The Private International Cartels (PIC) Data Set:

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Abstract

This paper describes the sources and methods used to create the PIC data set, which the author believes to be the largest collection of legal-economic information on contemporary price-fixing cartels. It details the scope, strengths, and limitations of the data therein. Finally, summary descriptive statistics are developed for cartels detected during 1990-2017. A few highlights are:

- The number of new cartels detected peaked at 83 per year in 2010-2015.
- Of 1405 investigated cartels, 1130 were convicted, 124 dismissed, and 151 undecided.
- Relative to GDP, cartels operating in Europe are triple the number in North America.
- However, the affected sales’ size of all European cartels equals the N. American ones.
- Affected sales total about $900 billion, of which global cartels account for 37%.
- The average guilty cartel’s estimated sales size is $917 million, global $6.9 billion.
- More than 49,000 companies were indicted for international price fixing.
- Monetary penalties reached $233 billion, which equals 2.0% of affected sales.
- More than half of all cartel penalties are paid to North American authorities.
- EC and DOJ fines were 95% of world in early 1990s; down to 40% in 2015-2019
- 65% of guilty corporate cartelists are headquartered in W. Europe.
- 1349 persons were sanctioned: the median fine for 584 was $50,000.
- Prison sentences imposed on 376 executives total 1833 years.
- Gross cartel overcharges are $64 to $286 trillion, two-thirds by global cartels.
- Worldwide cartel penalties declined after 2012-2014.

Keywords: Cartel, price fixing, collusion, penalties, injuries, antitrust

JEL Codes: K21, L13, L41, L44
Important Note to Readers:

A summary spreadsheet of the 2019.5 Edition of the Private International Cartels (PIC) data described in this Guide is available at an archive maintained by the Purdue University Library (doi:10.4231/G5GZ-0505). This final edition of the PIC dataset stops with cartels discovered or detected as early as January 1990 and as late as December 2017; it reports on information collected up until August 31, 2019.

Secondly, the Competition Division of the Organization of Economic Co-Operation and Development (OECD) has prepared a reformatted version of these data called the *International Cartels Database (ICD)*. The OECD is committed to vetting and updating the ICD annually, including cartels detected after 2017. It is now available at https://qdd.oecd.org/subject.aspx?Subject=OECD_HIC.
I. INTRODUCTION

This guide provides a description of the sources and methods used to collect data in the Private International Cartels (PIC) spreadsheet, and it illustrates the scope and richness of the data set with text, tables and charts.\(^1\) Section II explains the strengths and limitations of the PIC data in eight subsections: Definitions, Coverage, Spreadsheet Organization, Cartel Size Measures, Penalties, Dates, Market Structure, and Conduct Indicators. Section III presents summary statistics on the same characteristics of contemporary price-fixing cartels across broad geographic regions.\(^2\) Section IV concludes by pointing out some fresh avenues for research on cartel behavior made possible by the PIC data set.

II. SAMPLE CHARACTERISTICS

A. Private International Cartels Defined

*Private International Price-Fixing Cartels*

PIC samples the discovery and initial prosecutions of private international “hard-core” cartels. These are the largest, most injurious, and most difficult to prosecute of all price-

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\(^1\) The PIC data set was initiated around the year 1997 solely by the author and continuously updated through August 2019 thereafter. Until 2011, the author was supported by Purdue University mainly from formula Hatch Act grants made by the U.S. Government. After June 2011, the author continued expanding the PIC data set as an aid to his own cartel research and those of other scholars. No corporations, law firms, or similar entities have ever materially supported the development of PIC. In late 2017, the data set was sold for $1.00 to the Organization of Economic Co-Operation and Development. The author thanks Christopher Bach, formerly of the U.S. Department of Commerce, and Prof. Robert Lande for numerous constructive comments on this guide.

\(^2\) This is the third and final edition of the *PIC Data Guide*. The first edition is Connor (2014b), which contains cartel statistics from PIC up to the end of 2013. The second is Connor (2016b).
fixing violations. PIC focuses on what antitrust authorities decide; subsequent court appeals of such decisions are too difficult to follow worldwide.

A cartel is a voluntary association of legally independent firms that aims to raise their joint profits through explicit agreements.° Hard-core cartels fashion agreements (contracts, deals, coordinated bidding, and the like) with the intent to control market prices or restrict industry supply directly (or both).° PIC generally follows the definition of international price-fixing agreements employed by the Antitrust Division of the U.S. Department of Justice (DOJ).° However, PIC also includes cartels investigated as infringements under anti-cartels laws employed by other jurisdictions.°

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3 Each of the four definitional elements is a necessary condition. “Voluntary” implies that compulsive state power cannot be present; “legal independent” implies that two subsidiaries of a common parent firm cannot collude; “joint profits” may increase after collusion while some members may experience a decline in [monopoly] profits; the agreement (contract) must involve explicit communication through writing, talking, body language, or the like; whether merely an agreement to distribute strategic information is illegal may depend on jurisdictional rules.

4 Cartel conduct is a knowing conspiracy among actual or potential rival firms; whether the conspiracy was effective in reducing output is immaterial to a guilty finding. The conspiracy concept of illegal cartel conduct (“by object”) is found in Common Law countries, but in the last 20 years has become the norm in the EU and other administrative-law jurisdictions.

5 Nearly all the cartels collected in PIC are hard-core, but inclusion relies on the prosecutorial judgement of antitrust prosecutors operating under varying legal regimes. Thus, a small proportion of the PIC observations may include cartels that would not be prosecuted criminally in criminal jurisdictions or be classified as hard-core in administrative antitrust jurisdictions. That is, a few cartels aim at raising market prices or reducing industry output indirectly by employing facilitation conduct such as sharing of confidential strategic information.

6 Identifying which U.S. DOJ Antitrust Division prosecutions should be categorized as international was first comprehensively analyzed by the International Competition Policy Advisory Committee (ICPAC 2000). ICPAC notes that the DOJ first developed a precise definition of “international matters” in FY1997 (ibid. Chapter 4, fn. 15). A cartel matter (a/k/a investigation or case) is international if (1) one of the companies is a non-U.S. business, (2) some of the potentially illegal collusion occurred offshore, or (3) the investigation involves substantial cooperation with a foreign government.

7 For example, under EU law (and widely adopted elsewhere), vertical price-fixing by a manufacturer that results in uniform pricing by distributors of the manufacturer’s product is usually deemed a “very serious” violation of anti-cartels laws or market rules. Similarly, collusion among manufacturers on the introduction of new products, on product quality, on the entry of parallel imports, or other restrictions on product distribution are typically considered serious cartel violations in the EU. Sharing of sensitive commercial secrets among rivals that reveal strategic plans and future business conduct is often
The PIC data are comprised of private international price-fixing cartels that are subject to antitrust laws. First, the term international describes a cartel’s membership composition. The main idea is to select with precise criteria way those cartels that are more difficult to prosecute because of evidentiary and other hurdles. Therefore, an international cartel is a conspiracy in restraint of trade that has or is alleged to have one or more corporate or individual participants with headquarters, residency, or nationality outside the jurisdiction of the investigating antitrust authority; alternatively, cartels with at least two members with different nationalities are also categorized as international. I have identified most of the cartels as international by using the country of registration of the considered sufficient evidence of serious cartel conduct. Thus, some cartels charged with such violations operating outside the United States are included in PIC.

However, under current U.S. and Canadian enforcement standards, the foregoing behaviors might be treated as civil antitrust violations, but they would not by themselves be condemned as criminal, hardcore violations. Thus, nearly all of the cartels in PIC that operated solely in North America were charged criminally by the DOJ or the Canadian Bureau of Competition. A small number of North American cartels prosecuted by the U.S. FTC or state Attorneys General for criminal-like violations are included in PIC.

8 “Price fixing” is short-hand jargon used by economists to identify corporate conduct that is aimed at controlling market price in ways that distort the normal market forces of demand and supply. The tactics employed are numerous. The most straightforward is for suppliers to agree overtly on minimum, target, or transactions prices. Other “price-fixing” conduct includes agreements on output quotas, exclusive territories or customers for members, reducing product choice, slowing technological innovation, blocking industry entry, and restraints on the terms of trade (e.g., forbidding secret discounts) – all of which can affect market price.

9 A large majority of the sample of international cartels also is international in a geographic sense. PIC includes a small number of national export cartels that may have members from only one country (e.g., Vitamin C Exports from China to US) or that may be exempt from prosecution by the country of origin. Ocean liner conferences are categorized international because their rates affected commerce between two jurisdictions, and most are global because their routes are inter-continental. All cartels fined by the EU qualify as international because the European Commission only has jurisdiction if a cartel sells a significant proportion of its output (or buys inputs) across the borders of the EU’s member states.

10 In effect, the “international” selection criterion ends up selecting virtually all large-scale cartels, but also includes some very small ones (as measured by affected commerce).

11 So, it is unusual but possible that all the cartelists are from the same nation. For example, the Apple Premium Products Distribution cartel was comprised of three U.S. companies, but since France was the prosecuting authority, it is international. Another rare example is a national export cartel.
ultimate parent companies participating in the cartel. Second, private cartels are those that are not protected by government sovereignty or by international treaties, like the Organization of Oil Exporting Countries (OPEC). Put another way, private cartels can be indicted by antitrust authorities or sued by aggrieved plaintiffs.12

Geographic Concepts

PIC further categorizes international cartels into three degrees of geographic spread, namely, global, EU, and national. Global international cartels fixed or attempted to fix prices on at least two continents. Most of the “global” cases examined herein involve cartels that targeted markets in “the Triad,” the most industrialized regions of the world – namely, Western Europe, North America, and Southeast Asia.13 A large minority of the global cartels also conspired to fix prices in Africa, Latin America, Oceania, or other parts of Asia. The EU-wide cartels operate across two or more countries, but entirely within a single customs union, the European Union (EU).14 The EU cartels are classified separately because while the EU is well along to becoming economically integrated into a single market, it is not quite a unified sovereign state with a federal structure. The national cartels confined their operations to one country.

The EU-wide cartels are signaled by the involvement of the EC as the prosecuting unit, because the EC is required to establish significant effects on trade between the Member

12 A non-profit organization located in the United States sued OPEC for antitrust damages in federal court. Its action ended when guards at OPEC’s Vienna headquarters simply refused entry to a lawyer attempting to serve a summons. U.S. or Austrian law did not apply the headquarters.

