelated to the economic evidence presented. Rather, he seemed most persuaded by the testimony of class counsel that this was a hard-fought deal that was unlikely to be improved. About 33 of 400 direct buyers in the class begged to differ by opting out of the settlement. Most of the opt outs were larger firms with the legal resources to continue hard negotiations with the defendants. Although settlement terms are confidential, reports in the press suggested that the opt-out firms, with the benefit of criminal guilty pleas by the lysine cartel members, got at least double the amount per dollar of purchases than did the smaller buyers in the class (Connor 2001a, pp. 452-453). This trend – opt-outs becoming a larger share of the buyers and obtaining better settlements – continued in subsequent cartel settlements throughout the late 1990s (*ibid*., pp. 458-472).

With the benefit of hindsight and a great deal more information, it appears now that the first $150-million estimate by the plaintiffs was too high. Considering seasonality would have reduced the overcharge amount by about 10% or so. More importantly, the two periods selected to determine the but-for price were most likely unrepresentative predatory-type episodes that could not have been sustained for the entire three years of the cartel's operation. That is, ADM was punishing its future and actual cartel partners by unilaterally forcing prices down to the point where ADM was barely covering its variable costs.[31] Thus, the $0.70 but-for price was not enough to cover fixed costs and a normal return on investment. That is, in retrospect, a but-for

[31] Note that the lowest prices observed were $0.64 in July 1992 and $0.62 in June 1993. A cost-of-production analysis showed that ADM's average variable costs were $0.63, a result that is perfectly consistent with economic theory. That is, as a rule the lowest rational price a firm will accept or charge in the short run is the one that equals its variable economic costs of production.

price of $0.80 was closer to a long run competitive price, suggesting that the true U.S. overcharge was around $80 million.

The federal lysine class and the opt-outs from the class eventually collected approximately $70 million from the cartel members; indirect purchasers of lysine obtained an estimated $15 million in state courts where such buyers have standing to sue (Connor 2001a, tbl. 16.A.1). Thus, U.S. lysine buyers recovered as a group slightly more than single damages; net of legal fees, buyers recovered less than single damages (*ibid*., tbl. 18.1). The lysine buyers' settlements were comparable to the settlements in two similar cartel cases that followed on the heels of the lysine case (*ibid*., p. 474). Direct buyers of citric acid and vitamins recovered 90% and 135%, respectively, of U.S. overcharges. These results reinforce Lande's (1993) conclusion that civil price-fixing awards are typically less than actual damages, never mind treble damages.

The *ex ante* perception of antitrust liability is a critical determinant of deterrence. If would-be price fixers expect that their monopoly profits will exceed the financial costs of antitrust fines and civil settlements, it is rational for them to form a cartel. In the Introduction above, it was noted that the potential antitrust liability in the United States is presently in the range of eight to 12 times the U.S. overcharges, and overcharges are only slightly larger than the monopoly profits from collusion. One might argue that the best conjectures a company could have made about antitrust liability during 1988-1992, the period during which the recent crop of global cartels were established, were much lower because of the changing legal landscape during the latter part of the 1990s. However, this is at best only a partial explanation for the spate of global cartels unmasked and punished after the lysine actions in 1996. In evaluating the deterrence capabilities of current antitrust sanctions, one must also consider three additional factors: the probability of an operating cartel being detected and prosecuted, actual rather than

maximum antitrust penalties, and the geographic location of the monopoly profits generated by a cartel.

Limited evidence from the United States and Europe suggests that the probability that an established illegal cartel will be caught is somewhere between 10% and 20% (Connor 2001a, p. 79). Outside of North America and Western Europe the chances are negligible. Evidence from the three best-documented cartel cases of the late 1990s shows that U.S. criminal and civil penalties approached but never exceeded double the U.S. overcharges. In the EU, these same cartels were made to pay fines about equal to single damages; the prospect of costly civil suits in Europe is dim. In Asia, cartel fines are small or nonexistent. A striking feature of most global cartels discovered since 1996 is that their sales and profits were distributed almost equally across North America, Western Europe, and the rest of the world. Taking into account each of these three general features of modern cartels and contemporary anticartel enforcement practices, it logically follows that global-cartel deterrence requires actual monetary sanctions to exceed *five to ten times* worldwide overcharges, where the exact multiplier depends inversely on the probability of discovery. Treble damages will not deter global cartels.

The rationale of deterrence can be illustrated with financial information about ADM, the most heavily fined of the lysine conspirators. ADM's monopoly profits from fixing the U.S. price of lysine for three years were about $80 million. ADM paid a $70-million fine to the federal government, about $49 million to direct buyers of lysine, and $15 million to indirect buyers in state court cases (Connor 2001a, tbl. 19.4). Not counting legal fees and other intangible costs, ADM's *ex post* costs of collusion somewhat exceeded its U.S. revenues from collusion. On the other hand, ADM garnered approximately $100 million from its non-U.S. sales of cartelized lysine. The EU's $45-million lysine fine, Canada's $8-million judgment, and

a few other minor actions abroad left ADM with a positive return of $25 to $35 million on its non-U.S. price fixing. Crime did not pay for ADM in the United States, but it did pay abroad. For its four co-conspirators, the lysine cartel was very likely a profitable venture.

