ARCHER DANIELS MIDLAND:

PRICE-FIXER TO THE WORLD

by

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Dept. of Agricultural Economics

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Abstract

Both market structure and corporate practices of Archer Daniels Midland fostered the implementation of the largest price-fixing conspiracies seen in modern times. These events have spurred renewed attention by U.S. antitrust authorities in prosecuting international cartels. The overcharges imposed on buyers of lysine and citric acid during 1994-1995 by ADM and its co-conspirators amounted to at least $200 million, and the total amount of public penalties, private damages, and legal costs exceeds $500 million. Perpetrators of price-fixing now face monetary exposures that are five times the amount of the harm caused to buyers.

Keywords: Price fixing, lysine, citric acid, sweeteners, wet-corn milling, starch industry, Archer Daniels Midland, market structure, monopoly overcharge, antitrust law, legal damages, U.S. Department of Justice.

Outline

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Introduction

The purpose of this paper is to describe the operation of three large international price-fixing conspiracies involving wet-corn milling products and to analyze a number of legal and economic issues raised by these events. The paper begins with a brief description of the markets for and market structures of lysine, citric acid, and corn sweeteners. A short profile of Archer Daniels Midland indicates a company with a leadership and corporate culture well suited to reckless collusive behavior and well positioned in markets that had nearly all the features necessary to carry out such a scheme. The next section chronicles the operation of the three conspiracies as far as that is possible from the public records. The final section of this paper examines the legal and economic issues surrounding the proper estimation of antitrust damages in this case.

The importance of these topics is demonstrated by the paper's five major conclusions:

- ADM was at the center of at least three international price-fixing conspiracies involving wet-corn-milling products, circa 1992-1995: lysine, citric acid, and corn sweeteners. Buyers were overcharged at least $220 million for the first two products alone.

- In terms of the monetary damages paid, these are by far the largest price-fixes in modern times. The huge fines paid by ADM and its co-conspirators were unprecedented; future fines and damages could reach *five times* the overcharges generated by a conspiracy.

- The events have spurred the Department of Justice (DOJ) into investigating more than 20 international commodity cartels.

- ADM management practices have been called into question; ADM's board of directors changed over night; the "Andreas' Era" at ADM appears to be over; four managers are facing serious criminal penalties.

- These events demonstrate that import competition is no longer sufficient condition for good domestic competition and that companies with vastly different corporate cultures and globally dispersed operations can easily learn to conspire. The extraterritorial reach of the antitrust laws is more needed than ever.

The Markets

Lysine

Lysine is an essential amino acid that stimulates growth and lean muscle development in hogs, poultry, and fish; a small portion of production is used for human nutrition (Appendix B). It has no substitutes, but soybean meal also contains lysine in small amounts. For hogs, lysine and corn are reported to be a perfect nutritional substitute for soybean meal: 100 lb. Meal = 97 lb. corn + 3 lb. Lysine. Some sources say poultry feeds need lysine and soymeal is not a substitute. Optimal feed efficiency ratios in 1990s were 3.5 to 3.8 lb. for hogs, 1.8 for broilers, and 2.7 for turkeys at usual slaughter weights. Significant declines have occurred since the mid 1980s, somewhat reducing the demand for lysine. Improved genetic types of hogs and poultry now can absorb about 3 lb. of lysine/ton of feed, but traditional breeds only 1-2 lbs./ton of feed. For hogs, 50% were "improved" (high-lysine-absorbing) types in 1985 across the U.S., up to about 80% in 1995. Most poultry breeds in current use already absorb high-lysine feeds. Thus, with efficiency ratios declining and genetic substitution almost over, the prospects were for lysine growth slowing after late 1990s.

Sometime in the 1960s, Asian biotechnology companies discovered a fermentation process that converts dextrose into lysine. By the 1980s, they were importing large quantities of dextrose from ADM and other U.S. wet corn millers and exporting high-priced lysine back to the USA. ADM became the sole U.S. manufacturer of lysine in early 1991 and quickly gained about 50 percent of the U.S. market. Real growth of U.S. lysine consumption in the mid 1990s is 10% p.a.; the U.S. market reached $330 million in 1995; the world market is about $600 million. Industry experts place ADM's 1995 cost of production at below $0.85/lb.; a 1996 affidavit says the break-even point is $0.66/lb.; Whitacre says that in 1992-1993, there were large losses when the price reached $0.60/lb.

All sides writing about the U.S. lysine market during 1992-1995 agree that it has a highly concentrated oligopoly trading in a homogeneous product. During 1994, ADM supplied 48 to 54 percent of the U.S. market, Ajinomoto 22 to 23 percent, Kyowa 16 to 21 percent, and Sewon Group 5 to 10 percent. The Herfindahl-Hirshman Index of concentration was between 3300 and 3700 in those years. In addition, technical barriers to entry for a fifth supplier were also quite high. Building a new plant would take two or three years and involve a large sum of sunk capital investment. There were many animal feeds manufacturers buying lysine; some dated estimates of regional concentration show four-firm concentration (CR4) was 60 to 70 percent, but national concentration was much lower. Imports accounted for 52 percent of the U.S. market in 1994 and only 46 percent in 1995, but all imports came from the three Asian members of the price conspiracy.

Trading conditions and buying methods used in the lysine market are not known, but there is no public or trade sources of prices on a regular basis. Private treaty negotiations appear to be the major method of pricing.

Citric Acid

Citric acid is an acidulent, a class of food additives that sterilizes, fixes flavors, and enhances flavors (Connor). About two-thirds of all citric acid is used in foods and beverages and the remainder in detergents. Citric acid accounts for more than 80 percent of the market for food-grade acidulents. It is sold in liquid, anhydrous, and salts forms.

World capacity in 1991 was about 1.1 billion pounds (excluding the former Soviet Union, which may have no capacity and in any case does not trade internationally). Capacity grew by about 7 percent per year, reaching 1.4 billion pounds in 1995. The U.S. share of global consumption was 32 to 33 percent in the early 1990s. U.S. plants exported about 8 percent of their production (mostly to Canada) and imported about 25 percent of U.S. consumption, mostly from Western Europe and minor shares from China, Israel, and Turkey.

During 1990-1995, there were only three U.S. manufacturers of citric acid. Haarmann & Reimer Corp., a subsidiary of the Swiss chemical company Bayer AG, sold citric acid made in two Midwestern plants operated by Miles Laboratories, another U.S. subsidiary of Bayer. Haarmann & Reimer/Bayer held a 42 percent capacity share of U.S. and Canadian consumption in 1991 which declined to about 32 percent by 1995. ADM entered the world and U.S. market by buying two plants from Pfizer in December 1990 along with the technical expertise to operate the plants. ADM's capacity share of the U.S.-Canadian market was initially about 49 percent, but declined to about 37 percent in 1995. (Capacity shares may overstate sales shares if the plants operate at low utilization rates).

The main reason that Haarmann & Reimer's and ADM's shares slipped is that Cargill entered the industry by building a new plant in Iowa during 1988-1990 and significantly expanding that plant in 1991, 1993, and 1995. Cargill's capacity share of the U.S. - Canada market was 16 percent in 1990, 18 percent in 1992, 28 percent in 1994, and 33 percent in 1995. Thus, in 1995, adjusting for imports, the three U.S. producers controlled about 90 percent of the U.S. market with almost equal market shares.

The two largest importers into the U.S. market were Jungbunzlauer of Austria and Hoffmann-LaRoche of Switzerland. Jungbunzlauer's three plants in Austria, France, and Germany gave it a 17 to 19 percent world share, almost double that of the three U.S. manufacturers. Hoffmann-LaRoche's Belgian plant accounted for 15 percent of world capacity in 1991, down to 11 percent in 1995. These two companies were the largest and most consistent importers to the U.S. market. A group of government owned Chinese producers aggressively entered the market in the early 1990s, with low-priced acid, but threats of trade reprisals (reportedly instigated by ADM or Cargill) caused them to pull back a bit. Smaller, more sporadic importers were located in Italy, Israel, Turkey, and Indonesia. The top five manufacturers controlled 65 to 70 percent of the world market in the early 1990s.

In 1988, list prices of citric acid delivered east of the Rocky Mountains were $0.81 per pound anhydrous equivalent. With Cargill's impending and actual entry, prices fell dramatically to the $0.63 to $0.73 range during 1990 (CMR). In 1991, a series of price increases were initiated by Cargill, to be followed by a spiral of announcements by ADM, Cargill, and Haarmann & Reimer through 1993. From late 1993 to the end of 1995, list prices remained stuck at $0.85 despite what CMR called "ample supplies." Information on actual transactions prices is more spotty. Importers' prices run about 2 to 4 cents lower, with Chinese imports closer to 6 cents lower than list prices. During periods of normal supply, U.S. transactions prices are reported to be about 5 to 8 cents lower, with the gap closing to as little as 1 cent at times. In a 1994 government report, domestic sales prices were reported to be $0.804 for citric acid and its salts, or 5 percent less than list prices in that year. In the first six months of 1996 after the cartel was exposed, importers' prices fell to $0.73.

Corn Sweeteners

ADM is a manufacturer of all three major corn sweeteners: glucose, dextrose, and fructose (Connor). Dextrose is normally sold in powder form and there is a new crystalline form of high-fructose corn syrup (HFCS), but glucose and HFCS are sold in syrup forms. The leading sweetener is sucrose made from cane or beets. Three minor naturally occurring sugars are maltose, lactose, and zylitol. All six of these nutritive sweeteners have some unique uses in food processing, but for other uses they can be complementary. HFCS is commercially produced in three sweetness levels, all of which are sweeter than dextrose; glucose syrups (ordinary "corn syrup") come in ten commercial forms, all of which are less sweet and more bulky than dextrose. Altogether there are 18 standard forms of starch-based sweeteners (made from corn in the United States but from wheat, potatoes, or other starches in other countries).

The U.S. market for corn starch sweeteners is very large, about 14.9 million metric tonnes in 1995. U.S. consumption of dextrose amounted to almost 700,000 tonnes but has grown only very slowly (25 percent from 1970 to 1995). Glucose ("corn") syrups account for 25 percent of corn sweetener tonnage, with production up 150 percent since 1970. HFCS is now by far the largest segment (68 percent by volume), all of its growth occurring since 1970. The total value of the U.S. corn sweetener market in 1992 was $2.9 billion (at f.o.b. manufacturers' prices), of which 82 percent was HFCS.

Volume growth of HFCS was spectacular up to 1990 when a marked slow down occurred. Growth during 1990-1995 averaged only 3.8 percent per year. Growth of glucose syrups during the early 1990s averaged 4.3 percent, and dextrose grew at 2.8 percent per annum. The HFCS segment became a mature market around 1990, just as dextrose and glucose had been for years before. HFCS grew fastest when sucrose substitution was large (particularly in the soft drink industry). With that substitution phase at an end, corn sweeteners cannot grow much faster than the real growth of all the food processing industries (about 2 or 3 percent per year).

In 1992, there were 28 companies in the wet-corn milling industry, but 9 of them operate 23 plants that account for nearly all U.S. production. The top four companies operate 16 plants in North America that accounted for 86 percent of HFCS capacity in 1991; the four-firm concentration ratio (CR4) for all wet-corn milling was 73 percent in 1992. (Concentration within each of the corn products markets such as starch, corn oil, amino acids, and the like is higher than for all products taken together). ADM is the leading producer of HFCS with about one-third of industry capacity, A.E. Staley (owned by Tate & Lyle) about one-fourth, Cargill about 20 percent, and CPC International 10 to 15 percent. International trade, except small imports from Canada, is negligible.

Sales figures are more difficult to obtain than physical output. Estimates from Census data show that glucose syrups had shipments' value of $735 million in 1992, up 60 percent since 1982 or 1987; the U.S. market for dextrose is small, only $284 million in 1992, up 25 percent since 1982. Finally, HFCS sales reached $1,892 million in 1992, up 110 percent since 1982.

Wholesale list prices are quoted monthly for dextrose and glucose syrup, but not for HFCS. List prices of dextrose used to change nearly every month, but that stopped in early 1981. Then a pattern emerged of constant prices for many months (e.g., $27.17 per cwt. For 15 months in 1981-82;

$26.36 for 16 months in 1983-84, and $24.50 for four years 1989-94!). Census data seem to show that transactions prices were 21 percent lower than the posted list prices.

List prices of glucose syrups were far more variable since the mid 1970s than dextrose. Intra-annual prices rose as high as 83 percent and fell as much as 32 percent. Prices in 1994-1995 (the probable conspiracy period) were 14 percent higher than in 1993, but did not increase above average 1990-1992 levels.

HFCS prices averaged about $10.50 per cwt. in 1992, about the same as selling prices in the 1980s. HFCS with more than 50 percent fructose levels sold at a 5 percent premium in 1992, but that premium is down from 15 percent in 1982. Little else can be found about HFCS prices from public sources. However, it is known that CPC paid $7 million to HFCS buyers as civil damages in September 1996. If a HFCS price-fixing conspiracy was in effect during 1994-1995 (the same period as lysine), then with two-year company sales of $420 million, the implied treble damages were *at least* 1.7 percent of CPC sales of HFCS. If all sellers overcharged at the same rate, the total damages were about $62 million (overcharges were $21 million), but these estimates are conservative and speculative.

Profile of Archer Daniels Midland

In fiscal year 1995, ADM had consolidated net sales of $12.7 billion (ADM). However, gross sales, which includes the total sales of merchandised grain and oilseeds, totaled $15.9 billion in 1995. Finally, total sales including those of unconsolidated affiliates were approximately $20 billion. For the three fiscal years ending 1993 to 1995, after-tax earnings averaged 5.5% of net sales and 11.7% of stockholders' equity. Over the last nine years, ADM's net sales increased by 10.1% per year. From fiscal 1986 to fiscal 1990, net earnings rose from $230 million to $484 million (or by 20% per year), but from 1990 to 1994 ADM's net earnings stalled at $500 million per year. In 1995, net earnings jumped to $796 million, or 60% above the 1990-1994 average.