13 Triadization is a concept in management science and political science that hypothesizes that “globalization” (strong socio-economic integration across nations) has been heretofore largely restricted to the aforementioned regions. See Milward (2003).

14 The EU is a hybrid government, a loose federation of nations for many purposes (monetary, military, etc.), but has a fully centralized competition-law agency -- the EC. The EC has antitrust jurisdiction not only in the EU proper but also a group of states that are members of the European Free Trade Agreement (Norway, Iceland, Liechtenstein and, before they joined the EU, Finland, Sweden, and Austria). (EFTA has a small competition-law authority). This expanded antitrust zone is called the European Economic Area.
States in order to investigate a potential violation. However, the reverse is not true. Member States of the EU typically prosecute only nation-wide cartels with negligible cross-border effects under their own national antitrust laws, but their competition authorities may prosecute international cartels under EU law as well.

The **national** category contains the smallest cartels in a geographic sense, those few that had international representation but that operated solely or almost solely within a single national border or a single customs union. A cartel prosecuted by one national authority may have been active more broadly, but a second antitrust authority may not have prosecuted because of lack of evidence or limited prosecutorial resources. In a few cases, multiple national prosecutions in the same product markets are entered as separate PIC observations even though one might speculate that they were connected conspiracies. Although rather awkward phrasing, these cartels may be thought of as “domestic” international cartels.

**Legal Status**

PIC surveys the international cartel landscape from the vantage point of mid-2019. As soon as sufficient information becomes available that an official allegation of horizontal

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15 The vitamin B4 cartels are a case in point. Three North American manufacturers agreed to cease exporting to Europe, and three European companies reciprocated. All six met once, but thereafter operated separately as far as is known. PIC enters them as two conspiracies, one centered in the NAFTA area and one EU-wide.

16 “NAFTA” cartels that operated in both Canada and the United States are placed in this category. NAFTA has no competition-law authority.

17 For example, several ready-mix cement bidding rings have been prosecuted in Europe that contained overlapping but not identical membership and time periods. Some European retail-gasoline and pharmaceutical cartels may have been multiply prosecuted after cooperation among some EU member states.

18 Monthly amendments and additions were made by the present author from the early 2000s to late 2018 for cartels detected from 1990 to December 2017. Since late 2017, an updated version of PIC has been prepared and distributed by the OECD.

19 At a minimum one needs a well defined market designation, one or more geographic regions of operation, and an allegation made by some recognized antitrust authority that the conduct probably rises to the level of hard-core price fixing (that is, and indictment is made or a formal investigation is
price fixing has been made, a cartel number is assigned to a (probable) cartel. Thus, the spreadsheet includes a preponderance of guilty cartels and a smaller number of as-yet-unproven cartels; in many cases announced investigations simply disappear from public view. The columns of data on sanctions help distinguish cartels merely “under investigation” from those with “all (legal) actions closed” and from cartels still being sued. Dates can tell the same story. When a start date is coded but no end date is coded for some antitrust authority, the cartel is still under investigation and its members may be subject to additional future sanctions. When both dates are recorded, either a legal action is complete or the case is closed (no cartelists penalized and no companies required to pay substantial monetary recoveries).

B. Coverage

Although technically a “sample,” PIC aims to contain the universe of private international cartels detected by antitrust authorities since 1990. All private cartels with international membership that were detected after January 1, 1990 and before January 1, announced). Each of these pieces of information may be subject to revision as new information is made available. Approximately 6% of the cartels in the PIC spreadsheet at any point in time will be eventually downgraded to “non-cartel” or “unproven” status. Downgrading often occurs because the conduct is later revealed to be vertical rather than horizontal or monopolistic rather than multilateral. Some guilty cartels are relegated to the unproven category because the antitrust authorities were unable to obtain the cooperation of the companies that were charged.

20 Some antitrust authorities are neat and tidy about releasing the opening and closing dates of investigations. The EC and the EU NCAs usually announce new investigations if the press has caught on to raids, but they may be silent for years until a Statement of Objections is announced; unlike many other authorities, the EC is reliable in informing the public about closed investigations. Other authorities vary considerably in announcing that investigations have opened or stating that a case has terminated. Criminal jurisdictions usually keep cases confidential until the first conviction.

21 Columns OM to OU summarize legal status.

22 By “discovery date,” I mean the date the first notice was taken in the press of a formal antitrust investigation or filing of a private damages suit. This date is found in the column “FIRST DATE GOVT PROBE.” A few cartels have discovery dates predating 1990 because important legal decisions were made after 1989.
2018 are in the sample. “Public” cartels protected by sovereignty or multilateral treaties are excluded, as are suspected cartels with no sanctions imposed after about five years.\textsuperscript{23}

The author believes that PIC is virtually complete for international cartels that have been fined or otherwise penalized by government antitrust authorities or for which class actions were filed. However, the PIC data depend on publicly available information. Thus, it may contain a few cartels that were cleared confidentially by authorities during 2015-2019, and it may miss a few small cartels for which the sole penalties were settlements reached by private negotiations between cartelists and the injured parties. PIC focuses on the decisions rendered by primary-level antitrust authorities; it does not attempt to follow up on the penalty adjustments of appeals courts or higher tribunals, which often require a decade or more to be decided.

A cartel is entered into PIC as soon as press reports first surface about allegations about a probable international price-fixing or bid-rigging scheme.\textsuperscript{24} International cartels are “discovered” when “raided”\textsuperscript{25} by an antitrust authority, subpoenaed for documents, or sanctioned for a price fixing violation from January 1990 through August 2019. By sanctioned is meant (1) pleaded guilty, (2) were judged guilty by a court of law or antitrust commission, (3) were indicted and are awaiting trial, (4) were fined\textsuperscript{26} by an antitrust authority, (5) agreed to pay a substantial civil settlement,\textsuperscript{27} or (6) were restricted in their future competitive conduct by a “consent decree” or similar mandatory legal

\textsuperscript{23} Sometimes antitrust authorities announce that they have closed an investigation; in the United States, it is often a company that was under investigation that issues a press release about the closure. A separate section retains a list of accused cartels that were later “cleared” because all investigations were closed, all law suits were dismissed, or because there was no public record of the cartel having been penalized.

\textsuperscript{24} Some alleged cartels are almost certainly going to qualify for international in membership because of the geographic extent of its operations or other indicators. If an alleged cartel is in the road-building, ready-mix concrete, asphalt, retail or wholesale distribution industries, the author awaits information on the list of perpetrators before coding the cartel. “Press reports” include press releases of corporate targets or of antitrust authorities.

\textsuperscript{25} Antitrust authorities often prefer to say that search warrants were served to suspects.

\textsuperscript{26} Mandatory restitution obtained by an antitrust authority is added to fines proper.

\textsuperscript{27} In a few cases cartels are included that experienced initial sanctioning decisions in the 1980s were appealed and final decisions not issued until the 1990s.
agreement that restricts a company’s conduct.\textsuperscript{28} PIC also contains cartels known to be under investigation by a public antitrust authority or subjects of damages lawsuits but not yet sanctioned. Press reporting of raids is not infallible, but it is quite common when the alleged firms are listed companies or large employers. The imposition of sanctions is nearly always newsworthy. By sanctioned is meant pleaded guilty, were judged guilty by a court of law or a commission, were indicted and are awaiting trial, were fined by an antitrust authority, or agreed to pay a civil settlement.\textsuperscript{29} Cartels known to be under investigation by a public antitrust authority but not yet sanctioned are in the PIC.\textsuperscript{30} Cartels that were initially under investigation but were not sanctioned by an authority are moved to a special section of the PIC spreadsheet for “cleared” cartels. Usually the reasons for closing an investigation are not announced, but most often it is lack of sufficient evidence – evidence often provided by an amnesty applicant -- or the fact that the illegal activities were curtailed prior to a statute of limitations.\textsuperscript{31}

There are no geographic or industrial limitations on the cartels sampled. Searching for cases was made principally in English-language sources.\textsuperscript{32} More than half of the world’s

\textsuperscript{28} A consent decree is a contract between an antitrust authority or a competition tribunal and a guilty cartelist to refrain from collusive behavior in the future. Failure to follow the agreement can result in large monetary fines or other severe penalties, such as the imposition of a government monitor with managerial powers. A few jurisdictions impose costly restructuring remedies (i.e., mandatory divestments of assets) or insert government monitors inside the firms for several years. In some jurisdictions consent decrees are called cease-and-desist orders, warnings, or (in Europe rather confusingly) settlements.

\textsuperscript{29} In a few cases cartels are included that experienced initial sanctioning decisions in the 1980s were appealed and final decisions not issued until the 1990s. In this paper I use the terms “guilty,” “punished,” “prosecuted,” “penalized,” and “sanctioned” interchangeably.

\textsuperscript{30} These can easily be eliminated by sorting on the column titled “Monetary Penalties: WORLD TOTAL” or the nearby column “Guilty.”

\textsuperscript{31} Thus a “cleared” cartel may have been guilty of an antitrust infringement, but had its case closed for technical, procedural reasons. If no news about the termination of an official cartel investigation can be found after about five years, the cartel data are retired as presumptively closed. A few cases terminated for years were unexpectedly resurrected.

\textsuperscript{32} The author can cope with a number of Latinate (“Romance”) and Germanic languages. Information on cartels in other languages has been increasingly accessible through online translation programs. Non-Roman scripts like Hebrew are more challenging.
150+ antitrust authorities have English-language sections that sometimes give detailed accounts of sanctioned cartels.\textsuperscript{33} The PIC data presently contain international cartels penalized by about 80 antitrust authorities.\textsuperscript{34} Cartels active in Australia, Canada, New Zealand, South Africa, and a few other Anglophone criminal jurisdictions may be over-represented in PIC because they have assertive English-language presses.\textsuperscript{35}

Determining the coverage of U.S. prosecutions of hard-core cartels is made difficult because DOJ enforcement statistics are not organized in a manner compatible with other antitrust authorities.\textsuperscript{36} Nevertheless, the extent of coverage of international cartel enforcement in PIC can be gleaned from some types of information on U.S. prosecutions contained in Connor (2011b) and the DOJ’s own enforcement statistics for 1990-2017 (DOJ 2018). First, the extent of PIC coverage of DOJ enforcement can be calculated from the \textit{number of penalties imposed on corporations} during 1990-2019. For example, PIC lists 573 instances of findings of illegal corporate cartel conduct\textsuperscript{37} by the U.S. DOJ, in contrast, over

\textsuperscript{33} The OECD also gathers competition-law agency reports annually in English and French, and its researchers are frequent users of PIC.