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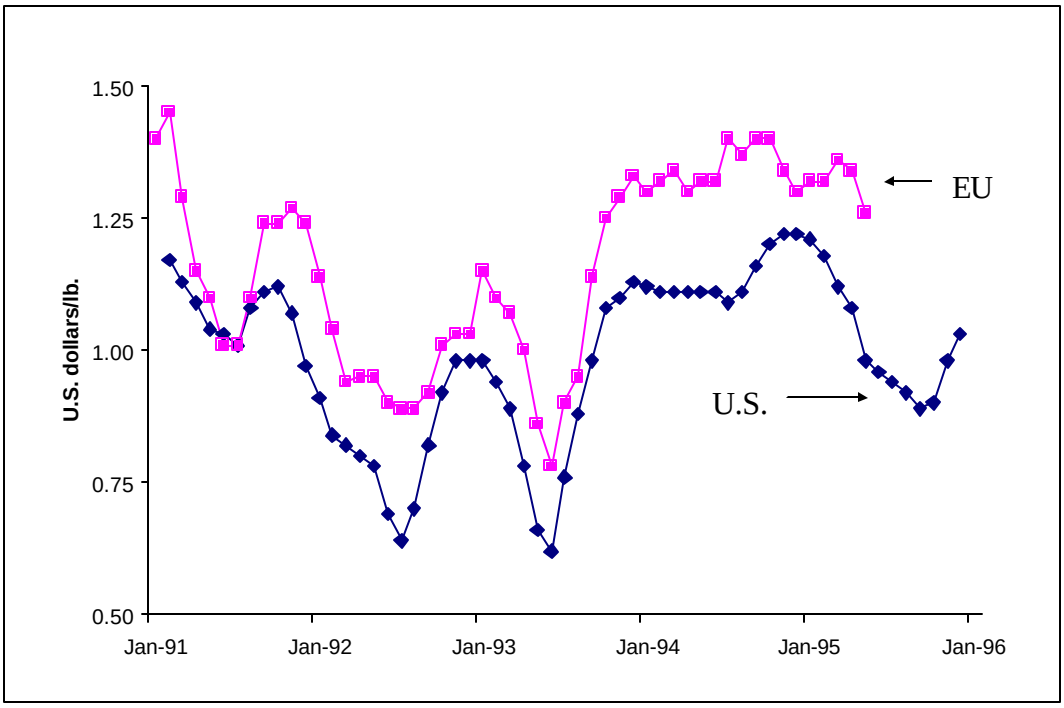
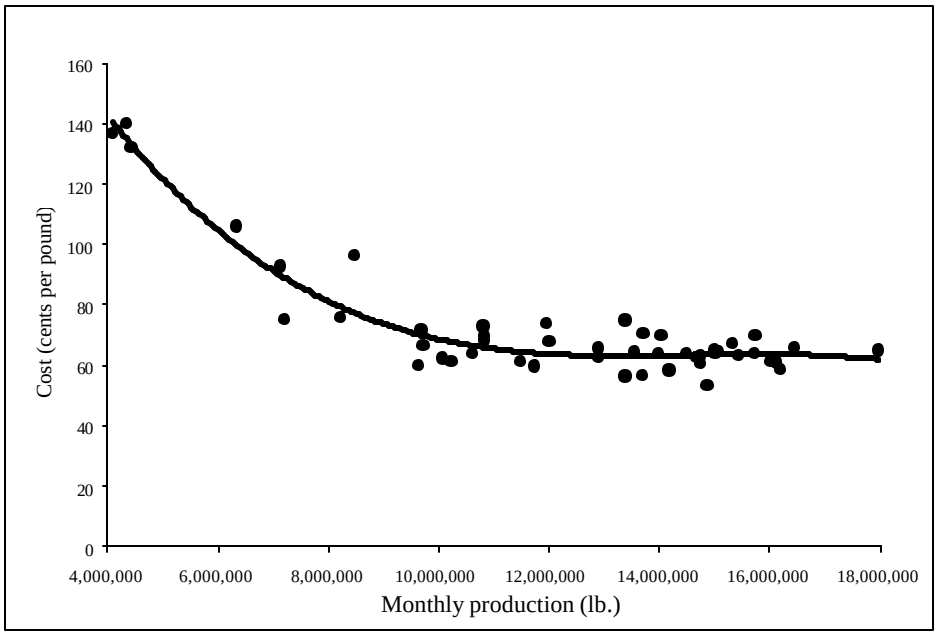
Figure 1. Lysine Transaction Prices, U.S. and EU Markets, 1991-1996.



Note: U.S. prices from sales by the four largest manufacturers (see Appendix A of Connor (2000) for details). EU prices from a European Commission notice published on the *RAPID* web site in 2001, in euros, translated into U.S. dollars at the prevailing monthly interbank exchange rate.

Figure 2. ADM's Lysine Manufacturing Costs, 1991-1995.



Source: Tr. Ex. 60-67.