ADM has four major product divisions: oilseed products, corn starch products, dry milled grains, and other; in 1995 the four divisions contributed 60%, 20%, 11%, and 9% of net sales respectively. The oilseeds division sells corn, peanut, palm, cottonseed, soybean, canola, and sunflower oils and their byproducts. Specialty products include lecithin, vitamin E, monoglycerides, soy protein concentrate, and soy isolate. The corn starch division produces corn syrups, crystalline corn sweeteners, corn starch, alcohols, malt, and a host of biotechnology products (monosodium glutamate, citric acid, lactic acid, sorbitol, xanthan gum, lysine, methionine, trytophan, threonine, ascorbic acid, astaxanthan, and biotin). Dry milled products include flours and pastas. Miscellaneous sales consists of aquiculture fish, hydroponic vegetables, grain merchandising, and numerous joint ventures with farmers' cooperatives. Within the corn products division, HFCS and ethanol are mature or maturing industries with slow growth and narrowing margins; however, the other bioproducts from corn generate much higher margins and represent ADM's hope for the future.

For a company of its size and diversity, ADM is managed by a remarkably small number of managers. Dwayne Andreas and three or four other top officers made all major decisions from 1970 to 1997. Until late 1996, the ADM Board contained a large majority of current and former company officers, relatives of Andreas, long standing close friends of Andreas (e.g., "Happy" Rockerfeller, Ray Goldberg), or officers of companies that supply goods and services to ADM (agricultural

cooperatives or legal services). Members of the press or stock analysts almost never had open contact with ADM officers except D. Andreas himself.

Andreas cultivated the image of an international statesman primarily concerned with world hunger and national food security. His official biography gives him credit as one of the major forces behind the PL 480 Program. He is identified as Armand Hammer's successor as the U.S. capitalist with the closest relationship with Kremlin and other Eastern Bloc leaders. Andreas has built a legendary network of powerful business and government contacts since the 1960s. He was close friends with and contributor to a wide array of farm-state Congressmen and Senators, especially Hubert Humphrey and Robert Dole. Since 1979, Andreas and ADM have contributed more than $4 million to candidates for national office or their parties. ADM has benefitted greatly from the U.S. sugar program and from federal ethanol subsidies and usage requirements (Bovard). Lobbying by ADM and its trade associations on these and other government favors is intense and well documented. ADM maintains a palatial suite of rooms in the Hays-Adams Hotel (which overlooks the White House) for the frequent use of Andreas and other officers. Andreas often appears on *Forbes* magazine's list of the 400 richest people in the United States.

There are several ADM management practices that bear the Andreas stamp and that made ADM prone to price fixing. ADM made quick and aggressive investment decisions. To enter the citric acid business, ADM paid top dollar for some aging Pfizer plants (two of which were closed soon after) primarily to obtain the production technology. In both lysine and citric acid, very large capital expenditures were incurred to expand plants to the largest feasible scales. When production problems occurred with lysine, ADM hired engineers from their primary competitor, Ajinomoto. Whitacre claims that "stealing technology" was common practice at ADM. Specifically, Whitacre asserted that ADM hired Asian engineers to build and run its Decatur lysine plant and that it stole technology and trade secrets from other companies to begin production of vitamins and medicinal products from corn. Moreover, Whitacre relates that a culture that fostered or permitted price fixing permeated ADM, at least within the corn-producing division. It is clear that Dwayne Andreas has no respect for free markets, an idea he considers to be a figment of politicians' imaginations (Bovard). Whitacre claims that taped price-fixing discussions within ADM involved the Chairman (D. Andreas), Vice Chairman (M. Andreas), President, and at least three VPs of operating divisions; the counsel and assistant counsel were aware of the activity as well. ADM's own guilty pleas submitted to two federal courts are consistent with Whitacre's charges. Finally, Whitacre asserts that ADM routinely rewarded mangers at his level very large bonuses that were paid tax-free into foreign bank accounts by means of phony invoicing schemes. Many of Whitacre's characterizations of ADM have yet to be independently verified.

Economic Conditions Facilitating Price-Fixing

Standard industrial-organization textbooks like Scherer and Ross provide check lists of market conditions that are known from economic theory or industrial experience to encourage overt cartel behavior (price-fixing, quantity-setting, or territorial shares).

A typical list of facilitating factors is given in Table 1. The first group of factors refers to market sales concentration in its broadest sense. The number of significant sellers of the three relevant wet-corn-milling products is very small. For the three corn sweeteners, the number of sellers

ranged from 3 to 8. Sales concentration is extremely high by any standard, though the HHI for corn fructose is lower than that of lysine or citric acid. Buyer concentration is generally low.

Table 1. Conditions Facilitating Price-Fixing in the U.S. Corn Refining Markets, Circa 1992

Market Conditions	Lysine	Citric Acid	Three Corn Sweeteners
World market size	$0.6 bil.	$1.1 bil.	$4.0 bil.
U.S. market size	$0.3 bil.	$0.4 bil.	$3.0 bil.
Concentration:			
Small numbers of suppliers	4	6[a]	3 to 8
High U.S. sales concentration	CR4=100% HHI=3500	CR4=90% HHI=3500	CR4>85% HHI=2150
Low buyer concentration	CR4<30% Regional higher	CR4<50%	CR2=73%
Cartel culturally & geographically close	1 US 4 Asia	3 US, 1 Asia 3 Europe	U.S. Midwest 1 from UK
Small U.S. imports outside the cartel	None	5-7%	None
Product homogeneity among sellers	Perfect	Yes, except some imports	Standard grades
Product substitutes few	Soy meal, if lysine price high	Some other edible acids	Complex, depends on uses
Entry barriers:			
High MES plant scales (sunk costs)	$150 mil.+	$150 mil.	$300 mil.
Technology secret	Yes	Yes	Yes, HFCS no for others
Building capacity slow	3 yrs.+	3 yrs.+	3 yrs.+
Other factors:			
Transparent price info.	No	No	Some
Major rivals have history	Some	Much	Much
Large, infrequent transactions	Yes	Yes	Yes
Market growth slow or slowing	Yes(10%)	Yes(5%)	Yes(4%)

Sources: Affidavits in court records, expert consultants' reports, and industry trade journals.

[a]In 1992-1995, there were 2 U.S. manufacturers and two consistent European importers. Imports from China were significant but may have come from one government-owned company or one export association. There are at least six more manufacturers, but exports from one Italian and one Israeli firm were very small and quite irregular; the other four firms are not known to be exporters to the USA.

The lysine cartel consisted of four companies, and these companies were the only world producers of lysine from corn dextrose. The U.S. cartel in citric acid was comprised of four or five companies (the status of Cargill is unclear). In addition, there were one or more Chinese chemical companies consistently exporting citric acid to the United States; two other companies were sporadic or negligible exporters. In any case, U.S. imports were small, only 5 to 7 percent of U.S. consumption. Finally, little is known about the conspiracy (if any), but the five dominant producers are all located in the U.S. Midwest, and imports were nil (the only significant imports are from a CPC plant in Ontario, Canada).

For each corn product, at least one facilitating concentration condition is not met. Similarity of business cultures and geographic closeness are absent in the lysine and citric acid cases. Two lysine producers were from Japan and one from South Korea: In citric acid,
two producers were Swiss companies (one operating in U.S. subsidiary) and one was Austrian. In the case of corn fructose, the missing factor is low buyer concentration: Coca Cola and Pepsico buy 73 percent of all U.S. fructose.

Product heterogeneity is never a problem for these products, but if prices become high enough, some feasible substitutes appear. Soybean meal can substitute for lysine and corn, but during 1991-1995 price relationships made this possible on only a couple of months. Malic and phosphoric acids can be substituted for citric acid in some food or nonfood uses if citric acid prices rise high enough. The most complex substitution patterns appear among the three corn sweeteners (dextrose, glucose, and fructose) and ordinary sucrose. In some uses, they are substitutes and in other uses they are complementary with each other.

The technical barriers to entry are high in all three markets. Plants are highly specialized in production (implying large sunk costs of investment), and their sizes are large relative to market demand. Technological secrecy is strong in all but the dextrose and sucrose cases. The time required to full production is three or more years.

There are five remaining facilitating factors. Market power is difficult to exercise when accurate price reporting mechanisms exist, such as auctions in public exchanges. Lysine prices are completely hidden from public view (except when traded internationally). Like all these products, private treaty negotiations established prices. Spotty surveys of posted prices of citric acid occasionally appeared in the trade press (usually in the *Chemical News Reporter*), and regular quarterly reporting of dextrose and glucose posted prices can be found in *Milling and Baking News*. No posted prices can be determined for fructose, where substantial price discrimination appears to be standard operating practice. Most important, current transactions prices practically never appear in widely published sources. Such pricing mechanisms favor noncompetitive pricing behavior.

The development of tacit pricing cooperation among conspirators is facilitated by companies with years of experience in observing strategic moves and countermoves in an industry. The major in the citric acid and corn sweeteners markets have interacted in this fashion for more than 20 years. Very little new entry took place that might have encouraged aggressive or maverick behavior. The purchase of A.E. Staley by the UK firm Tate & Lyle brought about no notable change in pricing behavior; Tate & Lyle is highly experienced to operating in tight oligopoly structures in their European sucrose markets. In the citric acid market, Cargill and ADM were the leading actors.

These two companies have strategic contact points in several agricultural product markets. There appears to be an understanding between the two that neither will aggressively seek more than 50 percent of their overlapping markets; both companies build capacity in order to signal to each other that they will be satisfied with 35 to 40 percent market shares.

There is less "history" in the lysine market. The absence of a long period of business interaction means that tacit forms of cooperation are not an option, but overt price-fixing is. Ajinomoto had owned a U.S. soybean operation since the early 1970s, but the two South Korean companies were relative newcomers to the U.S. corn products markets and owned no U.S. production facilities. ADM made its decision to build a plant that would more than double world capacity in 1989; when its Asian co-conspirators doubted its size, ADM gave unrestricted tours of the Decatur facility to Ajinomoto and Sewon managers and engineers (Appendix A). When ADM's new plant came on stream in 1991, it cut U.S. lysine prices from $1.30 per pound to the $0.60 to $0.70 range and kept those money-losing low prices for more than one year. The Asian exporters of lysine were losing because their facilities were smaller and older, their dextrose supplies were more costly, and trans-Pacific transportation costs were significant. This one-year lesson in how far ADM was prepared to go in obtaining a 50 percent worked market share was apparently enough to convince the Asian exporters of the superior profitability of a cartel arrangement. From their point of view, half a cake was better than none at all. The history lesson was brief but pointed.

Another key event took place in 1991 that may have emboldened ADM to seek an understanding with its Asian rivals. In that year, a federal judge in Des Moines, Iowa dismissed a price-fixing case against ADM and other defendants in the HFCS (corn fructose) market. This case had been prosecuted by the Department of Justice for ten years. Its dismissal was a rare and humiliating defeat for the DOJ.

Another characteristic feature of all the corn products markets is the large and infrequent procurement patterns in these markets. Animal feeds manufacturers, beverage bottlers, detergent makers, and other buyers purchased these ingredients by the ton. In the case of citric acid, buyers signed one-year supply contracts, but for the other ingredients purchases were made somewhat more frequently. In any case, large and lumpy orders are easier for a cartel to monitor compliance than a frequent, continuous negotiation process.

Finally, empirical studies of discovered price-fixing cases have established that price-fixing is characteristic of slow-growing or decelerating markets. Citric acid markets were growing at a steady 4 to 6 percent annually; HFCS, after enjoying 20% real growth rates in the early 1980s, slowed to a mere 4 percent per year by the early 1990s. Lysine growth rates were more robust (about 10 percent per year), but by the late 1990s prospects for high growth were dim because the substitution of high-abortion genetic types in hogs would be at an end.

In sum, nearly all of the market preconditions for price-fixing were met for lysine and citric acid. The major exception is the surprisingly pluralistic composition of the conspirators and their globe-girdling locations. Industrial economists must apparently accept the fact the cultural diversity and geographic space are no longer necessary conditions for effective collision among multinational corporations. The corn sweetener markets do not fit the price-fixing profile quite so well. Seller-side concentration is high enough, but high buyer concentration may countervail attempts to exercise seller

market power. Moreover, significant substitution and complementarities exist among corn sweeteners and sucrose. There is some pricing transparency for glucose and dextrose (posted prices), but none for HFCS. These considerations (plus the dismissal of the 1981-1991 federal HFCS antitrust case) in all probability swayed the DOJ in its decision to drop prosecution of ADM and others in the HFCS market; lack of video or audio tapes of meetings among HFCS producers was probably a factor as well (tapes of discussion *about* HFCS among the lysine conspirators do exist, which is sufficient evidence in a criminal conspiracy trial, but may be insufficient to assess fines or establish private injuries). If there was in fact an effective conspiracy in HFCS, the defendants benefitted greatly from the plea bargain offered by the DOJ because U.S. sales of corn sweeteners were nearly *four times* the sales of lysine and citric acid combined (Table 1).

Price-Fixing: Chronology & Mechanics

The purpose of this section is to summarize the events surrounding the price-fixing conspiracies initiated by ADM in 1992 and discovered by the public in 1995. Details are given in Appendix A. As of March 1997, not all legal procedures have reached their culmination and the results of many private legal negotiations may never be known. The record is much fuller in the case of lysine than for citric acid and corn sweeteners.