\textsuperscript{34} Almost every nation has only one administrative authority that enforces anti-cartel laws, though most of their decisions are subject to higher tribunals or appeals courts. The United States is almost uniquely competitive in its antitrust enforcement, with two federal antitrust agencies (the DOJ Antitrust Division and the FTC), several sector-specific competition-law agencies (the Securities and Exchanges Commission, the Federal Reserve Bank, the Commodities Futures Trading Commission, the Department of Commerce, the Department of Transportation, the Department of Agriculture, and the Office of the Comptroller of the Currency; in this report, all of these agencies are treated as units of the overarching U.S. Government. There are 55 State Attorneys General with sovereign powers over antitrust laws of their states.

\textsuperscript{35} On the other hand, many non-English-speaking countries have major newspapers or press services that translate important business and government news. Moreover, for the Web pages of some of the newer antitrust authorities with no English translations, Internet translation programs have become notably improved since 2005.

\textsuperscript{36} Unlike the EC and most other antitrust authorities, the DOJ (2018) reports “cases” (investigations of any number of corporate or individual cartelists), i.e., some of the participants in, never whole cartels; except for one minor statistic, it’s statistics do not distinguish domestic from international violations; and its data are reported on a Federal Fiscal Year basis, not calendar years (ICPAC 2000: Chapter 4, fn. 15). The DOJ is by far the major player in the United States; the U.S. FTC and other federal agencies have prosecuted a modest number of international cartels.

\textsuperscript{37} Fines were imposed 484 times and consent decrees (with no fines) 89 times. In addition, at least 55 cartelists were granted amnesty. There is a small amount of double counting of companies because of
the same period the DOJ counts 728 fines for Sherman Act Section 1 crimes (DOJ 2018). That is, PIC coverage is at least 66% to 78% of guilty corporate cartelists, the remainder being members of purely domestic schemes.\(^{38}\) Second, a more precise alternative PIC coverage ratio can be developed from \textit{large fines imposed} by the Antitrust Division on firms in international cartels from guilty-plea agreements (DOJ 2019).\(^{39}\) The most commonly cited DOJ statistics on fines are not comparable.\(^{40}\) However, looking only at large, international fines, PIC coverage is 100% of these DOJ antitrust fines.\(^{41}\)

The PIC data set includes all cartels determined by the EC to have violated EU competition rules that prohibit horizontal, collusive market restrictions, because the EC only convicts collusive “infringements” that are by definition private international cartels.\(^{42}\) The great majority of the world’s antitrust authorities follow administrative recidivists like Akzo Nobel, which was a leniency applicant or a convicted party in multiple cartels. Note that DOJ (2018) statistics do not count immunized leniency applicants as convicted.

\(^{38}\) In the 1990s, an ICPAC (2000: Chapter 4) analysis of DOJ criminal cases found that about 25% were international. The DOJ does not distinguish non-U.S. from domestic fines, except for one tabulation of fines of $10 million or higher (DOJ 2019).

\(^{39}\) This compilation records 137 fines agreed to by non-U.S. companies in guilty-plea agreements or imposed at trial (one fine) since 1990; international conspiracies comprise 98.1% of all large fines ($10 million or more); moreover, PIC data demonstrate that 98.6% of all U.S. government fines are “large fines”. The total fines by all U.S. Government agencies is $41.25 billion; non-DOJ fines are subtracted.

\(^{40}\) The most frequently cited DOJ figure is for all antitrust fines \textit{collected by a federal court} in the same period: $14.43 billion. PIC coverage of fines is an extraordinary 288% of the “collected” fines for three reasons. First, coverage is greater than 100% because some fines do not clear the courts for a few years after guilty pleas and because high percentage of convicted firms pay their fines in installments over the five years following sentencing. Second, DOJ data include small fines and those from domestic cartels. Third, PIC data include cartel-related criminal and civil fines by all federal agencies (FTC, CFTC, Federal Reserve Bank, and the like).

\(^{41}\) Indeed, by including all U.S.-Government fines and mandatory restitutions, PIC reports large international-cartel fines of $37.6 billion, which is 197% higher than the large fines reported by the DOJ itself. The higher PIC figures derive from a small number of finance-industry cases (FOREX, LIBOR, ISDAfix, ADRs) that had penalties imposed by non-Antitrust Division agencies for fraud connected with collusion.

\(^{42}\) Collusion and other restrictive market practices are controlled under Article 101 of the Treaty on the Functioning of the European Union (TFEU) or Treaty of Lisbon; formerly known as Article 81 of the Treaty of Rome. PIC does not include EC actions under other Articles that correct excessive Member State support for national champions.
antitrust systems like that of the EC. Consequently, information on their cartel-enforcement activities is also nearly complete in the PIC data set.

In common with nearly all other empirical studies on cartels, PIC considers only discovered cartels. If users are interested in all international cartels, PIC may suffer from sample selection bias. The cartels in PIC were formerly clandestine, and their members typically attempted to cover up or destroy evidence of their meetings and communications. Cartel studies generally conclude that only about 10% to 30% of all such conspiracies are discovered and punished. Undiscovered cartels are probably more durable than discovered cartels and may differ from discovered cartels in some other economic characteristics.

C. Organization

The PIC summary spreadsheet comprises information collected at three levels. Each row has a unique code number (column labelled “Code”), which is a combination of three numbers: “Mkt.,” “Co.,” and “Exec.” These three numbers are combined using a formula into a unique row number called “Obs.” Some rows of data refer strictly to

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43 Although common before the 1950s, I have seen no credible contemporary evidence of an effective international cartel that remained undiscovered.

44 For example, information about Mark Whitacre, the ADM executive who was convicted for conspiring in the Lysine cartel, is found on the row with the Code 3.001020. This code is a combination of Lysine (Mkt = 3), ADM = 1, and Exec = 3 (out of six men indicted). The whole-cartel “Mkt” number in is assigned sequentially when an investigation is announced, and these numbers are retired if an alleged cartel has its case closed or when a categorical error is discovered (see the Directory, spreadsheet Table A0). That is, column Code has a formula imbedded in it. For each cartel, market-level rows column Co = Exec = 0. Penalized corporations, associations, or similar entities are assigned unique arbitrary numbers in the Co column. In cases where companies are serial colluders, a given company will have arbitrary numbers assigned but different Mkt numbers. Similarly, penalized or charged executives are given their employer’s code in the Co column plus a unique arbitrary number in the Exec column.

45 That is, the first three columns contain “raw data” from which are linked using an embedded Excel formula for the “Obs” column. Formulas are developed for many columns, which are easily observed by users and, therefore, generally require no comments in this Guide. Columns labeled “diff” are internal consistence checks for summations of raw data within rows.
the *market* (i.e., the whole cartel), and for these rows Co. = 0. The largest number of rows refer to the *companies* that participated in the cartel, and these cartelists have Co.>0 but Exec. = 0. Finally, some rows refer to *individuals* (if any) that are proven or alleged managers of the cartels, all of which have numbers in Exec.>0. The whole-cartel rows contain sums of some of the variables; for example, the cartel rows total the penalties of each participant, whether a company or an executive that managed the cartel. Similarly, the company and individual rows have their cartel-market information repeated.

*Observation Coding*

Each cartel is identified with a unique code number (column labelled “Mkt.”) and market name (“MARKET”). Often the cartel/market name will be close to the legal name of the case given by the antitrust authority, commission, or court. However, priority is given to common economic terms for the cartelized markets (using American English spelling). Market names generally follow industry titles found in U.S. or UN product classification systems. To assist in sorting and finding related industries, the name of the key industry will sometimes be placed first, followed by a qualifier (e.g., the EC’s Auto Glass case is named in PIC “Glass, auto”). If the cartel operated in only one or two jurisdictions, a geographic abbreviation (the country’s Internet address code) is added. For example, a South African case involving the placement of steel pilings for the foundations of large buildings is listed as “Construction, steel pilings, ZA”. Sorting is also assisted by geographic, jurisdiction, and special codes for the cartel’s industry group. (See Sheet 3 of the Full Data spreadsheet for added notes about market nomenclature and abbreviations).

When a cartel spills across multiple jurisdictions and is the object of multiple legal decisions, it may be convicted under somewhat different names in each jurisdiction. Usually, the names, dates of collusion, and identities of the perpetrators are similar enough that multiple convictions can be judged as to whether or not they are

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47 Confusingly, the U.S. Antitrust Division assigns case names that often do not correspond to the names applied to private damages suits, and the latter may differ between class actions (Multi-District Litigation or MDLs) and opt-out cases brought by a single plaintiff or small group of plaintiffs. Moreover, legal names are often different across jurisdictional boundaries. Devising a cartel market name that connotes all of these is challenging.
geographic manifestations of the same scheme. For example, many cartels set prices in both Canada and the United States. Especially widespread multi-jurisdictional cartels may be global; these are given one name and code number.\textsuperscript{48}

Extreme forms of global cartels are deemed “Supercartels.” This term was coined in Connor (2013) to encompass conglomerated collusive conduct. I have coded four connected groups of global cartels with overlapping membership as supercartels, viz. \textit{Vitamins, Auto Parts, Banking,} and \textit{Lava Jato} (for a discussion of coding protocols, see the Appendix). The identifiers for the four supercartels are listed in the column “SUPER CARTEL”.