Lysine

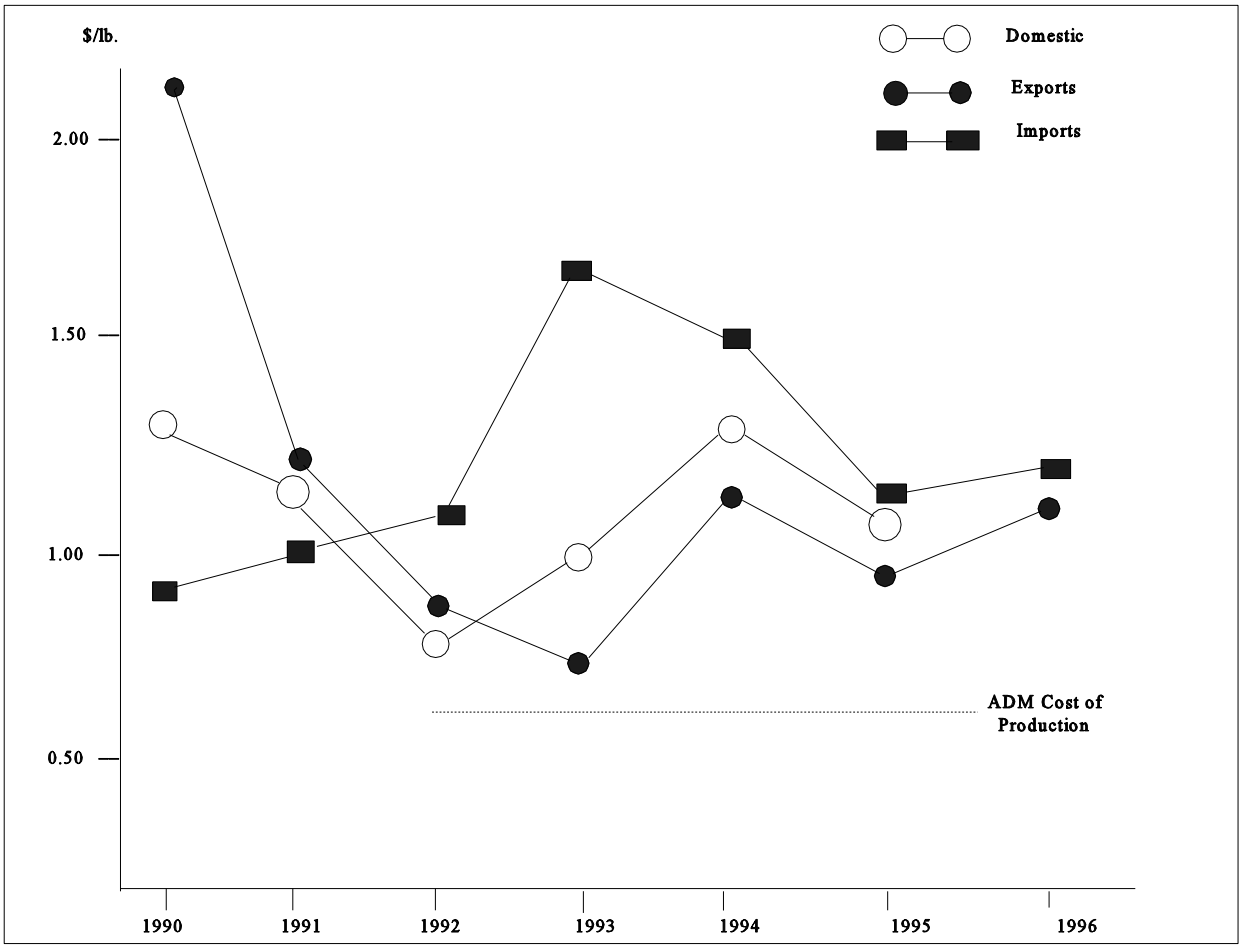
In the 1960s, Ajinomoto or some other Asian biotechnology company discovered how to convert dextrose into feed-grade lysine, an essential amino acid that stimulates growth as leanness in hogs and poultry. By the late 1980s, Ajinomoto, Kyowa, and one South Korean company (Sewon) were exporting about $30 million of lysine per year to the United States and charging about $1.00 per pound, much less than U.S. organic chemical companies were charging for synthetic lysine.

In 1988, ADM discovers why Asian biotechnology companies are buying so much dextrose from the United States—it is the raw material for lysine made by fermentation. In 1989, ADM commits an initial $150 million to build the world's largest lysine factory in Decatur, Illinois and hires 32-year-old Mark Whitacre to direct the new lysine division. Production begins in early 1991 and a "tremendous price war" begins. The U.S. price drops from $1.30 in 1990 (or $1.20 in January 1991) to a record low of $0.64 in July 1992 (Figure 1). ADM's cost of production is reported to be between $0.60 to $0.70 per pound when the plant is operating as designed (production glitches occurred in 1991 and 1992). At selling prices near $0.60 ADM is losing millions of dollars per month in its lysine operations. Asian producers are suffering even greater losses.

About this time, the lysine division is placed under ADM V.P. Terrance Wilson, who directs Whitacre to meet with the Asian lysine producers. In April 1992, Whitacre meets in Japan with Ajinomoto and Kyowa Hakko where he proposes the formation of an "amino acids trade association." By this time ADM controls one-third of the world market.

In June 1992, the first of many meetings of the "lysine association" takes place in Mexico City. The three companies (and later a fourth South Korean company, Sewon) discuss raising prices, allocating production, and sales shares across several regions of the world. Wilson leads the discussion, often repeating ADM's creed:

Figure 1. Annual Average U.S. Lysine Prices, 1990-1995



"The competitor is our friend,
and the customer is our enemy."

The conspirators apparently are successful in raising the U.S. price of lysine to $0.98 for three months (November 1992 to January 1993), but for some reason the consensus breaks down in early 1993 (Figure 2). By June 1993, prices are again way up above ADM's putative production cost. Indeed, from October 1993 to August 1994, prices hold at a suspiciously steady $1.08 to $1.13 and then were raised again to about $1.20 for another six months. Whitacre has stated that the conspiracy lasted until late 1995. Prices fell during the first nine months of 1995, probably in response to the corn-soybean ceiling price, which fell from mid 1995. In late 1995, lysine prices rose briefly, just as the ceiling price did. Why this occurred (and continued for five months in 1996) is puzzling. Perhaps it indicates that the industry was entering a new period of tacit price cooperation.[1] U.S. exports plateau at $100 million during 1992-1995 (Figure 3). After the conspiracy ends, exports double.

Whitacre was recruited as a secret agent ("a mole") in November 1992. Up until June 1995 he provided hundreds of audio tapes of many price fixing meetings concerning lysine, citric acid, and HFCS. The FBI made additional video tapes of the "lysine association" meetings. A federal grand jury is formed in early June and obtains subpoenas for all information on price-fixing by ADM and its co-conspirators.

A large group of FBI agents raids ADM's corporate offices on the night of June 28th; many ADM officers are interviewed in their homes that night as well. Seized documents show 1992-1995 "sales targets" and "actual sales" by all members of the lysine association. In July 1995, Kyowa Hakko states that it was "coerced" into colluding by Ajinomoto. Documents are subpoenaed from many other firms by the DOJ during July-October. ADM's stock price falls 24% ($2.4 billion dollars of market value).

By February 1996, ADM has a total of at least 85 suits filed against it, 14 by lysine buyers and many others by stockholders claiming mismanagement and failure to divulge material information. At its October 1995 stockholders' meeting, Dwayne Andreas imperiously quashes discussion of the price-fixing charges. ADM's legal costs reach $6 million during September-December 1995 and are rising.

In the Spring of 1996, the DOJ's case is beginning to falter. The DOJ is targeting Michael Andreas (Executive V.P.) And Terrance Wilson for criminal charges, but not a single ADM officer will offer to corroborate the evidence. Moreover, Whitacre's credibility is tarnished by his own admission that he received at least $10 million in bonuses while an FBI mole on which he did not pay taxes. Whitacre was fired in August 1995 and was eventually sued by ADM for fraud. Perhaps in desperation, the DOJ announces that Dwayne Andreas is no longer a target of its investigation; this is a rare action by the DOJ.

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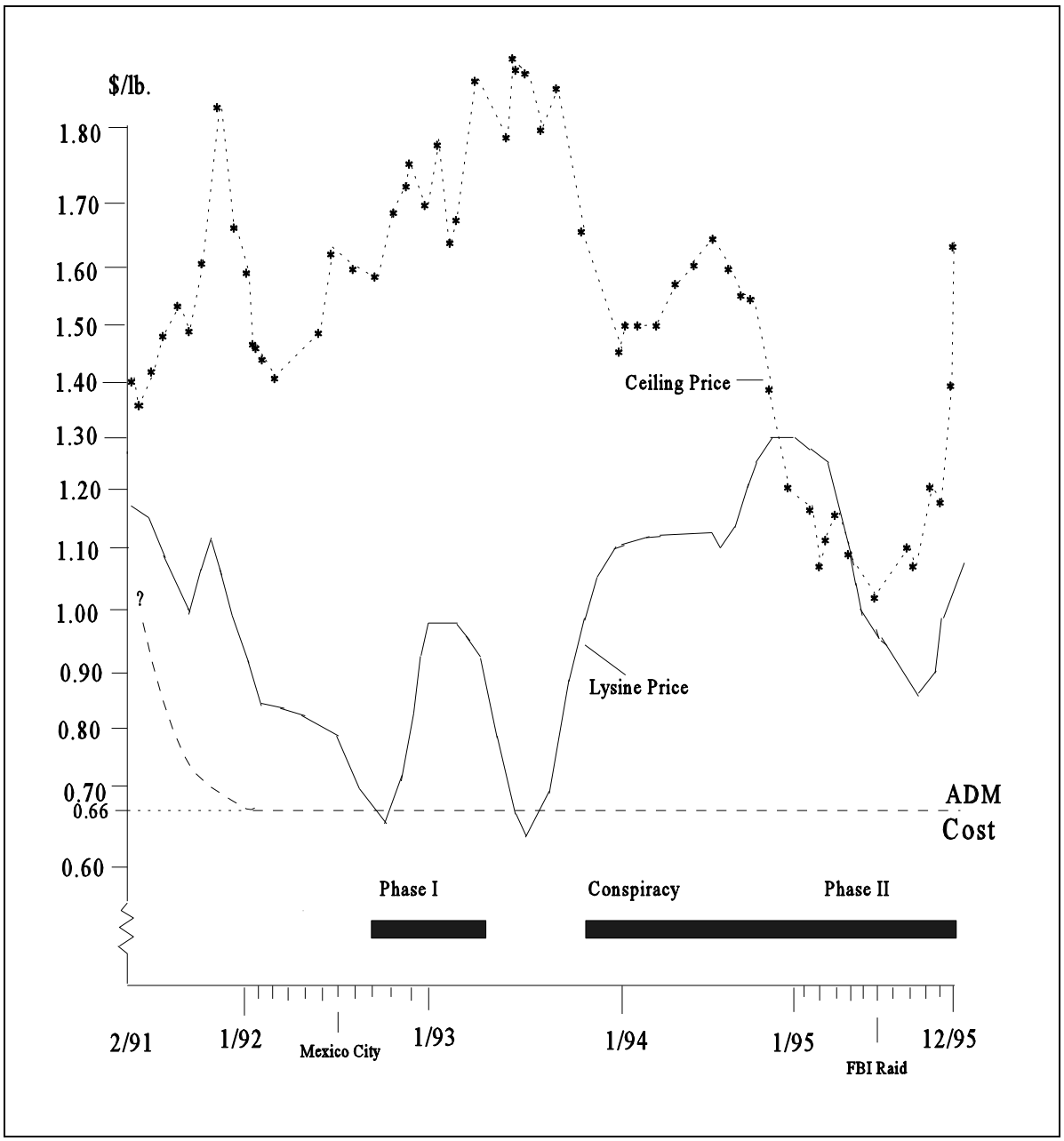
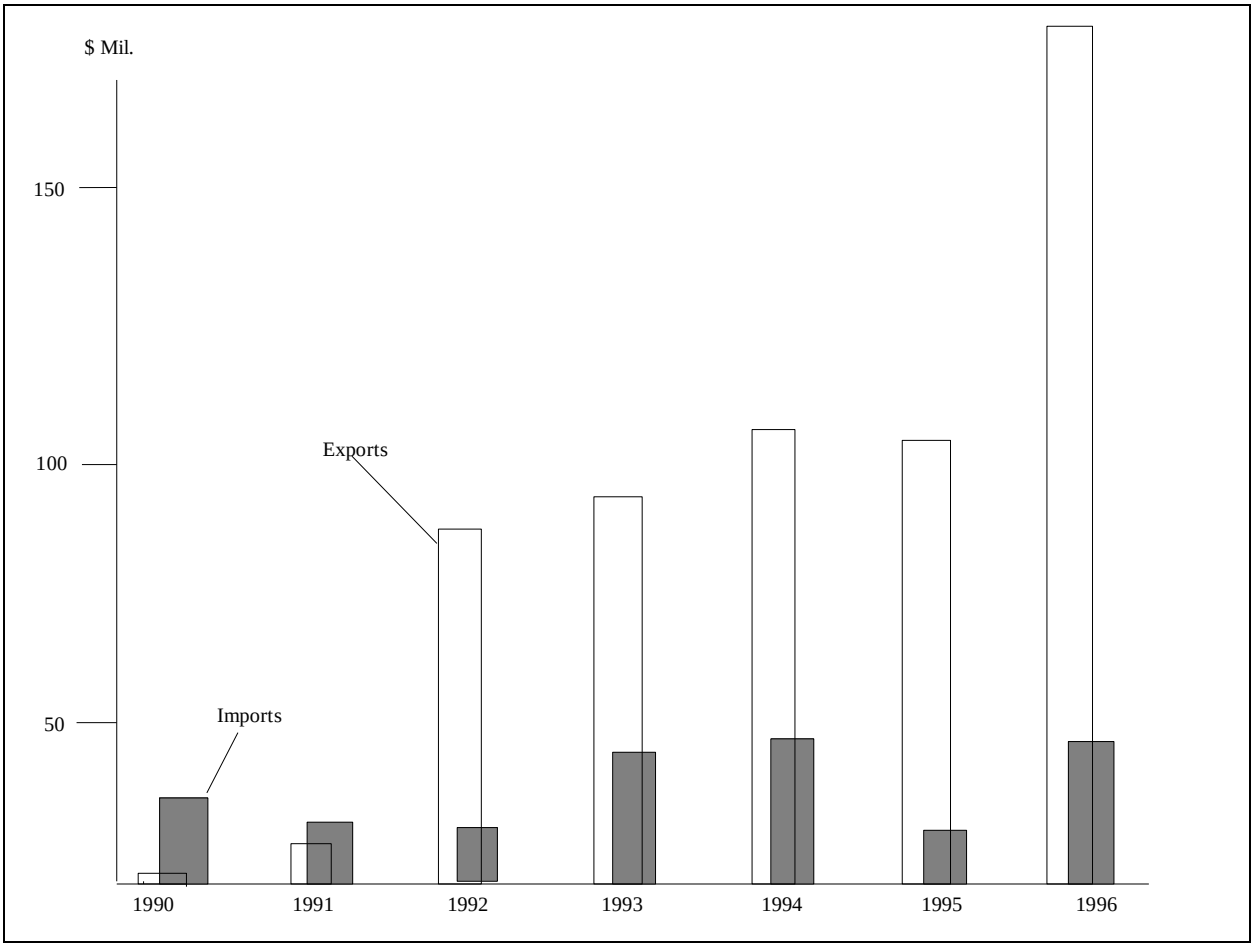
[1] Over the six years 1990-1995, there is a price pattern consistent with a seasonal price cycle, with a trough in August and a peak around November (except in 1995). Six years of data is insufficient to confirm such a pattern statistically.

Figure 2. Monthly U.S. Transactions Prices of Lysine, 1991-1995



Sources: Lysine prices supplied by three defendants in a notice to class-action members. ADM costs from buyers' affidavits. Ceiling price based on formula (100 lb. soymeal = 97 lb. corn + 3 lb. lysine) and Illinois cash prices for corn and soybean.

Figure 3. Lysine Exports and Imports, 1990-1995[2]



[2] STAT-USA on-line data service of U.S. Dept. of Commerce. HTC Code No. 292241000.

In April 1996, ADM, Ajinomoto, and Kyowa offer to pay "treble damages" of $45 million for buyers of lysine during 1994-1995. Technically, the three companies are not admitting that they are guilty of price fixing. The negotiations were carried out by a Philadelphia law firm that made the lowest bid in an almost unprecedented *auction* held by U.S. 7th District Court Judge Shadur! The judge refuses to consider bids based on *percentage* contingency fees. Buyers must decide by July 15th whether to take a portion of the $45 million settlement immediately or to "opt-out" of the agreement and sue privately for more. Based on overcharge estimates that are 10 to 12 times higher, many large feed companies do in fact opt out (see Appendix B). The judge is criticized for rushing to judgement civil penalties that normally follow the completion of the criminal case by the DOJ. Auctions for *fixed* fees appear to introduce perverse incentives for the winning law firm.

In a shocking setback for ADM, in August 1996 the three other lysine co-defendants "cop a plea." In return for lenience, the three Asian *companies* file guilty pleas, and three *executives* also admit personal guilt and agree to testify against ADM. This is the beginning of the end for ADM.

On October 14, 1996, ADM also agrees to plead guilty to criminal price-fixing, to pay a $70 million fine for its lysine activities, and to fully cooperate in helping the DOJ prosecute M. Andreas and T. Wilson. Numerous changes in ADM's Board of Directors take place; M. Andreas is given a 15 percent raise and placed on "administrative leave"; T. Wilson resigns; and D. Andreas is relieved of his duties as Chairman (though he keeps his title).

The $70 million fine is five times larger than the previous highest fine for price-fixing. It is based on new (1991) DOJ sentencing guidelines that permit fines that are *double* the illegal profits from price fixing. (The *treble* damages to private parties still stand in addition). Thus, the penalties for price fixing have dramatically escalated since 1991, to an amount *five times* the overcharges to buyers.

I estimate that the total fines and civil actions have cost the guilty parties at least $154 million in the case of lysine alone as of March 1997 (Table 2). Legal defense and offense costs are around $76 million for all three commodities, and shareholders' suits were settled for $30 million by ADM. The total for all related price-fixing, mismanagement, and fraud cases is $511 million and rising.

The $70 million fine paid by ADM for lysine is an implicit admission by the DOJ that 1994-95 overcharges were *at least* $70 million for all four guilty conspirators; it is probably a "discounted" fine because of ADM's agreement to help prosecutors. Note that it is 4.7 times the class-action settlement for lysine in July 1996 and about 50% of the estimate shown in Appendix B.

The Asian defendants might have been hoping that the evidence of meetings held outside U.S. territory would become inadmissable. But a March 18, 1997 ruling in a federal appeals court in Boston makes price fixing by foreign companies abroad illegal if it affects U.S. trade or commerce (Wilke).

Table 2. Summary of Costs and Fines Proposed or Paid up to March 1997.

Case	Party	Date Offered	Amount
			$*Million*
A. Lysine Criminal	ADM	10/96	70.0[a,b]
	Ajinomoto	11/96	10.0[a,b]
	Kyowa	10/96	10.0[a,b]
	Sewon	12/96	1.3[c]
	3 executives	8/96	0.2+
	3 executives	pending	1.1[E]
Lysine Civil Class Action	ADM	4/96	25.4
	Ajinomoto	4/96	10.0
	Kyowa	4/96	10.0
	Sewon	pending	1.0[E]
Lysine Civil, 32 Opt-Out firms	All of above	N/A	15.0[E]
Subtotal			154.0
B. Citric Acid Criminal	ADM	10/96	30.0[a,b]
	Bayer/Miles/H&R	1/97	50.0[a]
	Hoffmann LaRoche	3/97	14.0
	Jungbunzlauer	3/97	11.0
	2 executives	3/97	0.3
	1 executive	pending	0.4[E]
Citric Acid Civil Class Action	ADM	10/96	35.0
	Bayer/Miles/H&R	12/96	46.0
	Hoffmann LaRoche	10/96	5.7
	Jungbunzlauer	10/96	7.6
	Cargill	"never!"	N/A
Subtotal			200.0

Table 2. Continued

C. HFCS Civil Class Action	CPC Intl.	9/96	7.0
	ADM	10/96	0.0
	Cargill	pending	N/A
	A.E. Staley	pending	N/A
	Am. Fructose	pending	N/A
HFCS Criminal	ADM	10/96	0.0[b]
	Others	pending	N/A
Subtotal			7.0
D. Shareholders' suits: Mismanagement and failure to divulge material information	ADM	pending	30.0
E. Fraud and Embezzlement of ADM	Marc Whitacre	9/96	30.0
F. Legal costs and defendants	ADM *et al*		50.8[d]
Legal costs of plaintiffs	many buyers		25.4[d]
TOTAL			$500.2

N/A = Not available at present.

[E] = Estimated by the author from market shares, similar fines, and other public information. None of the participants in the litigation nor their counsel provided the author any information on these settlements. The author has had no access whatsoever to confidential information on these settlements.

[a]These fines are based on the "two-times" (profits or injury to buyers) rule outlined in 1991 Sherman Act sentencing guidelines.

[b]Although the "two-times" rule was used, the fine was reduced substantially because the party agreed to cooperate with DOJ prosecutors and FBI investigators.

[c]Very low fine because company unable to pay calculated amount due.

[d]Extrapolated from costs of legal defense reported to shareholders by ADM to be 14% of amounts of fines paid by defendants. Assumed plaintiff's costs were half of defendants.

Citric Acid

Much less is known publicly about the citric acid conspiracy than about lysine (see Chronology, Appendix A). The allegations first surfaced shortly after the June 1995 FBI raid on ADM's Decatur, Illinois headquarters. Documents containing detailed information on prices charged and volumes of production of major citric acid manufacturers worldwide are
found in ADM files. Audio tapes provided by Mark Whitacre and video tapes taken by the FBI of the "Lysine Association" contain references to the citric-acid conspiracy. In addition to the lysine meetings, ADM's Terrance Wilson apparently met with representatives of Bayer and Hoffmann-LaRoche in hotels in Paris and London, but no video tapes are believed to exist for these meetings.

The DOJ prosecution activities are centered in the U.S. Attorney's office in San Francisco, partly because citric acid is used in many processed tomato products. By February 1996, ADM is facing at least seven private price-fixing suits on their citric-acid activities. Lawyers are trying to form a class-action group that will be recognized by a judge. The federal case is said to be stalled in the spring of 1996. The lack of video taped information is a disadvantage because none of the conspirators is ready to confess. ADM is reported ready to argue that the conspiracy arose outside the United States without ADM's overt participation.

By August, ADM is on the defensive because three Asian co-conspirators agreed to testify against ADM in the lysine case. With surprising suddenness, on September 29, 1996 ADM offers to settle the class-action citric-acid suit for $35 million. The timing is surprising because plaintiffs were still arguing for class-action status in federal court just the previous week. However, the timing could prove to be a smart move if the plaintiffs quickly accept, because the agreement would not involve an admission of guilt and because the amount of the settlement might have escalated had it occurred after the settlement of the criminal case with federal prosecutors. Just two weeks prior to the citric-acid offer, ADM's Board of Directors had undergone its second shake-up; two old (74 and 79 years) former officers resigned, bringing to eight the total resignations since the price-fixing allegations erupted. At the time ADM's stock price was near its nadir, so the Board may have thought that dramatic offers to settle were in the best interest of stockholders. Moreover, the Directors themselves could have been held legally liable for failure of their duties had they not settled quickly and fully. A few weeks later at ADM's annual meeting, it is revealed that a "corporate governance" committee of seven "outside directors" was created a year before and authorized to make any plea agreements necessary with DOJ prosecutors.

On October 14, 1996, ADM announces that it will plead guilty of criminal price-fixing in U.S. federal court in San Francisco and pay a fine of $30 million to the government for the citric-acid portion of the case (and $70 million more to settle the lysine portion). The fines paid are based on the DOJ's new "two-times" rule (fines are twice the agreed-upon overcharges made by ADM to its customers), but the $30 million may have been discounted because ADM also made a major concession to the DOJ. ADM promises to offer full cooperation to the DOJ in its criminal prosecution of two ADM executives, M. Andreas (still the Executive V.P. of ADM) and T. Wilson (recently retired President of the Corn Products division of ADM), as well as prosecution of citric acid co-conspirators (both companies and individual officers). In addition, the DOJ offers immunity from prosecution for price-fixing to Barrie Cox, V.P. of the citric-acid division of ADM, in return for Cox's full cooperation in its citric-acid investigation.

Cox divulges details of ADM's conspiracy with Haarmann & Reimer (Bayer's U.S. subsidiary handling citric-acid sales), Hoffmann-LaRoche, and other co-conspirators. The DOJ states publically that Cox "did cooperate...and it is substantial..." in its citric-acid investigation. Legal counsels for Bayer and Hoffmann-LaRoche also state that their companies are fully cooperating with the DOJ. In its plea agreement filed in U.S. District Court in Chicago, ADM admits that its representatives attended meetings in the United States and overseas in which "...agreements were reached as to the prices the firms would charge for citric acid...and the volume of citric acid each firm would sell."

On December 9, 1996, four companies submit an offer to pay $94.25 million to settle the class-action private antitrust suit concerning the citric-acid overcharges in San Francisco District Court. The offers include ADM for $35 million (made in early October), Hoffman-LaRoche for $5.68 million, and Jungbunzlauer for $7.57 million (both made in late October). The latter two companies imported citric acid made in their French, German, and Belgian factories. The fourth company was Haarmann & Reimer, a wholly owned subsidiary of Bayer AG, which offered $46 million. The DOJ signaled its approval of the $94 million private class-action suit by indicating that it would not seek further civil damages for injured buyers.

Hans Hartmann, a German senior manager of H&R, was indicted for criminal price-fixing in January 1997. In addition, Bayer agreed in January 1997 to pay the DOJ a criminal fine of $50 million for its role in the citric-acid case. In March 1997, the remaining two co-conspirators pleaded guilty to price fixing in the U.S. citric-acid market. Jungbunzlauer and Hoffmann-LaRoche supplied the U.S. market from its Western European facilities; they paid hefty fines of $11 and $14 million, respectively. Two executives of these Austrian and Swiss firms also pleaded guilty to criminal price fixing and paid small fines. Whether other importers from Europe or China cooperated with the cartel is not known, but they were probably not active members of the conspiracy. Thus ended the governments role in the lysine and citric acid cases, which Gary Spratling of the DOJ termed "...one of the largest—if not the largest—conspiracies ever prosecuted by the Department of Justice."

Federal officials emphasized that the $105 million paid in corporate criminal fines for citric acid (as well as the $91.3 million for lysine) could have been even larger had the four companies not helped the DOJ investigation. Under DOJ sentencing guidelines the fines paid could have been as high as double the overcharge for the two year conspiracy. Joel Klein, acting chief of the Antitrust Division, specifically refused to identify the total overcharge in the citric acid case at a January 29, 1997 press interview. Therefore, all we know is that the $105 million fines were discounted substantially from the maximum possible fine, perhaps by 25 to 50 percent. If so, the true overcharge by the conspirators ranged from $70 to $105 million for the two-year period. The two most reliable sources on U.S. citric-acid production are slightly inconsistent, but annual U.S. consumption (production plus met imports) was in the range of 300 to 425 million pounds per annum in 1994-1996 (CMR, USITC). The most accurate consumption figure seems to be 366 million pounds, and the most reasonable price around $0.80 per pound. Therefore, total 1994-1995 wholesale sales were around $615 million. An overcharge of $70 to $105 million implies that prices were raised by 12 to 18 percent.

The role of Cargill in the citric-acid conspiracy remains obscure. Cargill accounted for about 30 percent of the U.S. citric-acid market in those years. Cargill steadfastly refuses to admit that it participated in price-fixing and has refused to negotiate with plaintiffs in the private suits(which are

still pending). Even if Cargill is not liable, as seems likely at this point, it may have raised prices to the level that the price-fixers were charging; under the law, the conspirators are liable for Cargill's over-priced sales. If Cargill kept its prices low, then the $70 to $105 million overcharge simply refers to a smaller sales base; in this case the conspiracy raised prices by 17 to 26 percent. In sum, the citric-acid conspiracy raised prices by 12 to 26 percent.