\textit{Whole-Cartel Numbers}

First, the \textit{market-level} sample consists of 1303 suspected hard-core cartels (see Table 1 for details). These cartels either have had participants indicted or have been sanctioned by an antitrust authority. Of these detected cartels, the greatest amount of information is available for cases where at least one participant was penalized (“guilty” cartels). Of the 1303 detected cartels, 1151 (88.3\%) have been judged guilty of price fixing. There are four outcomes for the 1151 penalized cartels: for 66\% of the cartels its members were fined only, 14\% paid both fines and private damages, 10\% paid penalties through private suits only\textsuperscript{49}, and 10\% were subject solely to non-monetary penalties.\textsuperscript{50} Because the PIC data set shows the cartel world as it was looking back from September 2019, some cartels were not yet penalized or dismissed. In mid-2019, 150 (11.5\%) cartels were currently still under investigation.

\textsuperscript{48} Multi-jurisdictional cartels that operate across two or more continents are classified as “GLOBAL” in the columns marked “CONT” and “GEOG”.

\textsuperscript{49} Thus, 24\% of all penalized international cartels were required to pay private damages as of August 2018, but with several settlement negotiations still underway. Another way of describing the private suits is that 58\% were follow-on suits and 42\% were non-follow-on (for details, see Connor (2012)).

\textsuperscript{50} Non-monetary penalties include consent decrees, warnings, and similar conduct remedies. They also include structural remedies such as mandatory divestiture of assets. Many antitrust authorities (including courts supervising private damages suits) pile on consent decrees alongside fines. Mandatory restitution is considered equivalent to a fine.
In addition to the proven or still-suspected cartels, a small proportion of all the detected cartels (204 or 13.5%) have been “cleared” or had their cases closed by prosecutors or appeals courts. Clearance occurs in some cases before an authority can complete its work, e.g., because of a statute of limitations or insufficient evidence.\textsuperscript{51} For these “discarded” cartels, only the information developed up to the time of clearance is retained in a special cartel “cemetery” section of the spreadsheet.\textsuperscript{52}

Additional statistics on whole cartels are presented in Section III below.

\textit{Company-Level Numbers}

Cartelists may be companies or individuals. The PIC data set includes cartelists that were indicted but are awaiting sentencing as well as cartelists that have been penalized as of mid 2019.\textsuperscript{53} A very high share of the companies indicted are convicted.

The \textit{companies} that are in the sample occupy 11,522 rows of observations of indicted cartelists. On each row, at least one and up to three ownership-related companies (and their headquarters’ national locations) are identified by name if possible. Each company

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\textsuperscript{51} When an investigation is announced or a “raid” is reported (a cartel “discovery”), that date is entered under the appropriate authority’s column. Some of the authorities announce when an investigation is closed (the EC and most EU NCAs follow this helpful practice), and this date is duly noted. Other jurisdictions, such as the United States, do not usually announce closed cartel investigations; generally, when no information about an alleged, reported cartel investigation can be found after about five years, the cartel is reclassified in a special section as “unproven.” A cartel that is only being prosecuted by private plaintiffs for damages is given a few more years to resolve its legal status.

\textsuperscript{52} Occasionally, long-dead cartels must be exhumed, as dormant prosecutions are resumed.

\textsuperscript{53} In criminal-law regimes like the United States, cartelists are usually indicted, convicted, and penalized simultaneously through court-approved guilty-plea agreements. Only a few are indicted and go to trial, and only a minority are acquitted at trial. Traditionally, in administrative-law regimes like the EU, cartelists are indicted when the antitrust authority issues a Statement of Objections to cartelists the authority believes have infringed on EU rules. A small proportion of those indicted are dismissed, but most are fined. More recently, the EU has begun to employ a faster prosecution method that has many of the same features as criminal-law systems. As for private damages cases, I consider the defendants mentioned in a filed complaint to be indicted.
row has information on corporate-level fines imposed, settlements paid, or other penalties. A very high share of the companies (9518 rows or 83%) are convicted. Most of the remainder are still awaiting sentencing.\(^4\)

Sometimes antitrust authorities release information on groups of parent companies, rather than individually identified corporations (“named” companies). Counting both named and groups of anonymous firms, PIC identifies more than 109,000 corporate cartel defendants (Table 1). Of these, 100,501 are anonymous corporate cartelists and 8624 are responsible “named” ultimate parent companies; however, 46% of these parents had their subsidiaries (3935) held directly liable by the antitrust authority(ies) (Table 1).\(^5\) Many of the named parents appear in multiple rows; such “double counting” is the result of serial collusion.\(^6\)

Laws on legal responsibility for antitrust violations vary across jurisdictions.\(^7\) If shown in the appropriate cell, the “Subsidiary Penalized” is the entity that was charged with and convicted of price fixing.\(^8\) If no subsidiary is listed, which is the case for 54% of the named parents, then the parent firm is the only company identified as the guilty party.

\(^{54}\) The last cartels added to the PIC data set were detected in late 2017, but data collected ended in September 2019 or nine months later. The mean average time required to make decisions is 5.2 years, and the median is 3 years. A small number of corporate cartelists known to be innocent remain in PIC because one of their executives were penalized.

\(^{55}\) Although PIC identifies a large and growing number of contemporary corporate cartelists, it is well to note that joining a cartel is still a “rare event” for the majority of companies. For example, in Western Europe, Bertrand et al. (2014: 11) estimate that among those 5709 companies with at least €10 million in assets headquartered in the 26 EU Member States 2001-2011, only 2.6% joined a cartel convicted by the EC.

\(^{56}\) Serial collusion, some of which is legal recidivism, is discussed in Section H below

\(^{57}\) In the EU, the United States, and many other jurisdictions, companies that operated as participants in a cartel are usually held “jointly and severally” liable for price-fixing infractions and for damages. In criminal law jurisdictions, guilt may reside in just one legal business unit, depending on the organizational location of the managers of the cartel.

\(^{58}\) Occasionally, more than one subsidiary is listed. This occurs when a parent company engaged in global price fixing and two or more antitrust authorities penalized multiple subsidiaries for collusion in that market.
That is, 4689 (54%) of the company-level rows have only a parent-company name, because the company was “independent” (i.e., had no higher parent firm ownership). The “ultimate parent” is the highest-level legal entity that owns a controlling interest in a penalized firm (usually at least a 30% minimum). Ultimate parents may be holding companies, families, governments, or managerially affiliated groups. Listed in between some of the subsidiaries and their ultimate parents are oftentimes well known intermediary operating companies.

Cartelists that applied for and were granted immunity by the U.S. DOJ are difficult to identify by name, because it is DOJ policy not to reveal the identity of amnesty recipients. However, there are methods available to obtain the names of U.S. amnesty recipients (Connor 2010a). In the EU and most other jurisdictions, fully immunized cartelists’ names are revealed in the decisions of authorities. Even though no fine is paid, immunized companies are regarded as having confessed their guilt.

Ownership is traced using LexisNexis Corporate Affiliations, Bloomberg, Google Finance, other similar business-reference sources, or, if it has a Web page, a company’s own history (“About Our Company” tabs are common). Generally, ownership relationships are shown at the time of the cartel investigation or penalization. If a merger of an ultimate parent occurs later, the new owner’s name will eventually be substituted (with the former ultimate parent’s name in parentheses or moved to the parent column). Sometimes, alternate names (“a/k/a”), former names (“f/k/a”), trading names (“t/a” or “trading as”), or well recognized conglomerate designations (“Mitsui Group”) are placed in the PIC spreadsheet.

The loose Japanese conglomerates now called keiretsu (some of them successors to pre-World-War-II Japanese zaibatsu) are identified as ultimate owners of many Japanese cartelists because of vertical sales, interlocking directors, mutual shareholding, a lending bank or international trading wholesaler in common, and other business relationships. Most have a committee of guiding executives. The major examples are Mitsui, Mitsubishi, Sumitomo, Toyota, Fuyo, and DKB. Most, but not all companies that share a Keiretsu’s name may be classified as a member. Some possible keiretsu, such as Sanwa and IBJ seem too weak to constitute classic keiretsu (see the Fairfield Project at http://fairfieldproject.wikidot.com/japanese-keiretsu-groups). The Korean chaebol (LG, Samsung, etc.) are similar, except that single-family control is common.

Although unusual, some Japanese companies may belong to more than one keiretsu. Hitachi Ltd. Is represented on three “presidents’ councils,” DKB, Fuyo, and Sanwa. I judged that Hitachi was most closely tied to DKB Group, but it was a close call. Bank mergers have also blurred the lines between keiretsu and may symbolize a weakening of this singularly Japanese conglomerate business structure.

In the cases of some very large multinational corporations, I have had to omit the names of one or more intermediate ownership entities. Generally, I chose a familiar operating subsidiary to represent the ownership chain.
In some jurisdictions, the number of cartelists in a group convicted is revealed in the published decisions, but in other jurisdictions the size of the group or the identities of some or all of the participants are withheld from the public out of privacy concerns. For example, although not a general practice, the Netherlands did not identify on its Web site the great majority of the 2000 construction firms that were discovered to have engaged in bid rigging in the 1990s and early 2000s; only a few are known by name from press reports. The German Federal Cartel Office likewise is inconsistent in naming and shaming corporate cartelists. In other decisions, a corporate association with many members is condemned; we regard the association members as ultimately responsible for collusion, but penalizing every member by name is impractical for prosecutors. Banking associations or consortia are frequent examples. As a result of these prosecutorial limits, 92% of the parents’ names in PIC are unknown (Table 1). However, the loss of information due to cartelists’ anonymity is insignificant. For example, the share of corporate penalties imposed on anonymous parents is quite small, about 0.6% of the total.

Executive-Level Numbers

Third, 2138 individual executives, cartel managers, or directors who were indicted or punished for price fixing are listed by the person’s name (if known), employer, and the person’s nationality (Table 1). Usually these corporate executives were singled out by prosecutors because they had a direct managerial role in perpetuating the cartel. I give their full legal names and sometimes nicknames within quotation marks. The sizes of the fine, length of prison sentences, or debarments are also given, by jurisdiction, if any. Individual cartelists are listed as soon as they are charged (“indicted”) or after pleading guilty, typically before being sentenced (“guilty”). The majority of indicted cartel managers are sentenced to pay fines or restitution, to serve custodial sentences, or both. A very few suspected cartel executives are acquitted after a trial. Some indicted

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62 The Visa and MasterCard payment-card organizations are extreme examples. At the time they were indicted, they each had more than 20,000 member banks. When they were penalized, each member paid. PIC does not list each member. Later, they were reorganized as joint ventures.