Corn Sweeteners

The least information is available concerning the alleged price-fixing in corn sweeteners. It is not even clear that HFCS was the sole sweetener suspected of being the object of price fixing.

For ten years the DOJ pursued a civil price-fixing charge regarding HFCS against ADM and others in the Des Moines U.S. District Court, which dismissed the government's case in 1991. Whether this dismissal emboldened ADM to initiate new price-fixing agreements is not known, but price-fixing discussions (illegal in themselves) began in late 1992. In June 1995, the DOJ established a federal grand jury in Chicago, Illinois to investigate price-fixing in lysine, citric acid, and HFCS. At least four companies were subpoenaed: ADM, Cargill, CPC International, and A.E. Staley. These defendants tried to get the civil cases consolidated into one class-action suit and moved back to the same judge that dismissed similar cases in Des Moines in 1991. The number of private HFCS suits rose to a maximum of 28 by February 1996.

By early 1996, the grand-jury probe of the criminal HFCS case had moved to Atlanta. Two of the largest buyers, who control nearly 75 percent of the market, declined to sue ADM *et al.* The high buyer concentration and the absence of tapes showing ADM meeting with other corn-sweetener manufacturers weakened the government's case from the beginning. By September, ADM had offered settlements in both the lysine and citric-acid private class-action suits, but the HFCS class-action lawsuit in Peoria, Illinois was left unchanged by defendants. However, CPC International did agree to pay $7 million to settle private suits against it. Cargill consistently denies any knowledge of price fixing in HFCS; this position is backed up by an interview published in *Fortune* by Mark Whitacre, who quotes M. Andreas as saying that Cargill would never participate in price fixing.

In October 1996, as part of its plea agreement with the DOJ, ADM is granted immunity from criminal prosecution in the corn-sweeteners markets during 1992-1995. The DOJ says that its Joliet, Illinois grand jury investigation of price fixing in these markets by other companies will continue. No progress has been noted recently in this investigation.

Other Products

Lysine and citric acid are but two of a long list of synthetic organic chemicals now being made by ADM, Cargill, and other wet-corn milling companies. Maize fermentation technologies are being applied to produce a widening array of organic chemicals at lower costs than traditional methods. The rapid growth of specialty chemicals made from corn starch is partly the result of encroachment of wet-corn millers into the traditional synthetic organic chemicals industry, which had sales of nearly $100 billion in 1995 (USITC). These products include food ingredients (such as sorbitol), feed ingredients (tryptophan), and medicinals (ascorbic acid).

While these chemicals are made by more than 700 U.S. manufacturers, the number of domestic sellers of the individual products is at times minuscule. For most specialty organic chemicals, only one to three domestic producers are active (USITC). For example, ADM was one of three U.S. Manufacturers of lactic acid, sodium lactate, and sodium gluconate in 1994. As wet-corn millers continue to move into these specialty chemical markets with their high sales concentration, the opportunities for price-fixing many increase. Moreover, public information on these markets is getting worse. The ITC's report on the synthetic organic chemicals industry, which it published annually for nearly 80 years, was terminated by order of the Chairman of the ITC's Congressional oversight committee, an unusual intrusion into the operations of an independent federal agency.

Measuring the Injuries

The courts have held that price-fixing is *per se* illegal under the 1890 Sherman Act. That is, prosecutors need only prove that an agreement (a written or verbal overt contract) was "beyond a reasonable doubt" made to restrain prices or output; it is not necessary to prove that the agreement was in fact put into operation or had any measurable effects on prices or output to establish illegality. A conspiracy to raise (or lower) prices is illegal even if no economic harm can be identified.

However, antitrust offenses typically do cause economic harm to many groups: rival firms, buyers, suppliers, employees, shareholders, and other stakeholders. The adverse economic effects of illegal anticompetitive acts are called *injuries*. An injured party that can establish that an antitrust violation was the direct and identifiable cause of an injury is said to have *standing*. Standing is the right to stand before a court of law and sue a perpetrator for compensation for the injury. The compensation is termed *damages* under the law. If a cartel raises prices in an industry, rivals outside the cartel have no standing, but buyers probably would.

Thus, plaintiffs in a civil antitrust case bear a heavier burden of proof than in a criminal case. The plaintiff must prove "with reasonable certainty" that the violation occurred (and may use evidence from an earlier criminal proceeding to do so); that it suffered a compensable harm as a *result* of the violation; and that the harm occurred within the statute of limitations (civil actions must be initiated no later than four years after cessation of the violation). Estimating damages is the work of economists, accountants, and other experts.

Economic Theory and the Law

In order to estimate damages, a plaintiff must determine the difference between the revenue or profits actually earned during the period of unlawful conduct and what would have been earned absent unlawful conduct. The amount of damages will also depend on which parties have standing (Page).

Figure 4 illustrates the overlap between economic concepts of injury and the legal treatment of damages in the case of an effective price-fixing conspiracy. There are five potential groups that may be harmed by price-fixing. (Although illustrated by a case of raising the selling price of a finished product, the analysis also applies to cases where a cartel
colludes to reduce the price paid for an input).

The first and clearest case of damages occurs in the case of actual *direct purchasers* who pay an inflated price called the overcharge (rectangle A in Figure 4). Direct buyers of lysine spend $P_m Q_m$ during the conspiracy, which generates "excess" or "monopoly" profits of $(P_m - Mc_m)Q_m$.[3] Under economic reasoning the entire monopoly profits rectangle is a transfer from buyers to the cartel and should be considered damages, but under legal standards only $(P_m - P_c)Q_m$ is recoverable as damages. Direct buyers of lysine have had standing to recover the overcharge since the first federal case was decided in 1906.

A portion of the overcharge is passed on to the *indirect* buyers of products containing Q. In the present case, hog and poultry farmers who buy prepared animal feeds containing lysine are harmed by the higher price of animal feed. Indeed, if an indirect buyer has a "cost-plus" contract with a feed manufacturer, *all* of A is passed on to the farmer. With other purchasing methods, A shrinks depending on the location of the *derived* demand and supply curves (not shown in Figure 4). Under many state antitrust statutes, indirect overcharges are recoverable in state courts, but since the famous *Illinois Brick* decision of the Supreme Court in 1977, no standing is given to indirect buyers in federal courts. Since 1977, bills have been introduced in Congress each year trying to overturn the *Illinois Brick* ruling, but none has yet passed.

A third group of buyers may be harmed. If a cartel does not contain all the producers in an industry, it may happen that nonconspirators ("fringe" firms) raise their prices toward P_m (the "umbrella" effect). Direct buyers from noncartel sellers are harmed, while the fringe firms enjoy serendipitous excess profits during the conspiracy period. There is no Supreme Court ruling on standing in this case, but while U.S. District Courts are split on the issue, the great majority have allowed standing. Thus, cartel members are liable to pay damages even to direct buyers of output sold by nonparticipating sellers. This type of injury does not apply to lysine (because all sellers in the world belonged to the conspiracy), but it may apply to citric acid or HFCS.

A fourth group harmed by price-fixing is those forced to buy inferior substitutes or those who reduce their purchases in response to the higher price. This injury is represented by the consumer portion of the dead-weight loss (triangle B in Figure 4). Although well accepted in economic theory, the parties incurring deadweight losses generally have been denied standing.[4] However, the courts might allow damage claims if the parties can show "a regular course of dealing with the conspirators" during nonconspiracy periods. Moreover, one could argue that the deadweight loss should be computed when assessing penalties in *public* trials even when they are not permitted in private antitrust suits.

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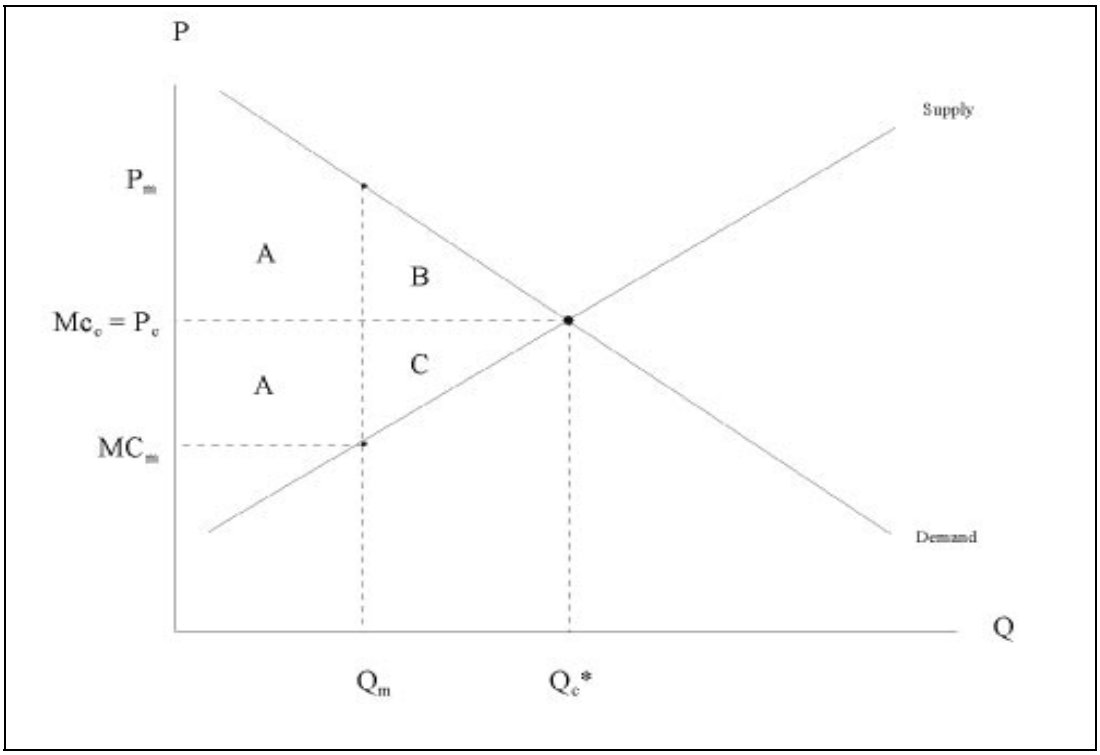
[3]The lower half of rectangle represents short-run economic profits; in the long run profits will be smaller if there are fixed costs of production because the average total cost curve will intersect Q_m above MC_m.

[4] The legal reasoning is that treble damages are meant to deny conspirators the fruits of their illegal conduct, but the deadweight loss is not a gain to conspirators. The courts view these losses as "remote" and identifying which non-buyers are injured as a speculative exercise. Many legal commentators believe that actual calculation is problematic, but the formula shown in Figure 4 is quite feasible.

Figure 4. Price Fixing: Injuries and Standing



P is price, MC is marginal costs, Q is output, c is perfectly competitive case, m is observed market or monopoly case.

Five Groups

A Overcharge to direct purchasers from cartel (e.g. lysine buyers). Courts always allow standing. $A = (P_m - Mc_m)Q_m$ or $(P_m - P_c)Q_m$

A´ Indirect or Derived Overcharge (portion of A passed on to indirect buyers, e.g., animal feeds buyers). Some state courts allow standing, U.S. not since 1977.

A˝ Portion of overcharge paid by direct buyers from noncartel ("fringe") suppliers that raised their prices toward P_m. No U.S. ruling; District Courts are split but have allowed payments in major beef and salmon cases.

B DWL to buyers forced reduce their purchases or to purchase an inferior substitute. Courts allow claims from nonpurchasers that were regular clients of the conspirators, but proof is viewed as difficult. DWL $= \frac{1}{2}E_d(P_m - P_c)^2 \; P_cQ_c$.

C DWL to suppliers of factors of production to cartel members (reduced derived demand due to output contraction). Usually input suppliers have no standing because courts consider injury "remote". An exception is made for injured whistle blowers.

The last injured group are those supplies of factors of production to the conspirators who lose sales or income due to output contraction. This corresponds to triangle C in Figure 4, the supply side of the deadweight loss. The courts do not usually allow standing for such parties, such as workers forced into unemployment, because the injuries are viewed as indirect or remote.[5] A clear exception is that standing is allowed for employees who were fired because they refused to participate in price-fixing arrangements or became whistle blowers.

Empirical Estimation Issues

Estimation of the overcharges to direct buyers is in principle straight forward. P_m, the actual price paid by buyers, and Q_m the volume sold, can be obtained from the business records of the plaintiffs or more conveniently from the cartel members during the pre-trial process called "discovery." Other information required is P_c, the price that would have governed sales "but for" the illegal conspiracy and the length of the conspiracy period.

Determination of the unobserved "but for" price P_c is often the most contentious area of expert opinion. The correct level of P_c can be calculated in four ways: the "before and after" approach (that is, examining price levels immediately before or after the known conspiracy period); time-series econometric estimation of demand and supply relationships to obtain the competitive price (a dummy variable can be inserted to model the conspiracy period); obtaining information on costs of production by the conspirators (proprietary information on production capacity, utilization, variable costs, and fixed costs); and theoretical oligopoly models that require information on actual concentration among all sellers (not just the cartel) and elasticity of demand for the cartel's product.

An analysis of the lysine overcharge and deadweight losses using the first approach is shown in Appendix B. The overcharge was based on an *assumed* period covering two conspiracy periods of 31 months during 1992-1994. The *inferred* P_c was \$0.70 per pound for lysine, so the monthly differences between the actual lysine price (P_m) and \$0.70 yielded an overcharge estimate of \$155 million to \$166 million (see Figure 2). The inferred competitive price was backed up by credible information that ADM's cost of lysine production was \$0.66 per pound during most of the conspiracy period (if the Asian producers had higher costs, the overcharge might be less). The deadweight losses were estimated to be \$5 to \$14 million, or 3 to 8 percent of the overcharges.