63 Prison sentences are the usual custodial outcomes, but these may be later modified with good behavior. In some jurisdictions (e.g., Canada) a high proportion of prison sentences are converted to home detentions, community service, work release, or similar alternatives to conventional imprisonment.
executives are never sentenced, because they are fugitives or because they are later dismissed by prosecutors after serving as cooperating witnesses. Dismissed individuals are rarely innocent, but rather are granted immunity for prosecutorial cooperation or convenience. The increased use of leniency programs means that increasing numbers of individual cartelists’ identities are hidden because of grants of immunity.

Half of the individual cartelists are anonymous. Identification of corporate cartelists by name is hampered by the practices of some European and Asian antitrust authorities that fail to identify by name all convicted cartelists.64 The Netherlands and Germany account for the majority of anonymous individual cartelists. If an authority or news source reveal that “two directors of firm ABC GmbH” were fined, this anonymous information is recorded under the appropriate cartel and company name.

Executive-level data rows repeat the cartels’ market-level and his employer’s company-level information. What is unique in these rows are the executive’s penalties (fines, incarceration, etc.). The PIC data includes a total of $635 million in individual fines, most paid by named cartelists, which is 0.5% of the corporate fines. A total of 22,033 months of prison have been imposed, or an average of 10.3 months per guilty individual (higher if only imprisoned persons are considered). Similarly, every company-level row includes unique information on corporate cartel penalties (plus the total number of months of incarceration of all of its employees, if any).65 The cartel-wide rows ought to sum up the total penalties of all of its member cartelists.66

64 In contrast, the UK Office of Fair Trade and the European Commission are punctilious in naming all sanctioned companies, even when there are many and some are small partnerships. Generally, in Common Law countries like the United States, Canada, Australia, and South Africa, all corporate cartelists’ names are published, unless they were granted amnesty and immunity from government prosecution (at which point they effectively enter the government’s “witness protection program,” which in my view is an unsustainable silly conceit for corporations).

65 If known, the company’s own affected sales (the cartel’s affected sales times the company’s market share) is also entered so as to compute the severity of the participant’s penalties.

66 Information about total cartel penalties is sometimes available earlier than cartel participants’ penalties.
D. Size Measures: Affected Commerce and Overcharges

Affected Commerce

The markets identified in PIC consist of the products or services that were the objects of price fixing. If available, information on the "affected commerce" was collected, estimated, and entered for each cartel. For a large proportion of these markets, PIC identifies the revenues of a cartel during the collusive period. Sales are in millions of U.S. dollars in nominal terms. While inflation has been slow during 1990-2017, the effects of time can be large, leading to gross understatement of real cartel sales for older cartels. The average midpoint of collusion for the PIC data is 2004, so on average nominal sales are 33% lower than inflation-adjusted 2019 sales.

As of mid-2019, PIC covers 1303 proven or presently suspected cartels. Estimated affected nominal sales are available for 878 (75%) of these cartels total $1,237 trillion (Table 1). Estimating cartel sales is challenging. Data on affected sales for a year or more during the collusive period are sometimes revealed in court or commission decisions. EU decisions are especially important sources of precise sales data, because these sales are necessary to determine cartelists' fines. Similarly, posted DOJ plea agreements or sentencing memoranda usually mention a corporate cartelist’s affected commerce, and sometimes it

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67 Affected sales are sometimes revealed in a published decision or a guilty plea press release. Often only partial information about a cartelist’s sales is given (e.g., the cartel’s sales for one year), but enough is revealed to compute a reasonable estimate of market-wide sales during the whole collusive period. In many instances, using resources in the archives of my university’s economics library, I can estimate affected sales from information on the precise definition of an affected industry’s definition and the duration of collusion. I call these “known” affected-sales estimates.

68 For example, one of the oldest cartels (High Voltage Power Cable, Germany) operated from 1902 to 1997 and had a reported $29 billion in sales. The mid-year of this 98-year-long scheme was 1950, so measured in 2019 ("real") dollars, affected sales were about $301 billion. Note that inflation can be adjusted using indexes in Sheet 2.

69 That is, a simple projection to cover missing sales’ data suggests that all 1304 cartels may total $1,649 trillion. For an analysis of various projections, see Connor (2017).

70 Sales for each member of a cartel are reported to the EC and the EU NCAs, but these figures are usually redacted in the publicly available decisions.
is possible to sum these across all the cartel’s members to obtain whole-cartel affected sales. Many other estimates were created from the annual sales revealed in an authority’s decision or press release; combined with the dates of collusion, a reasonably accurate cartel affected sales figure can be computed.\textsuperscript{71} For a small number of cartels, Complaints submitted by parties in private suits or the unrefuted expert reports can offer useful guidance.

If published decisions were unhelpful but the industry definition was clear, then standard business-research sources of industry size were examined.\textsuperscript{72} Even when a good match, these latter (whole-market) sales data may overstate affected sales because they include the sales of fringe firms, which average 10\% to 15\% of total market sales.\textsuperscript{73} On the other hand, sales by fringe firms may legitimately be included in affected commerce if fringe producers follow umbrella pricing. Without information to the contrary, the PIC sales’ data assume umbrella pricing is the norm.

Even after conviction, information on a cartel’s market sales can be slim. As previously mentioned, three-fourths of the guilty cartels have sales’ estimates in the PIC data set. That ratio is higher for fined cartels and lower for cartels guilty through consent decrees.\textsuperscript{74} When making initial estimates, I have noticed that sales of cartels still under investigation tend to be overestimated after making more reliable estimates, whereas sales of cleared cartels tend to be underestimated. The mean average guilty cartel’s estimated sales size

\textsuperscript{71} If multiple years are not available, annual growth rates of typically 3\% to 5\% per annum (and 10\% in rare cases) were inferred from descriptions of industry sales’ growth from the trade press.

\textsuperscript{72} Industry trade magazines and industry reports of consulting companies were consulted. Among the more useful trade magazines and newsletters are \textit{Chemical Market Reporter, Oil and Gas Journal}, and similar publications available on major business-and-law search engines (\textit{Factiva, LexisNexis, Nexis Uni, Law360.com et al.}). Electronic sources include \textit{Market Research.com Academic, MarketLine}, and \textit{Global Market Information Data Base}.

\textsuperscript{73} On the other hand, if fringe firms raise prices to the cartel level, then whole-market sales are a better indicator of the cartel’s effects.

\textsuperscript{74} Estimated sales are available for 75\% of these cartels, higher for the guilty cartels (80\%) but much lower for those still being investigated (34\%) (Table 1: fn. f and g).
is $766 billion, but the mean hides a great deal of variation. The arguably more representative median average of sales is only $2.1 billion.\textsuperscript{75}

The 1154 guilty cartels have mean average sales of $964 billion and a median of $2.13 billion. They can be placed in four major penalties’ categories (Table 1). The numbers and sales’ sizes of the cartels vary considerably across the penalty categories. First, the largest number of cartels for which only a fine was paid are mostly smaller in affected commerce (762 cases, of which 602 have known worldwide sales averaging a mean of $2.82 billion or median of $1.2 billion). Second, 100 much larger cartels paid only settlements to private plaintiffs (average sales $2,300 billion or $6.42 billion). Third, those that paid both types of monetary penalties (166 cases) were the largest of all ($4,521 or $4.77 billion). The fourth type of guilty cartels (124 cases) paid no monetary penalties but in most cases promised to accept future conduct restraints (consent decrees, structural remedies, etc.); these tended to be very small on average ($108 or $2.8 million).\textsuperscript{76} By far the largest detected cartels are those that were defendants in U.S. and Canadian class actions; a high share of these are global cartels.\textsuperscript{77}

\textit{Damages}

\textsuperscript{75} The sales data are very highly skewed. Sixteen cartels have sales in excess of $1 trillion, most of them banking or financial markets for which the definition of the affected market is conceptually challenging because of uncertainty over derivatives and substitutes. Many trillions of loan rates are tied to the \textit{LIBOR} interest rate, but one might argue that the \textit{LIBOR} defendants’ trading fees were the correct (and much smaller) market. It is noteworthy that the DOJ guilty pleas have been unconventionally silent on the affected commerce of \textit{LIBOR} and many similar cartels. Similarly, the \textit{Brent Crude Oil Index} conduct clearly affected natural gas prices as well as petroleum.

\textsuperscript{76} Besides consent degrees, in nine instances an authority issued a conviction decision but did not publish the fine; in eight cases, an amnesty application was submitted but the authority failed to act on the case; and in two cases, the authority was pursuing a decision and discovered it was time-barred.

\textsuperscript{77} The direction of causality is uncertain. Do class actions prove higher affected sales, or are plaintiffs drawn to bring suit against cartel with larger sales? The greater sales’ size of follow-on suits compared to stand-alone private actions is another surprise.
Damages are shown in PIC, where available.\textsuperscript{78} Damages, which most courts deem equivalent to overcharges, are always less than sales.\textsuperscript{79} The principal objective of most cartels is to increase the joint profits of the cartel’s members.\textsuperscript{80} Raising selling prices above the prices that would be observed in the market in absence of cartel conduct is the most common method of attaining supra-normal profits.\textsuperscript{81} Overcharges are the result of effective collusion that raises prices,\textsuperscript{82} thereby artificially raising affected sales (from the

\textsuperscript{78} Overcharges may be entered in PIC as either a dollar amount or as a percentage of affected commerce. Sometimes for a given cartel a percentage is available, but no affected sales implies that no dollar overcharge can be computed. Only rarely is the reverse true.

\textsuperscript{79} Damages or injury is the reduction in social welfare caused by fixed selling prices. Economists include both direct and indirect customer overcharges and the dead-weight loss to the economy as damages. Damages incurred by excluded suppliers may be compensable. A small minority of legal theorists prefer to include the lost profits of suppliers as a component in price-fixing damages, but as suppliers are the protagonists in the crime, the mainstream have little sympathy for such a calculus. However, the law in most states and nations restricts compensable U.S. antitrust damages to overcharges only (Page 1996: 16-20). Information on the sources and methods used to calculate an overcharge rate can be found in Connor (2014a, 2014b). See also Veljanovski (2020: Chapter 9) for damages in an EU context.

\textsuperscript{80} Many cartels established in the interwar period (1920-1939) claimed to pursue a price stabilization goal rather than improved collective profits. There is some empirical evidence to support this purpose (see Levenstein and Suslow 2004 [http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1091&context=econ_workingpaper&sei-redir=1&referer=http%3A%2F%2Fscholar.google.com%2Fscholar%3Fhl%3Den%26q%3Dlevenstein%2Bsuslow%2Bcartels%26btnG%3D%26as_sd%3D1%252C22%26as_sdtp%3D%26search%3D%22levenstein%20suslow%20cartels%22]). However, as many of these cartels operated in the Great Depression, during which prices frequently were falling for long periods, “stabilization” was in fact an attempt to prevent prices from falling as fast as natural market forces would have caused them to fall. Thus, this type of stabilization would be considered illegal under modern antitrust-law interpretations. (On the other hand, some cartels may have attempted to smooth industry output over time rather than suppress total output, an objective that might be considered legal).

\textsuperscript{81} Alternatively, if the cartel exercises oligopsony power, then the objective will to be to lower the price of a purchased input. Also, a cartel may try to enhance long-run profits by preventing market entry or slowing supply expansion by producers that are not members of the cartel. The latter conduct is most often regarded as an ancillary objective to control of market price.

\textsuperscript{82} If the cartel is a buyers’ cartel, then the cartelists use their market power to force down the price of an input sold to them. This creates an undercharge to suppliers, and damages are measured by the contraction in sales of the input by input suppliers. In PIC, undercharges are converted to positive dollar amounts and positive percentage changes.
level that would be observed with no overt collusion) and generating supranormal, monopoly profits for the members of the cartel.

The price effects of cartels are measured by the difference between observed market price and the “but-for price” during the collusive period.\(^83\) To easily compare the price effects across cartels, this difference may be divided by the but-for price (the overcharge rate) or by the observed market price (the Lerner Index of market power). Where available, PIC shows both the dollar overcharges the overcharge rate.\(^84\) Most of the overcharges are from published economic studies.\(^85\) At most one-fourth of the overcharges in PIC were calculated by the author from appropriate price data using the before-and-after method or other non-statistical methods.

In the PIC data set there are two methods of calculating of the overcharge rate shown.\(^86\) The columns headed “OVERCHARGE/AFFECTED SALES %” simply divide dollar overcharges by affected sales in the appropriate national or regional market. Conventionally, this is the way in which overcharge rates are reported by most lawyers, judges, or news media. However, in the PIC columns headed “OVERCHARGE/COMPETITIVE SALES %,” the denominator is “competitive sales” rather than all affected sales. That is, “competitive sales” is the counterfactual: affected sales minus the dollar overcharge. For effective sellers’ cartels, competitive sales are smaller than affected sales and, hence, positive computed overcharge rates will be larger.\(^87\) Note that both rates

\(^83\) The but-for price is often called the competitive benchmark. It may be the price expected price under perfect competition, or it may be the price that members of the cartel would charge as a result of tacitly collusive conduct. See Connor (2014b).

\(^84\) This is the ratio generally preferred in legal writings; it may range from negative to positive infinity. The Lerner Index is more common in the writings of economists; it can vary from zero to nearly one or from 0% to almost 100%. Unlike the overcharge ratio, the Lerner Index assumes that the but-for conduct in the industry is perfect competition. There is a simple formula that converts one index into the other.

\(^85\) For publication details, see Connor (2014a, 2014b). If multiple overcharge estimate were available, I used judgement to select the most accurate one. Connor (2014a, 2014b) also discusses average overcharges for several more types of cartels, regions, computational methods, and the like.

\(^86\) Both are given because it is often unclear which rate is being quoted by a source.

\(^87\) For effective buyers’ cartels, competitive sales will be larger than affected sales.
use the same dollar amount of overcharges. From an economic perspective, the latter overcharge rate is the more appropriate measure of a cartel’s power over price.

The PIC spreadsheet contains one or more non-zero overcharge rate on total sales for 405 cartels. The global mean average rate is 29%, and the median is 20% of total commerce. Alternatively, the denominator may be competitive sales, in which case overcharge averages 146% and 25%, respectively. The mean and median total-sales rates are calculated for at least one and for up to four geographic sales regions: the United States (34%, 24%), Canada (25%, 20%), Europe (27%, 22%), and some other jurisdiction(s) in the Rest of the World (27%, 20%). The Total column either repeats one of these regional figures or is a blend of several regions.

E. Penalties

Considerable effort has been devoted to collecting information on fines, settlements, imprisonment, and other cartel sanctions. Monetary sanctions include both government fines and the settlements reached in private damages suits in North America (and increasingly elsewhere). The term “fines” is used in PIC to cover all monetary payments imposed by a government entity of a compulsory nature. The strict meaning of a fine is a mandatory financial payment to a government entity (agency, commission, or court) for the commission of a crime or a civil fine for a violation of a rule. In PIC, fines also include lesser-used mandatory restitution or what is more precisely a disgorgement of illegal earnings.

Fines are precise data. They are translated, if necessary, into millions of U.S. dollars on the day that the decision was made or revealed. The Web pages of antitrust authorities are the major source, but sometimes articles from established business newspapers or trade magazines are used. Fines reported in PIC are those announced or imposed by an antitrust authority. They are not necessarily the amounts collected, that is, amounts actually paid by the guilty company or individual. Although a rare event, if an authority re-issues a decision, the updated fines are recorded.

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88 Currency translation was implemented through the Oanda Web site.

89 Also an unusual occurrence, an antitrust authority may report only the total fine imposed on (some or) all participants. If the total is small, the (residual) fine may be recorded in PIC as an equal amount across
The focus of PIC is on antitrust-authority decisions. It does not consider the effects of appeals to higher courts. Appeals usually take five to ten years to be decided. In most criminal-law jurisdictions, penalties cannot be appealed. But in some jurisdictions, notably the EU and Brazil, lengthy appeals are almost inevitable, and frequently result in fine reductions. Moreover, many newer authorities have difficulties collecting fines. Rules for interest due for late payments vary considerably. For these reasons, the total fines actually paid outside criminal-law nations may be lower than the fines recorded in the PIC data set.

Directly and indirectly injured parties are compensated for their losses through settlement agreements that typically conclude private damages suits. Settlement amounts are typically negotiated directly between the cartelists and attorneys representing their customers. In U.S. class actions, these civil penalties are supervised by a judge, but members of the class are permitted to opt out of proposed settlements and settle privately. Under U.S. federal antitrust law settlements may exceed full compensation levels (“single damages”) up to treble damages. In most other jurisdictions, single damages are the rule.

Settlement amounts from private damages suits are mostly reported on the public Web pages of the class-action settlements. Only monetary amounts are recorded; claims about the values of injunctive relief – often very substantial – are ignored. However, a minority of antitrust settlements is marked by significant numbers of class members the defendants with unreported fines. If some of the cartelists are known to be relatively large, their share of the total fine may be estimated to be larger than the remaining smaller cartelists. These apportioned fines have an “e” in the cell to the right (see “Missing Data” below).

90 PIC does not record “mismanagement suits” by stockholders against the directors or management of convicted corporate cartelists.

91 Settlement fund sites are particularly prone to the more general problem of ephemeral Web sites and links. Lepore (2015: 36-37) summarizes the large number of ways in which URLs and data content can become corrupted or unreliable: “link rot,” overwritten pages, “content drift,” and “reference rot.” Surveys show that 50% to 70% of all URLs in legal writings became non-operable. It is for this reason that the PIC data has been backed up with paper sources that are downloaded, printed, and filed the old-fashioned way.
opting out of the proposed settlement; in these cases, opt-out settlements may be kept confidential, unless they are large enough to have a material effect on profits for the opt-out firms or otherwise leak into the public domain. Large opt-out settlement amounts tend to become public. Nevertheless, on the whole, private damages settlements are probably slightly underreported.

Non-monetary sanctions are indicated in PIC by the word “consent,” which is short for consent decree, warning, or some other conduct restraint imposed on cartelists. These decrees are orders to firms to cease and desist henceforth from their illegal activity. Consent orders frequently accompany corporate fines in many jurisdictions, but in PIC there are about 124 cartels for which such decrees are the exclusive penalty. If violated in the future, substantial monetary penalties are likely. They are admissions of guilt.

Cartelists may pay no monetary penalties even if they are criminally guilty. First, a cartelist may have been the first to qualify for full amnesty (immunity from fines, if not from damages payments). Second, the cartelist may become a whistleblower for price fixing in a second line of business (“Amnesty Plus”). Third, one or all members of a cartel may agree to a cease-and-desist order or consent decree, or they may be warned by an antitrust authority. Because failure to conform to consent decrees and warnings often carry severe consequences for recidivists, these non-monetary penalties are recorded. (The term “consent” appears in the cell immediately to the right of a zero fine).

If no information can be found about the outcome of an investigation or if no member of a cartel is penalized after five to eight years, the cartel is moved to a section at the bottom of the spreadsheet colored dark brown – PIC’s “Cartel Cemetery”. This sub-set of data on 203 “unproven” cartels or abandoned prosecutions has not been analyzed.

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93 Amnesty recipients are identified by name in the published decisions of most antitrust authorities. The U.S. DOJ and a few other common-law criminal jurisdictions keep their identities secret. However, because all criminal cartel convictions are followed by private damages suits and these suits name all defendants, by the process of elimination it is possible to infer with near certainty the identity of U.S. amnesty recipients. Also, in the case of global cartels, the same company usually applies for amnesty in multiple jurisdictions. In the PIC spreadsheet, the letter “f” is inserted in the cell immediately to the right of a zero fine of an amnesty recipient.
F. Dates

There are many dates recorded for each cartel, and these dates are repeated for each corporate or individual member of the cartels. That is, dates refer to the whole cartel’s conduct, rather than a particular participant’s foreshortened involvement.

Detection and Prosecution

One of the most important markers is the date of detection. PIC records the “first public date” in each jurisdiction.\(^4\) That is the first time an investigation is revealed publicly about an authority’s investigation (formal or informal). Typically, this is new information for buyers and sellers in the market. Considerable research shows significant reductions in the stock prices of listed companies when cartel investigations become known.\(^5\) Some authorities inform the public of the date an investigation was launched years later when the full decision is published, while other authorities never reveal their investigative activities.