Defendants' economists (both were former Chief Economists of the Antitrust Division of the Department of Justice, one serving during the Nixon-Ford years and the other during the Reagan administration) made several criticisms of these estimates, but they never provided alternative estimates of their own. First, the defendants argued that the first conspiracy period was never effective and that the conspiracy ended in July 1995 about the time of the FBI raid in Decatur. This may be a just criticism, though there is conflicting evidence in the public records and no court

[5] Legal theory supports the identification of producers' deadweight losses as compensatory harms. Buyers who buy less during a conspiracy are harmed as directly as those who continue to buy at the higher price. Those who stop purchasing are in the same position as those who stop buying because of a refusal to deal; both are being illegally prevented from entering into a beneficial transaction.

testimony on the subject. If correct, the overcharge estimate is reduced to about $120 to $130 million. Second, the defendants suggested that there was a pronounced annual seasonality in lysine price movements that would account for some of the upward movements observed during the alleged conspiracy period. This is also a criticism with some face validity. Animal feeds use peaks somewhat in the winter months, so regular season shifts in the derived demand for lysine might well induce systematic seasonal patterns in lysine prices. However, the four years of data available are too few to test this notion satisfactorily, and the fact that lysine is storable suggests that the idea should be treated with skepticism.

As expected, the third and most serious issue turned on the proper height of P_c. It is in general illogical to identify P_c simply on the basis of the lowest observed prices. The $0.70 price was the average each of two periods (May-July 1992 and April-July 1993) that were given to be nonconspiracy periods. If the conspiracy period assumption is correct, then this procedure is a reasonable method of determining the "but-for" *competitive* price. However, the defendants made a more interesting economic argument concerning P_c. They presented data that demonstrated that the lysine market was highly concentrated (HHI = 3500), with high barriers to entry, no product differentiation, and large numbers of dispersed buyers. This information was available to the defendants but not to the plaintiffs prior to a July 1995 hearing, but there is little basis on which to doubt that the lysine industry has an oligopoly structure. Perhaps the only debatable portion of the assertion is that the animal feeds industry was atomistic; on a national basis that is true, but the animal-feeds market is geographically localized, which would imply moderate levels of buyer concentration.

The defendants then go on to assert that, given such a market configuration, "conditions are conducive to the implicit oligopolistic coordination that would keep prices substantially above the long run [competitive] price..." Moreover, they assert that the homogeneous Cournot model is the appropriate model to use to calculate the "but for" price and that P_c would be well above $0.70. In other words, the defendants take the position that in the absence of *overt* collusion (price-fixing) the lysine industry would have generated supra-competitive prices using a method of *tacit* collusion ("implicit coordination" of prices or output). Moreover, without admitting that P_c was actually within the range of their illustration, they hint that P_c was mostly well above the $0.70 figure (Table 3). The predicted Cournot price is very sensitive to the assumed elasticity of demand for lysine by feeds manufacturers. In fact, the price is *infinite* if the elasticity is equal to the HHI of 0.35 and *negative* if less than 0.35 — a patently nonsensical result. The predicted price is also quite sensitive to the marginal costs of production which for ADM is believed to have been between $0.60 and $0.70 per pound. The model assumes that all firms in the cartel had equal cost structures, but the Asian lysine producers' were probably higher than ADM's costs. Although it is likely that the elasticity is likely between 0.15 and 0.50 (see Appendix B) for individual feed types (i.e., meat animal species), it is possible that lysine buyers can easily shift among feed types. In this case the proper derived demand comes from all meat, poultry, and fish (except beef), and this is likely to be quite inelastic, perhaps in the 0.10 to 0.40 range that yields the most ridiculous price expectations. Given information about the monopoly price (P_m during the conspiracy) and marginal costs, it is possible to *derive* the exact elasticity from a well known monopoly formula. During the height of the conspiracy in 1994, P_m varied from $1.10 to $1.20. Marginal costs for ADM most likely varied from $0.60 to $0.70. Under these price-cost conditions, the cartel was behaving as if it believed that demand was highly elastic (-2.00 to -2.75).

There are several fundamental problems in assuming that Cournot pricing is the appropriate but for" model. One might first ask why Cournot was chosen in the first place. Defendants' economists said that it is the oldest, the "standard model," and the oligopoly model "most often used by economists." All true, but irrelevant. The truth is not the result of a popularity contest. The main reason that the Cournot assumption is the one made most frequently by economists is because of its "mathematical tractability" (Kwoka & White, *The Antitrust Paradox,* p.11). Indeed the Bertrand homogeneous model is nearly as popular, but using Bertrand was not in the defendants' interest because with three or more firms, Bertrand predicts an equilibrium price identical to the perfectly competitive price! It is also possible to question whether Cournot, Bertrand, or any other theoretical model with tacit collusion is reasonable for the lysine industry. Case studies generally support the proposition that long term historical interaction among firms must occur before companies can learn to cooperate for mutual benefit. It is doubtful that the 1991-1992 price war was the kind of experience that would induce *tacit* cooperative behavior over the 1992-1995 period. As in so many aspects of industrial organization, theory cannot solve this conundrum, only rigorous empirics can.

Many economists might have profound philosophical objections to adopting an oligopoly model as the standard of comparison in a price-fixing case. The fundamental purpose of the antitrust laws is uproot the sources of market power so as to maximize consumer welfare. The perfectly competitive market, while rarely achieved in practice, does that. Adopting an oligopoly price as the benchmark leads to a *reductio ad absurdum*. Future developments in theory might well lead to the publication of an oligopoly model that predicts the monopoly price. Or, defendants might argue that they intended to merge their operation into one legal organization. In either case, the "but for" price becomes the monopoly price and the justification for antitrust laws vanishes.

Public Penalties and Private Awards

There are many legal sanctions and remedies for price-fixing violations, and the ADM affair has signaled a significant escalation in those penalties (Table 2).

First of all, federal or state prosecutors have to decide whether the price-fixing is serious enough to warrant criminal charges or merely a civil suit. Criminal charges require that the prosecution prove "beyond a reasonable doubt" that defendants intentionally conspired to raise prices; that means that a jury must be convinced that there is no possible alternative explanation for the agreement. In a civil case, the standard of proof is lower, "the preponderance of the evidence." Under federal statutes only the Department of Justice can bring criminal antitrust cases.

When conspirators are informed of the charges against them, negotiations between prosecutors and defense lawyers begin. If the defendants refuse to admit their guilt, a trial occurs within a year or two. With a guilty verdict by a jury, the prosecutors propose separate penalties for the company and for the individual managers who colluded, and a judge makes a final determination of the penalties. If during pre-trial negotiations the defendants agree to plead guilty, prosecutors will usually propose lower fines and jail terms. Penalties for individuals may include up to three years in jail and $350,000 in fines. So far, five managers have pleaded guilty and paid small fines, and three more have been indicted and face large penalties. Up until 1991, the maximum penalty for guilty

Table 3: Hypothetical Equilibrium Price Under Homogeneous Cournot Conditions.

Marginal Cost of Lysine	Own-Price Elasticity of the Derived Demand for Lysine in Animal Feeds						
	-0.20	-0.40	-0.50	-0.60	-0.70	-0.80	-0.90
	Dollars per Pound						
$0.40	-0.53	3.20	1.33	0.96	0.80	0.71	0.65
$0.50	-0.67	4.00	1.67	1.20	1.00	0.89	0.82
$0.60	-0.80	4.80	2.00	1.44	1.20	1.07	0.98
$0.70	-0.93	5.60	2.33	1.68	1.40	1.24	1.15
$0.80	-1.07	6.40	2.67	1.92	1.60	1.42	1.31

Note: Assumes HHI = 3500, entry is blocaded, homogeneous product, all manufacturers with identical costs of production, and that each firm conjectures that all other firms will hold output constant if the firm changes its output. The predicted price is negative when ever the elasticity is less than 0.35 (HHI) and is infinity when equal to 0.35. If elasticity is -2.0, the price varies from $0.49 to $0.97.

companies was $10 million, but in 1991 new sentencing guidelines permitted assessing fines that were double the profits or double the injury done to buyers.

The first application of the "two-times" rule in 1995 resulted in a $15 million fine. The second time this rule was invoked was against ADM in October 1996 when it was fined $70 million for the lysine conspiracy and $30 million for its leading role in the citric acid conspiracy. These fines were front-page news around the world. However, it should be noted that the DOJ explicitly rewarded ADM with a discounted fine because the company agreed to cooperate in prosecuting two of its own officers (M. Andreas and T. Wilson) as well as the officers of Asian, Swiss, and Austrian co-conspirators. The Asian lysine producers got even larger discounts. The size of the discount awarded to the lysine producers for their good behavior is not known, but could be as high as 50 percent. In addition, the DOJ agreed to forgo prosecuting ADM for its role in the potentially larger corn-sweeteners case, albeit the weakest of the three commodity price-fixing cases. Thus, the $70 million lysine fine is at most a minimum indicator of the true overcharges incurred by buyers of lysine.

ADM had a U.S. market share of 48 to 54 percent during 1994-1995. The defendants maintained in court that the conspiracy was effective for only 18-20 months, but it could have been as high as $140 million. Therefore, one can infer that the total overcharge on buyers of lysine was *at least* $65 million to $73 million during an 18 to 20 month period, but it could have been as high as $140 million. Sales of lysine during that time were estimated to be $495 to $550 million, so the conspiracy raised lysine prices by a minimum of 12 to 15 percent.[6]

When guilty pleas are entered, normally a civil class-action suit is formed by injured private parties seeking treble damages under the Clayton Act. The lysine case is more complicated because the class-action suit was settled in July 1995 for $45 million and accepted by all but 32 larger feed manufacturers who opted-out of the agreement. Note that the $45 million represents *treble* damages, or three times the implicit overcharges. In other words, the feed companies who took the early and safe money (apportioned according to procurement shares) got a bad deal. The $45 million was only 25 to 35 percent of a *minimum* estimate; had they waited the feed manufacturers could have received damage awards of $130 to $165 million.

The opt-out firms have negotiated privately with ADM, Ajinomto, and Kyowa Hakko to arrive at an agreement on damages. Unless those negotiations break down (and there are no signs that they have) so that the cases go to open court, the treble damages paid to these firms will never become public. They should be able to recoup 15 to 20 percent of their purchase values of lysine if their lawyers do their jobs well. Tentatively, it appears that these feed manufacturers will receive about $15 million or more.

There is more information available on the citric-acid case. ADM was assessed a $30 million criminal fine by the DOJ, and three European co-conspirators were fined an additional $79 million (Table 2). The time period is not known, but probably covers about two years (1994-1995). ADM's fine was discounted from the maximum application of the "two-times" rule, but the fine assessed Bayer seems to be closer to the maximum. Bayer's U.S. subsidiary Haarmann & Reimer had a 31 to 33 percent capacity share of the U.S. market. Thus, the total overcharge by all four cartel members was at least $155 to $160 million. The U.S. ITC survey reports that 1994-1995 manufacturer sales were from $525 to $555 million; net imports were $54 million (Stat-USA). However, *CMR* reports higher U.S. citric-acid consumption, which at prices of $0.79 to $0.85 per pound implies sales in the range of $680 to $730 million. Therefore, the citric-acid price-fixing overcharge was from 22 to 30 percent of industry sales during 1994-1995.

The private parties in the San Francisco class-action suit are allowed to claim damages that are treble the actual overcharge. Based on the cumulative DOJ penalties as of March 1997, treble damages in citric acid ought to be at least $230 to $240 million. However, seven weeks before the DOJ announced the huge criminal penalty on Bayer, the parties in the class-action suit agreed to payments of only $94 million. At the time, the lead attorney for the plaintiffs stated that "We think this is an excellent result for the class..." In retrospect, the class-action settlement seems like a good deal for the defendants, with plaintiffs getting less than half of what is due them.

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[6] Application of the full "two time" penalty rule in the future will become an important data source for IO economists and will assist plaintiffs in ascertaining the expected treble damages due in subsequent private civil actions.

In summary, price-fixing overcharges on lysine and citric acid amounted to at least $220 million. Yet. Proposed class-action settlements announced *prior* to the full imposition of criminal penalties amount to a paltry $139 million, which is as little as 20 percent of the potential private damages due to plaintiffs.

Conclusions

The world markets for lysine, citric acid, and many other specialty products of the wet-corn milling industry have the structural characteristics that facilitate collusive price-fixing conduct. In most cases the products made by fermentation of corn starch are homogeneous and have few, if any, close substitutes over normal price ranges. Corn refining technologies increasingly are able to produce low-cost versions of many synthetic organic chemicals used as food or feed ingredients or medicinals, and the lower prices will make substitution even less likely in the future. The markets for these new biotechnology products are typically tight oligopolies: few sellers, high sales concentration, high barriers to entry due to scale economies or technological secrecy, large numbers of buyers, and the absences of price information from open markets.

Archer Daniels Midland had a corporate culture and a decision-making structure that made it prone to the high-risk game of price-fixing. ADM was conditioned to viewing markets not so much as inexorable engines for price formation but as creatures malleable to the intervention of regulators, politicians, and powerful businessmen. ADM's leaders were used to thinking that the whole world was its oyster, that global domination of trade was an achievable goal, and that active multinational networking is an essential means to that goal. The company prided itself in its quick, decisive, and large-scale moves into new industries, even if technological barriers were to be skirted by ethically dubious methods. The dismissal in 1991 of price-fixing charges against ADM concerning HFCS and the looming slowdown in most of its soybean and corn sweetener lines of business may have been among the proximate causes that prompted ADM to embark on its reckless decision to form two or more international cartels. ADM's reputational loss may in the end far outweigh the financial losses it has suffered.

Something there is that doesn't like a big, successful company that fairly exudes hubris. The Department of Justice, smarting from the loss of a major international diamond cartel case, pursued ADM with everything it had. Of course, targeting high profile companies is a wise use of constrained administrative resources because the deterrence effect is so large, but the DOJ's vigor may well have been driven by a hubris of its own (Preston and Connor). In any case, the DOJ sought and received levels of penalties that have markedly changed the rules of the price-fixing gambit. Price-fixers now face public penalties and private damages that are *five times* their ill-gotten gains, nearly a doubling of their previous exposure. Moreover, if the "two-times" rule for fines is fully applied, then private plaintiffs will have a sure guide to the treble damages to which they are entitled. Thus, the new penalty guidelines may lower the time, uncertainty, and costs of legal negotiations.