First, “first notice” dates often occur when an investigation (or grand jury) is announced or leaked to the press by an antitrust authority. Alternatively, the date of the first press reports of authorities’ raids on corporate offices are uncovered. Then business newspapers, trade magazines, and news services interview and publish pieces on the alleged violators and their industries. Whether a cartel qualifies as private and international is often unclear at this stage; indeed, some putative cartel investigations morph into merger or monopoly cases and must later be removed from PIC.\(^6\)

Second, a large number of discovered cartels are in many cases initially revealed to the public when raids, fines, a guilty plea, or an indictment is announced in press releases of the DOJ, the Canadian Competition Bureau (CCB), EC, or scores of other national

\(^4\) However, earlier dates, such as the time an amnesty applicant asks for a marker or the day an authority opens an official investigation, are recorded in the back-up tables A.0 to A.12.

\(^5\) Reputational losses have been analyzed using event studies by Alexander (1999), Aguzzoni et al. (2013), and Mariuzzo et al. (2019). In two of these, abnormal stock price movements are observed when penalties are announced, and in two abnormal returns occur when news of an investigation is publicized. Reputational effects seem to be fleeting.

\(^6\) Errors in cartel classification are noted in the Directory back-up spreadsheet.
antitrust authorities with active anti-cartel programs. The brief press releases are followed by additional documents, such as sentencing memorandums, plea agreements, Statements of Objection (in the EU), more detailed published decisions (in the EU especially), “statements of fact” (in Canada), annual reports, summary submissions to the OECD, and speeches of antitrust officials. In Europe, the most important cartels have the full decisions of the EC (some of them running to hundreds of pages) posted publicly a year or two after the brief press releases about Commission decisions. All these documents are normally preserved on the websites of the U.S., Canadian, and the EU antitrust authorities going back to the mid-1980s in most cases. Related U.S., Canadian, and European court decisions are fully archived.

Termination of an Investigation

A second date shown for each cartel (and each jurisdiction for global cartels) is the date on which an investigation was “terminated.” Termination dates are clear for cartels in the EU and in investigations in jurisdictions that follow the EC templates (so-called “administrative” legal systems). That is, termination of an authority’s prosecution is announced by a decision that covers all of the cartel members simultaneously. Decisions are typically announced in press releases within a few days of the event.

However, in criminal-law (UK, U.S., Canada, Australia, South Africa, etc.) and some hybrid legal systems (e.g., Brazil), penalty decisions are announced by the antitrust

97 For a nearly complete list of antitrust authorities and their websites, see https://en.wikipedia.org/wiki/Competition_regulator.

98 The Spanish antitrust authority is an exception. Before September 2007, it was called the Tribunal de Defensa de la Competencia (TDC). When it was given new responsibilities, the TDC was renamed the Comisión Nacional de los Mercados y la Competencia (CNMC), and all of the TDC’s information was archived in a separate website, making case searches difficult.

99 Decisions are made by the jurisdiction’s competition-law authority, such as a competition commission or tribunal, and first announced through a press release. In the EU, the press releases contain slim, but essential information. These releases are followed by a posted case summary with a bit more information. The final decision may be posted two to four years later, but all contain elisions or redactions that remove data that the authority regards as confidential. Dates of subsequent appeals of penalties are not recorded in the spreadsheets (though some are mentioned in the back-up tables A.0 to A.12).

100 The EC and the EU NCAs have become hybrid systems of prosecution. In 2008, after a flood of leniency applications, the EC adopted its “settlement” procedure, which permits leniency applicants to
authority sequentially.101 What is the most comparable event when prosecuting in non-administrative jurisdictions? I believe that the decisive event in government cartel prosecutions is the date the first cartelist is publicly reported to agree to cooperate with prosecutors, because then all the remaining members know that one (or two, if an amnesty application was awarded) company and its managers are prepared to testify in court against all the others. In these cases, the “termination” date for an investigation is the date the cartel was first “cracked” or broken by prosecutors, or on which the first notice was taken of guilt.102 Historically, the remaining guilty pleas flow out soon after the first one – about a year or so.

Similarly, when a cartel is being sued for damages by injured parties, the initiation date is the day in which the case was filed in court, and the termination date is when the first cartelist agrees to settle and to cooperate with plaintiffs.103 In my view, the date a first settlement is announced is a generally decisive prosecutorial event that signals the toppling of resistance by remaining defendants, though admittedly full settlement often takes a couple of years. Thus, the second date is oftentimes not the end of compensatory litigation, but rather the beginning of the end.

**Collusion**

PIC also records the starting and ending dates of collusion. In jurisdictions in Europe, these are the dates when the first two members of the cartel began colluding and the last cartelist stopped. In the United States and similar criminal jurisdictions, the dates of the

101 An additional layer of decision making can be found in the UK, South Africa, India, and a few other jurisdictions that have competition tribunals that receive a commission recommendation and vote on it. PIC records the commissions’ decision dates rather than the tribunals’ dates.

102 The EC and many other commissions announce the outlines of an adverse decision for all cartel members on a single day. However, other authorities (e.g., the DOJ) make their penalties known piecemeal. In private damages suits, both patterns are observed.

103 The first settlement agreement is often a sweetheart deal that will give plaintiffs probative information about illegal conduct should a trial become necessary. If this date is not announced, then PIC substitutes the date that the supervising court offers preliminary approval of settlements.
various guilty pleas and successful law suits are scanned; the earliest and latest dates proven are the ones recorded; if the plaintiffs in follow-on private suits prove to the court’s satisfaction more expansive periods than the criminal decisions, then the longer ones are adopted. In the cases where multiple jurisdictions prosecute the same cartel episode, then the earliest and latest dates across jurisdictions are adopted for the collusive period. While this procedure might be thought to exaggerate cartel duration, on average these duration periods are likely understated outside of Europe and North America.\(^\text{104}\) (EC dates are given separately to illustrate different approached in dating collusion).

G. Industry, Market and Cartel Structure

Each cartel is classified into one of 28 broad industries (see Sheet 3 of the spreadsheet for the codes). If a user desires more precise industry definitions, the names of the cartels can be used to subdivide any of these broad industries into finer industries; for example, “Finance, Insurance, and Banking” can easily be broken down into three or more sub-groups by sorting on the cartels’ names. In addition, there are six Industry Types coded that have been found to be relevant in explaining industry performance (capital good, final good, intermediate input, service, etc.).

Limited information is available for the structure of the cartel or its market. If known, the cartel’s percentage share of supply (CR) is noted; if that number is unavailable but narrative information indicates that the cartel “dominated” its industry, then “Cartel Share > 50\%” is coded as one. If available, the numerical market share is combined with the number of companies in the cartel (N) to calculate a measure positively related to N-firm industry sales concentration ratio \((CR/N = CR/N)\), which is the average market share held by a member of the cartel.\(^\text{105}\) If a cartel decision indicates that a firm acted as a cartel

\(^\text{104}\) Newer authorities have newer antitrust laws, and they cannot impose fines for periods that predate enactment of those laws. For example, a cartel detected by the Italian antitrust authority (AGCM) in 1991 could not be punished for collusion in 1989, the year before Italy had its competition law.

\(^\text{105}\) The cartel’s share of market control is usually so high that the degree of sales concentration for the top three to eight sellers is typically the same percentage. In other words, it is empirically impractical to distinguish the share of a cartel’s degree of market control from conventional concentration (the shares controlled by the top sellers).
leader (some penalty guidelines apply extra fines for this), then the “Leader” column has a 1 in it.

The buying side of the cartel’s market is encapsulated by zero-one variables in four columns: “Government is a Major Buyer,” “Many Buyers” (approximately more than 100), “Moderate Number of Buyers” (about 30 to 100), and “Few Buyers” (fewer than 30). These categorical designations sometimes arise from information in cartel decisions, the business press, or the author’s own knowledge of markets. These columns are frequently blank.

H. Cartel Conduct

Cartel conduct is difficult to encapsulate in a quantitative spreadsheet, but three characteristics are available. One is the distinction between bidding rings and classic “price-fixing” cartels (Marshall and Marx 2012). This distinction is not a completely sharp one (some price-fixing schemes treat certain large customers that buy using Requests for Proposals differently), but it is generally serviceable. Note that most cartels that have governments as their principal buyers also have Few Buyers = 1 and Primarily Bid Rigging = 1.

Third-Part Support is a characteristic sometimes noted in cartel decisions. Typically, this coding is used when an industry trade group, a consulting firm, or an accounting firm actively assists a cartel. A neutral arbiter can increase trust among cartel participants. If a cartel exploited an industry association by depending on regular meetings as a platform for making and enforcing agreements, this was also considered third-party assistance. While a few third parties have been penalized, their support is usually too subtle to warrant prosecution. This characteristic is very likely underreported.

Finally, a measure of corporate serial or repetitive collusion is coded in a “Recidivism” section of the spreadsheet. The idea is to encapsulate a company’s proclivity for serial collusion. The name of every corporate cartelist that was penalized for collusion since

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106 The PIC spreadsheet also includes a “recidivism” Cartel Count. This measures the number of cartel members that have firm-level recidivism rankings above one. The term recidivism has a narrower meaning in the law, but empirical studies show that true recidivism is a subset of serial collusion (Marvão 2014a).
1990 was sorted alphabetically, and if its name was found $N$ times, then that number was coded as its managerial recidivism ranking.\textsuperscript{107} Note that if a company acquires a new firm previously convicted of cartel conduct – even after collusion ended – then its measure of serial collusion will necessarily rise. If no multiple instances of cartel conduct can be found, then Recidivism = 0 (note that Recidivism = 1 is impossible).

### III. KEEPING COUNT: SELECTED STATISTICS

In this section I analyze the principal dimensions of international hard-core cartels over the 30 years 1990-2019. Sections A to H focus on worldwide cartel data. There, I present PIC-derived statistics on numbers, affected sales, corporate penalties, and individual fines and incarceration. In Section G, I highlight broad geographic variation.