The "two-times" rule for fines was applied by the DOJ to four price-fixing conspirators in the U.S. lysine market and four conspirators in the U.S. citric-acid market for the period 1994-1995. Total corporate criminal penalties were $91 million for lysine and $105 million for citric acid, but these fines are known to be less than the maximum possible because several of the perpetrators were

rewarded with reduced fines because they agreed to cooperate with prosecutorial investigations. Based on the public record, it is apparent that ADM paid proportionately the largest lysine fine and Bayer the largest citric-acid fine. From their market shares it is possible to infer that total price-fixing overcharges were at least $200 million or about 20 percent of U.S. sales in the two markets. Because they were international conspiracies, additional overcharges were very likely incurred by buyers of lysine and citric acid in Canada and other parts of the world. Lysine exports from ADM's plant doubled in 1996, the year after the price fixing ended, and it is likely that production restraints on other lysine and citric-acid plants were lifted as well. No information was released on the effectiveness of price fixing outside the United States, but as 60 percent of the world market is outside the United States, non-U.S. overcharges were probably substantial. The final point is that private parties in the United States were entitled to treble damages of at least $600 million (but possibly as much as $900 million, depending on the DOJ's discounting policy). As of March 1997, proposed civil settlements for lysine and citric acid are known to total only $140 million.[7] Therefore, private parties in the United States have so far recovered only 15 to 25 percent of the maximum allowed under the antitrust laws. The haste with which class-action settlements were reached in July 1995 (lysine) and late 1996 (citric acid) is one reason for the low damages.

Perhaps the most important lesson of the ADM scandal for antitrust enforcers is the ease with which an international cartel was formed and executed. ADM and Ajinomoto apparently led the lysine conspiracy, coercing the two smaller Asian companies (Kyowa Hakko and Sewon) into joining. With just two or three top managers from each company attending meetings around the world every month or two, the conspirators were able to arrive at complex allocations of plant production, exports from three countries, and sales to at least four distinct continents that were, if not optimal, highly profitable. The cartel hung together in the face of gyrating and uncontrollable soybean and corn prices and a presumptive cultural chasm between ADM and its three co-conspirators. On the other hand, the Japanese companies hailed from a national business culture that rewards corporate cooperation.

Management of the citric-acid cartel was if anything even more challenging. The cartel controlled output from three U.S. plants (two owned by Bayer, one by ADM) and five European plants (three belonging to Jungbunzlauer, one to Hoffmann-LaRoche, and one to ADM). Additional complexity in coordinating output restrictions was provided by the apparent absence of Cargill's formal cooperation (though it may have passively followed) and the more aggressive and erratic sales by Chinese government-owned chemical companies (probably acting in consort). Reports suggest that cheap Chinese exports to the U.S. market may have been tamed partly through the intervention of U.S. trade officials acting at the behest of ADM, Cargill, or Bayer. As in the lysine case, initiative in the citric-acid cartel was taken by ADM and one large partner, the U.S.-based subsidiary of Bayer; the other two European exporters with only 16 percent of the U.S. market simply fell into line at some point.

The multinational character of these two conspiracies underscores the need for extraterritoriality and international coordination among the world's major antitrust agencies. U.S.

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[7] Some plaintiffs that were not members of the lysine class-action suit have probably settled secretly. Moreover, some lysine buyers may not have sought damages.

law is now clear that U.S. authorities can seek redress from off-shore conspiracies that affect the U.S. trade or domestic commerce. However, effective national prosecution is limited by the existence of significant assets in the nation's territory. Formal annual meetings have recently begun among the U.S., Japanese, European Union, and other antitrust agencies. Cooperation is probably limited to sharing of information and prosecutorial procedures; the era of coordinated legal prosecution seems far off.

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APPENDIX A

Chronology - Lysine and ADM*

- Prior to 1960, produced for decades synthetically by the organic chemicals industry at high price (about $2.00 to $2.50 per pound).

- In 1960s, one or more Asian companies discover a biotechnology that converts dextrose into lysine by bacterial fermentation.

- Circa 1988, ADM discovers why Asian companies are importing so much dextrose from USA — to make lysine.

- In 1989, ADM commits $150 million to build the world's largest lysine plant in Decatur, IL. At 250 million pounds rated annual capacity, more than 50% of world supply in early 1990s. Eventually invested $1.5 billion in its Biotech Division 1989-1995.

- October 1989. ADM hires Mark Whitacre to head the new lysine division (B.S., M.S. Animal Science, Ohio State U.; Ph.D. Biochemistry, Cornell U.), then 32 years old.

- In 1990, U.S. imports reach $39 million at a price of about $1.00/lb.

- U.S. price reaches $1.30 in 1990. U.S. consumption is 150 to 200 million pounds, so U.S. market is worth $200 to $250 million.

- ADM builds plant in record time. Production starts February 1991. "Tremendous price war" begins.

- In 1991, a federal judge dismisses a 10-year antitrust case brought by the DOJ against ADM and others that alleged price-fixing in the corn fructose industry.

- ADM's price drops to as low as $0.60 in early 1992; ADM's market share soars, but is "...losing...a few million dollars a month." [Whitacre]

- In early 1992, both the lysine and citric acid divisions are reorganized, placed under V.P. Terrance Wilson, head of corn products. Wilson urges Whitacre to meet with lysine producers.

- April 1992: Whitacre meets with Ajinomoto and Kyowa Hakko in Japan. ADM has ⅓ of world market and all are losing money at $0.60/lb. Whitacre proposes forming an "amino acids trade association."

*Gleaned from dozens of articles in *Fortune, Wall Street Journal,* and similar sources.

- June 1992: Wilson, Whitacre, and Japanese managers have the first meeting of the "lysine association" in Mexico City. First of many meetings around the world. They discuss prices and volumes. Wilson repeats an ADM mantra:

"The competitor is our friend, and the customer is our enemy".

- August 1992: Japanese producers apparently are skeptical of ADM's large volume claims, so Ajinomoto and Kyowa managers and engineers tour ADM's Decatur plant to prove size of ADM's capacity.

- October 1992: Whitacre reports fermentation problems and suspects deliberate contamination. Dwayne Andreas asks an FBI friend to help with suspected sabotage in fermentation operations. Michael Andreas was "pissed off" and tells Whitacre not to cooperate fully with FBI (i.e., not to reveal "lysine association").

- November 1992: Whitacre talks privately with Decatur FBI chief and agrees to become a "mole". Telephones are tapped and Whitacre is wired. Whitacre is promoted to Corporate VP and eventually earns a salary of $320,000 per year. Whitacre's undercover role lasts officially from January 1993 to July 1995. His FBI contract promises no prosecution for price-fixing activities from November 1992 onward.

- November 1992-June 1995: FBI gets hundreds audio and video tapes of many meetings involving Wilson, Mick Andreas, Whitacre, and Japanese and European managers agreeing to worldwide volume and prices of lysine, citric acid, sweeteners and other corn products.

- The night of June 27, 1995: FBI sends dozens of agents to houses of ADM officers and raids Decatur corporate headquarters of ADM and issue subpoenas for records on corn products from 10 multinational manufacturers: ADM, Cargill, Ajinomoto, Kyowa Hakko, Sewon, Samsung, Tate and Lyle's A.E. Staley, CPC International, Bayer, and Hoffman-LaRoche. Events widely reported in world press.

- June 28, 1995: Whitacre confides his role as FBI mole to John Dowd (attorney of Akin Grump team hired by ADM to interview employees). Whitacre claims that Dowd promised attorney-client confidentiality.

- June 29th: Whitacre ordered to leave ADM headquarters, is formally fired August 7, 1995, and is charged with fraud and embezzlement of at least $2.5 million. (Amount later raised to $10 million). Whitacre hires a personal lawyer to defend himself; he attempts suicide in late August.

- World market about $600 million in 1995; net of exports, U.S. market reported to be $330 million.

- ADM's stock price falls 11% from 6/27/95 to 8/7/5.

- Federal grand jury in Chicago established by DOJ in early June 1995, before raids began.

- Subpoenaed and seized ADM documents show 1992-1995 monthly "sales targets" for lysine and actual monthly sales for three largest world producers.

- July 1995: Kyowa Hakko states that it was a "minor player" in setting lysine prices and that bigger Ajinomoto coerced Kyowa into colluding. Cargill denies involvement in price fixing in citric acid or corn sweeteners.

- July-October 1995: Subpoenaed documents from a dozen firms are received by DOJ investigators. ADM stock price falls 24% or by $2.4 billion in market value.

- September 1995: More than 20 civil suits filed against ADM by buyers of lysine, citric acid, or HFCS. Several seek class-action status. Some want consolidation across products or change in venue.

- November 1995: ADM faces 11 private antitrust suits by lysine users. More than 30 shareholders sue for "material mismanagement." Total suits rise to more than 70. M. Andreas and Wilson told they will be indicted by the DOJ.

- February 1996: Total suits against ADM reaches 85+, including 14 by lysine buyers or groups of buyers. Some of these are later consolidated. ADM creates a "reserve fund" to pay suitors, but size is unknown, and states that it is willing to consider settling out of court (SEC filing). ADM's legal costs for October-December 1995 reach $6 million.

- March 1996: Michael Andreas (Exec. VP), James Randall (President), and two more ADM officers resign from the 17-member ADM Board. Board will consist of majority "outsiders" for first time. Dwayne Andreas (77 years old) remains Chairman, CEO, and Board member; other Andreas' close friends include brother Lowell, M. "Happy" Rockerfeller, Ray A. Goldberg, Ross Johnson, and Brian Mulroney (former Canadian premier and lawyer representing ADM in Canada).

- Spring 1996: DOJ's case falters because not a single ADM officer will agree to cooperate; Wilson refuses to plea-bargain; in a very unusual move, DOJ announces that D. Andreas is not a target. Whitacre's testimony is weakened by ADM's embezzlement suit and by his own admission that he did not pay taxes on at least $10 million in income. Some large lysine buyers (e.g., Tyson Foods) refuse to cooperate (Don Tyson is another close friend of D. Andreas). Powerful Washington law firm of Williams and Connolly hired to defend ADM from DOJ lysine prosecution.

- March 1996: ADM and its Board now have 70 civil suits against them. In an unusual move, all three grand jury cases against ADM *et al.* come under the supervision of No. 2 DOJ antitrust official; shows government's high priority and extreme caution.

- April 1996: For the two years 1994-1995, ADM, Ajinomoto, and Kyowa agree to pay "treble damages" of $45 million ($25, $10, and $10 million, respectively) to all buyers who agree to join a class-action group. Settlement was negotiated by Kohn, Swift and Graf of Philadelphia which won a novel January legal-services auction. Kohn's fees were the lowest offered (capped at $3.5 million for any settlement $\geq$ $25 million). Such a fee arrangement offers perverse incentive to settle with haste. Kohn, never hired any economic experts, and completed the deal a shockingly swift time (3 months). (Normally, civil suits are negotiated and tried and settled *after* criminal cases settled, but ADM *et al*. have not yet been indicted!) Judge Milton Shadur must approve this class-action deal. Lysine buyers must decide to join, opt out and pursue a separate suit later, or to bring no actions whatsoever.

  An executive of one large buyer of lysine (probably Tyson) said they will not sue because even at $1.20/lb., it was "still a good buy" compared to lysine obtained in soybean meal; i.e., the buyer was still receiving a *portion* of its consumer's surplus.

  Wall Street reacts positively to the news. ADM's stock rose 2% in one day. If accepted, the class-action settlement would represent an annual overcharge of 1.6% of U.S. sales.

- April 19, 1996: Three replacements on the ADM Board are announced, but two are believed to be "close" to D. Andreas: daughter of retiring ADM VP and niece of a remaining Board member; John Block, Illinois hog farmer, former Secretary of Agriculture, and active member of many associations in which D. Andreas is active.

- May 1996: ADM starts to negotiate actively to settle class-action suits (lysine, citric acid, and shareholders).

- June 1996: ADM fights subpoenas by DOJ concerning Whitacre's untaxed income through phony invoices. Whitacre claims that it was company policy to reward top officers in this way, that it avoided jealousy by junior officers with lower compensation.

- July 10, 1996: 32 ADM lysine customers opt out of the proposed class-action settlement, partly because of analysis by John M. Connor that concluded that a fair settlement would be 11 to 12 times larger than the proposed $45 million. ADM's lawyers and economists criticize the estimate as too high.

- July 15, 1996: Plaintiffs that opted out argue before Judge Shadur that the proposed settlement of $45 million unreasonable and hasty. ADM *et al*. promise to pay that amount. Judge Shadur approves the class-action settlement as "reasonable and fair" on July 21st, but 43 companies decide to "opt out", which frees them to bring their own private antitrust suits. Most of the "opt-out" firms probably settled privately with ADM *et al.* in late 1996 or early 1997, but the terms of these settlements are not revealed. Some of the "opt-out" firms take no action.

- August 27, 1996: In a shocking setback for ADM, the three largest other co-conspirators file guilty pleas in U.S. District Court. Ajinomoto, Kyowa, and Sewon admit price fixing and

agree to testify against ADM. Three executives admit guilt and pay personal fines of $75,000 each and also agree to cooperate with the DOJ.

- September 1996: Two inside ADM Board members resign. D. Andreas's salary remains fixed at $3.6 million; no bonus or merit raise is awarded. SEC filing shows that "outside" directors were paid "unusually high fees" of more than $100,000 per year. One new "outside" director is Glenn Webb, Chairman of Growmark, Inc., a major supplier of ADM. ADM's fiscal 1996 net income was $696 million, a 12.6% decline from fiscal 1995. On June 30th , ADM had $2.5 billion in cash and liquid securities.

- September 22, 1996: ADM files $30 million suit against Mark Whitacre, including $20 million in punitive damages.

- September 29, 1996: ADM offers to pay $65 million to settle two related class-action suits (citric acid and shareholders').

- October 14, 1996: ADM pleads guilty of criminal price fixing and will pay the DOJ $70 million for the lysine conspiracy. It also agrees to help the DOJ prosecute its own corporate officers, M. Andreas and T. Wilson. ADM stock climbs to a record high $21.75, up 5.5% in one day. *Wall Street Journal* claims that the "Andreas Era" at ADM is over.

  Although the fines paid by ADM for lysine are almost five times larger than previous fines, ADM gets two valuable concessions from the DOJ. First, the DOJ will not prosecute ADM for price-fixing in corn sweeteners, potentially the largest case. Second, the DOJ agrees to end a grand jury investigation in Springfield, Illinois of ADM's theft of technology and trade secrets.

- October 15, 1996: The DOJ states that ADM is the first of many price-fixers to pay new higher fines based on the "two-times" rule (up to twice the profits made from the conspiracy or twice the harm to victims, or less if the perpetrator cooperates). Because ADM controlled ½ of the U.S. market, the implied overcharge for 1994-1995 by all three conspirators is *at least* $70 million and treble damages $210 million. This latter amount is 4.7 times larger than the class-action settlement approved by Judge Shadur in July but is about 50% of the amount calculated by Connor for the same period.

- October 20, 1996: Ajinomoto tries to plea "no contest" in criminal price fixing in lysine. (This type of plea cannot be used in evidence in related civil trials). U.S. District Court Judge Ruben Castillo angrily rejected the plea when he learned that Ajinomoto destroyed evidence after the June 1995 FBI raid. Kyowa was allowed to plead guilty and pay $10 million. Kyowa and Sewon stated that they were forced to join the conspiracy because of "threats and intimidation by Ajinomoto and ADM". Nine Ajinomoto executives were granted immunity because they will testify for the DOJ, but the lead conspirator Kazutoshi Yamada was not.

- October 15, 1996: ADM reveals that, during its first fiscal year 1996 quarter ending September 30th, it incurred price-fixing costs of $174.4 million, compared to quarterly operating earnings of $180 million. Of the $174.4 million, $100 million is to settle the DOJ

criminal cases, $25 million for the lysine class-action civil suit, $25.4 million for the proposed citric-acid class-action suit, and $25 million for legal costs for three months (July-September 1996).

- October 17, 1996: ADM holds its annual shareholders' meeting. M. Andreas is placed on "administrative leave" and T. Wilson, age 58, announces his retirement, at a contentious annual meeting. At last year's meeting, Chairman D. Andreas imperiously dismissed the importance of the gathering legal storm and stifled discussion on the price-fixing charges. This year, he briefly apologizes to shareholders. The Board of Directors rejected Andreas' offer to resign. A resolution offered by two major institutional owners to raise ADM's standard of "independence" for outside directors receives an unusually high 42% of the vote. The Board awarded M. Andreas with a 15% raise just before placing him on leave; D. Andreas also gets a smaller pay raise. There is no known successor for the 78-year-old chairman.

- November 1996: the ADM Board names a three-person "Office of the Chief Executive" to assist chairman D. Andreas in managing the company he has led since 1970. The three include James Randall (age 72), long-time President and COO of ADM; Charles Bayless, VP for soybean processing; and a nephew of D. Andreas. Board member Gaylord Coan, CEO of Gold Kist, is named Vice chairman, a title also held by M. Andreas.

- November 1996: Ajinomoto pleads guilty to one count of criminal price fixing of lysine.

- December 3, 1996: A federal grand jury in Chicago hands down four criminal indictments for a price fixing conspiracy in the world lysine market. Under the Sherman Act the maximum personal penalties are 3 years in prison and $350,000. The four are: Michael Andreas, Terrance Wilson, and Mark Whitacre, all former employees of ADM; and Kazutoshi Yamada, managing director of Ajinomoto, whose U.S. subsidiary Heartland Lysine, Inc. is headquartered in Chicago. In late December 1996, an arrest warrant was issued by a U.S. federal magistrate for Mr. Yamada who has refused to come to the United States to face trial. The Japanese Ministry of Justice is considering extradicting Yamada to face trial in the United States. A small South Korean company, Cheil Jedang, Ltd. also pleaded guilty and paid a $1.25 million fine.

  Mark Whitacre, an FBI mole for 2½ years, was apparently charged because he refused to admit tax fraud and wire fraud against ADM; some of the fraud took place while Whitacre was a mole. The DOJ offered Whitacre immunity against pricing fixing charges from the time he began cooperating in November 1992, but he is being indicted for price-fixing activities that took place prior to November 1992. Whitacre claims that the FBI induced him to confess but never told him of his "Miranda" rights.

- Fall 1996: Buyers of lysine that opted out of the class action suit quietly negotiate private agreements with ADM *et al*. Settlement amounts may never be known because ADM does not have to reveal costs of settlement that it decides will not have a "material effect" on its earnings.

- February 1997: DOJ prosecutors allege that international price fixing is becoming increasingly common. There are now 22 federal grand jury investigations of alleged international price fixing conspiracies. The 1995 dynamite case resulted in criminal price fixing please and fines of $25 million on two companies (U.S. subsidiaries of Norway's Dyno Industries and UK's ICI PLC). The 1996 lysine/citric acid cases involved criminal fines of $170 million against six companies.

  However, there are many difficulties in prosecuting such cases. A 1992 conspiracy by Japanese fax paper makers is held up in the courts because one defendant, Nipon Paper Industries, challenges the extraterritorial reach of U.S. laws. (All the other companies pleaded guilty). Moreover, because Japan's market was not affected, the Japanese government will not cooperate. Finally, some conservative U.S. economists think that such prosecutions will injure the free flow of foreign direct investment because subsidiaries are often held "hostage" until fines are paid. In a March 18, 1997 ruling, a federal appeals court made price fixing illegal even if solely foreign companies conspire outside U.S. territory.

  In 1994, the OECD member states signed a draft agreement on greater antitrust coordination and enforcement. Despite good intentions of JFTC, Japanese business practices generally foster price coordination.

- February 1997: In a *Fortune* interview, Mark Whitacre states that in November 1992 (when he began his FBI mole role) ADM had started lysine price-fixing discussions, but had not yet implemented the plan quite yet. (Note that Whitacre has immunity from all price fixing charges beginning in November 1992, but not before). He also quotes M. Andreas as saying that Cargill would never fix prices as a matter of policy. He charges the FBI with suppressing this and other evidence, including price fixing discussions involving D. Andreas and President Jim Randall. When the DOJ found out about the non taxed income Whitacre had received, they canceled certain payments or allowances that he had been promised. Whitacre claims that he has a tape of M. Andreas approving a $2.5 million illegal bonus for Whitacre. Whitacre says that he is being treated for manic-depression.

  In December 1996, the DOJ launched an internal investigation of Whitacre's charges of official misconduct: suppression of price-fixing tapes (about Cargill & D. Andreas), denying Whitacre access to a lawyer or doctor, and failure to follow Miranda rules. Whitacre's charges about FBI misconduct, if true, will be useful to the other ADM defendants.

  Whitacre admits he has tapes about price-fixing meetings and his dealings with the FBI that he has not turned over to prosecutors. In November 1996, those tapes were subpoenaed by a federal grand jury and Whitacre was questioned about them by the panel.

Chronology - Citric Acid

- 1991: ADM enters citric-acid business by buying 3 plants of Pfizer, Inc. Whitacre claims that ADM wanted the technology quickly. In July 1992, the citric-acid division headed by Barrie Cox is placed under ADM's chief of corn products, Terrance Wilson.

- 1991-1993: Increasing U.S. imports of citric acid from China cause price instability. Though of lower quality, prices are 20% below domestic producers. Domestic producers (ADM and Cargill) begin to pressure the U.S. Trade Representative's office to raise or threaten to raise import tarriffs on Asian citric acid.

- June 1995: Citric acid first mentioned as target of federal grand jury after FBI raid on ADM headquarters. Documents on prices and volumes of citric acid producers worldwide are found in ADM files.

- July 1995: Terrance Wilson reported to have met European conspirators in London & Paris hotels. Bayer AG makes citric acid in Europe and in Miles Labs' Elkhart, Indiana plant; says it is cooperating with DOJ. Hoffman-LaRoche is a big importer into the USA from European plants.

- November 1995: ADM faces four private price-fixing suits; rises to seven by February 1996.

- March 1996: DOJ investigation, centered in U.S. Attorney's San Francisco office, said to be moving slowly. No videotapes of price-fixing meetings exist. Documents in ADM offices show that ADM shared detailed sales figures with several European and Asian producers, but ADM will argue that conspiracy arose outside USA without ADM's participation.

- September 1996: With surprising suddenness, ADM offers to settle the class-action suit for $35 million. Plaintiffs had not yet received class-action status in the San Francisco District Court. ADM did not admit guilt in price fixing, but it signals intent to settle the DOJ cases as well.

- October 1996: It is revealed that a committee of 7 "outside" ADM directors was authorized to make any plea agreements necessary with the DOJ as early as October 1995. On October 14th, ADM announces a guilty plea agreement with the DOJ in the lysine and citric acid cases. Fines of $100 million are seven times larger than ever previously paid. ADM also agrees to help prosecute its own managers, Michael Andreas and Terrance Wilson. In return, DOJ agrees not to prosecute ADM for price-fixing in corn fructose (which has $3 billion in world sales vs. $1.5 billion for the other two). In addition, Barrie Cox, VP for citric acid is given immunity if he will testify for the prosecution against Haarman and Reimer (U.S. subsidiary of Bayer) and Hoffman-LaRoche.

  The DOJ states that ADM and Barrie Cox, VP for citric acid, "did cooperate" in its citric-acid case and "it is substantial." This cooperation led to a *lower* fine for ADM. In it's plea agreement, filed in Chicago District Court, ADM admitted for the first time that its "representatives" attended meetings in the U.S. and overseas in which "...agreements were

reached as to the prices the firms would charge for citric acid... and the volume of citric acid each firm would sell." The names of the co-conspirators were not revealed at this time (see next paragraphs).

All criminal charges against ADM as a company are resolved, but criminal indictments against M. Andreas and T. Wilson are still pending as are scores of civil injury suits.

- December 9, 1996: Haarman & Reimer Corp., based in Springfield NJ, becomes the fourth company to file a proposed settlement agreement in the citric-acid class-action civil suit. H & R, a wholly-owned subsidiary of Bayer, AG of Basel, Switzerland, offers to pay $46 million to citric-acid buyers. A federal judge in San Francisco must approve the proposed settlement.

  The first offer from ADM of $35 million came in October. Later in October, two citric-acid importers also made offers to settle: Hoffmann-LaRoche of Basel, Switzerland offered $5.68 million, and Jungbunzlauer AG of Vienna Austria offered $7.57 million. The fifth defendant in this case, Cargill Inc., refuses to negotiate with plaintiffs.

  The DOJ is continuing its criminal investigation of citric acid producers with the cooperation of ADM. The investigation is focusing on the coordination of restrictions in output by U.S. and European manufacturers as the method for lifting citric acid prices in major markets.

- January 29, 1997: Haarmann & Reimer GmbH, the New Jersey subsidiary of Bayer AG pleaded guilty to criminal price fixing in the world citric acid market. The company will pay a fine of $50 million, the second-largest antitrust fine ever assessed. The DOJ stated that the conspiracy was "one of the largest, if not the largest, conspiracies ever prosecuted by the Department of Justice." Officials repeated their assertion that the ADM and Bayer fines would have been much larger had the firms not cooperated with investigators, but they declined to state the size of the overcharges.

  In addition to fines, a senior executive of Haarmann & Reimer, Hans Hartmann, a German citizen, was arraigned in U.S. District Court in San Francisco for criminal conspiracy charges. He can be sentenced up to 3 years and $375,000. The DOJ will not seek civil penalties against Bayer because of the likely class-action settlement, but investigations continue in lysine and citric acid in Asia, Europe, and the United States.

- March, 1997: The two largest U.S. importers of citric acid, Jungbunzlauer and Hoffmann-LaRoche, plead guilty to criminal price-fixing and pay fines of $25 million. Two executives of these companies also plead guilty and pay fines of $150,000 each.

Chronology - HFCS

- 1971: High fructose corn syrups (HFCS) begin to be produced commercially in the USA.
- 1971 -1985 : Period of very rapid growth and numerous improvements in technology of production. Real growth 1970-1980 is 39% p.a.; during 1980-85 it is 19% p.a.
- 1981-1991: DOJ (civil) antitrust case in Des Moines federal court against ADM dismissed in 1991.
- 1990 -1995 : Market enters mature phase, growth slows to about 4% per year. There are U.S. 25 to 30 producers of wet-corn products but only 6 or 7 manufacturers of HFCS.
- July 1995: DOJ reveals that a federal grand jury in Chicago is investigating ADM, Cargill, CPC International, and Tate & Lyle's A.E. Staley subsidiary, for price-fixing.
- November 1995: more than 20 private antitrust suits against ADM by HFCS users. Coca-Cola and Pepsico hold back.
- February 1996: Number of price-fixing suits vs. ADM reaches 28.
- DOJ leaks indicate that HFCS prices are discussed during videotaped meetings, but no tapes of meetings among HFCS producers exist. Prosecutors consider HFCS the weakest of their cases. Coke and Pepsi, which now own many of the bottling operations that buy HFCS and account for 73% of HFCS sales, have not sued ADM.
- September 1996: CPC International pays $7 million to settle a private civil suit by HFCS buyers.
- October 1996: As part of a plea agreement with the DOJ, ADM agrees to plead guilty to price fixing in lysine and citric acid and to pay $100 million in fines. In return, the DOJ agrees to grant ADM immunity from further prosecution for price-fixing in the corn-sweeteners markets. However, the DOJ says that its Joliet, Illinois grand-jury investigation of price-fixing by other companies in corn sweetners *will* continue, but little is heard of this matter through early 1997.
- February 1997: Whitacre quotes M. Andreas as saying that Cargill would not conspire on HFCS prices as a matter of company policy.