#### A. Cartel Numbers

Information was collected on almost 1508 suspected or convicted cartels (Table 1).\textsuperscript{108} Of these 1508, about 103 investigations (6.8\%) turned out to be dead ends – researcher selection error.\textsuperscript{109} In addition, 124 of the qualifying international cartel investigations (8.2\%) were eventually closed or dismissed, in many cases even after indictments were handed down. Put another way, once a formal investigation of suspected price fixing is launched, the chance that an international cartel will be found guilty of an antitrust

\textsuperscript{107} This concept of recidivism is broader than many legal definitions of recidivism. It does not take into account when an episode of collusion began or ended. The spreadsheet has recalculated a recidivism ranking in 2009, 2012, and 2014; if a recidivism ranking is missing, that is because the cartel was not listed.

\textsuperscript{108} 1535 observation numbers were initially assigned sequentially, but as more information was revealed about a case, some did not qualify as international cartels or duplication was discovered, leaving 1508 usable observation numbers. (The Cartel Index or Directory back-up file details the use of each number).

\textsuperscript{109} That is, what initially were initially reported to be cartel investigations turned out to be merger or monopoly cases, or, if cartels, did not qualify as either private or international. Later, as more information about the case became public, it became apparent that it did not qualify for inclusion; alternatively, the antitrust authority closed its investigation, as revealed by an announcement or by inaction.
infraction is about 92%. Antitrust authorities are by-and-large cautious organizations when it comes to opening investigations, apparently preferring not to target potentially innocent parties.

Reasons for failure to prosecute the cases vary, but most investigations were shut down because of a lack of sufficient evidence of a violation; this might be interpreted as a type of prosecutorial selection error, but not decisions that lead to conviction error. Lack of evidence may either derive from the internal discretion of antitrust-authority prosecutors or from the decision of a judge that fails to certify a private civil damages complaint. In many cases, prosecutors were unable to secure cooperation from cartelists, many of which resided outside the jurisdiction. During nearly all of this data set’s study period, the United States, Canada, the EC, and the 28 Member State jurisdictions of the EU applied virtually identical, rigid standards of prosecution of hard-core cartels.\textsuperscript{110}

Besides the 8.2\% of the 1508 suspected cartels being judged as “not proven,” as of mid-2019 another 10\% of the detected cartels is still being investigated by government authorities or unresolved litigation through a private-suit damages suits (Table 1). The percentage of cartels under investigation tends to rise with every new Edition of PIC because the annual rate of cartel discoveries also increases.\textsuperscript{111}

The number of cartel discoveries per year worldwide rose slowly in the 1990s, from three to five in the early 1990s up to ten to 15 in the late 1990s. Detections surged in subsequent years, peaking to an average of 83 per annum during 2010-2014 (Figure 1). Although a bit early to tell, it appears that cartel detection rates have declined slightly since 2014. This certainly seems to be the case for U.S. prosecutions (Connor 2019, 2019a). If this recent decline can be attributed to a parallel fall in the number of extant, hidden cartels, then this is good news for cartel customers and consumers. However, it may be premature to declare the victory of tough antitrust enforcement over illegal collusion because the causes of detection rates are complex (Connor 2011a). For example, detections are rising

\textsuperscript{110} The EU tends to consider combinations of vertical and horizontal price fixing to be a form of hard-core cartel conduct, while the U.S. is slightly more lax in such cases. Similarly for frequent sharing of sensitive strategic business information, which may be sufficient evidence for conviction in the EU.

\textsuperscript{111} This comment does not apply to the discoveries in 2017 and 2018 because of lags in reporting.
in part because of the increasing number of detectors; the number of antitrust authorities that have tackled at least one international cartel rose from four in 1990 to 78 in 2018. Moreover, a seemingly worldwide shift towards nationalist-populist political regimes may negatively affecting anti-cartel enforcement efforts since 2016 (Connor 2019a).  

1. Annual Rates of Discovery  
Worldwide Peaked in 2010-2014

The PIC data comprise 1151 cartels have been deemed guilty of price fixing by one or more antitrust authority (Table 1). Convictions may be sorted into five categories, of which three precipitated monetary penalties. First, by far the largest category is filled with 763 cartels (66% of the guilty cartels) that had only government fines imposed and no civil judgments.112 The fines-only punished cartels accounted for 27% of all cartel fines

112 However, about 35 of these cartels are currently being sued by private plaintiffs who have not yet reached a settlement with the guilty cartelists. Several of these suits are making very slow progress through national courts in the EU. If these suits are successful, then the fines-only category could expand slightly.
but a surprisingly low 1.4% of the affected sales of the guilty cartels. Second, 166 cartels (14.4%) paid both fines and civil penalties; settlements for these 166 cartels were typically about two-fifths as large as the fines imposed. These cartels tend to be global cartels caught by antitrust authorities in North America and all of which paid damages in follow-on suits; they account for the great majority (73%) of affected commerce. Third, there were 98 cartels (8.7%) that paid only civil damages and no fines. That is, the prosecutors were plaintiffs’ counsel who on average obtained large settlements ($404 million per cartel) without the benefit of a prior criminal conviction. Despite the disadvantages of non-follow-on status, the severity of their settlements was 2.3 times the severity of the follow-on cases. Nearly all of these cartels were subject to court-supervised class actions in North America (see Connor 2012c).

Fourth, 124 of the guilty cartels (10.7%) accepted stand-alone “consent decrees,” cease-and-desist orders, or similar warnings from antitrust authorities that require the members of a cartel to curtail their anti-competitive practices but no accompanying monetary penalty. Consent decrees are indicators that the authorities observed illegal cartel conduct.113 Although seldom employed by the DOJ or EC, resolution of infringements by means of decrees is quite common among the EU’s National Competition Authorities (NCAs), which accounted for 45% of the consent decrees; they are also fairly frequent enforcement outcomes among the newer authorities in Eastern Europe (9%) and Asia (14%). Norway and Brazil have issued tough mandatory restructuring decrees to resolve cases, which are likely to be quite costly for defendants to implement. In at least seven cases (in Switzerland, Japan, and South Korea), warnings were issued because of an absence of fining authority or because the rigid rules in place in a jurisdiction’s guidelines resulted in fines that were considered too high to be politically acceptable. Another seven consent decrees were multi-year bans imposed on suppliers of goods or services that rigged bids issued by the World Bank. Four consent decrees were issued by U.S. agencies without criminal authority (the FTC and the U.S. Department of Transportation); the DOJ last used a consent decree for proven cartel conduct in 1996.

113 To be clear, these are cases where consent decrees were the sole remedy. When fines are imposed or civil settlements made, consent decrees are frequently used to amplify the deterrence effect of the monetary penalty.
Fifth, three investigations of cartels were interrupted by statutes of limitations. My reading of these cases is that either they involved an error by the authority or unusually strong non-cooperation by defendants.

B. Affected Sales of Cartels

Known cartelized sales of the 1138 guilty cartels total an impressive $887 billion (measured in nominal dollars), which implies a mean size of $917 million per cartel with known sales (Table 1). For the 71 cartels presently under investigation, the mean affected sales is seven times higher than the guilty cartels, $6.82 billion versus $917 million. As above, there are five categories of penalized cartels. By far the smallest of the guilty cartels were the fines-only or consent-decree-only cartels; the cartels penalized with damages settlements or dual monetary penalties have the largest total sales. Mean average known sales per cartel also varies by penalty category.\textsuperscript{114} These large differences across penalty categories are explained mainly by geographic and industry mix. For example, one of the principal reasons for the higher sales in the dual-penalty category is that many operated in the large auto-parts and banking industries (Connor 2013, 2014, and 2019). The cartels within the Auto-Parts and Banking supercartels are also mostly global cartels, which have average sales nearly \textit{80 times higher} than regional cartels (Table 2).\textsuperscript{115}

C. Corporate Monetary Penalties

In the 1990s, 84 private international cartels were fined $5 billion; total penalties reached a total of $12.3 billion. Then, in March 2012, after a period of accelerating antitrust

\textsuperscript{114} Mean average affected sales are $2,384 million for damages-only, $4,490 million for dual penalties, $289 million for fines-only, and $135 million for consent decrees only, respectively.

\textsuperscript{115} I am uneasy about reported affected commerce of three of the Banking supercartels. For example, the financial press often reports the asset sizes of derivatives connected to the manipulated LIBOR index, but a good argument can be made that the traders were colluding on trading revenues (roughly, the bid-asked price spread, which can average only a few basis points) only on a few days each month. Thus, the affected sales of three such cartels (LIBOR and two Swaps), entered as $1,145 trillion are likely overstated.
enforcement, penalties on 457 such cartels broke the $100-billion barrier. By mid-2019, some 1020 cartels had been found guilty of price-fixing crimes or rule violations and paid total monetary penalties of $231 billion (Figure 2).\textsuperscript{116}

\section*{2. Total Penalties on International Cartels $233 Billion (1990-2019)}

Of the 1020 “guilty” cartels penalized in 1990-2019, 758 (74\%) had fines imposed only, 167 (16.4\%) paid civil damages only, and 94 (9.2\%) paid both fines and civil damages (Table 1). On a per-cartel basis, fines averaged $151 million and settlements averaged $348 million; however, the average penalties were highest for the dual-penalty category ($772 million total, of which $468 in fines and $303 million in settlements), which has in it many global cartels prosecuted in North America.\textsuperscript{117} Monetary penalties historically

\textsuperscript{116} These data cover 1990-2019, but the amounts of antitrust fines or settlements imposed prior to 1990 by the United States, Canada, EU and Japan is insignificant.

\textsuperscript{117} Recall that “imposed” means announced fines, not necessarily paid. Some cartels are allowed to pay in installments over about five years, some have their fines reduced by appeals courts, and in some newer
are the outcomes of 89% of all corporate cartel convictions. The remaining cartels (9%) were issued solely non-monetary conduct remedies (consent decrees, warnings, and the like).

The severity of penalties may seem high when measured by the dollars paid per cartel -- $203 million on average. However, when severity is gauged relative to the affected sales associated with the cartels, the amounts are exceedingly low. Among the four continental cartels, this index of severity has a median average of 2.0%. The severity of penalties on global cartels is slightly larger (median 2.3% of sales); however, severity is markedly higher for the global cartels in industries making physical goods (median severity 3.5%) than those in the services-industries (1.05%).

**D. Cartel Overcharges**

Penalties are assessed by antitrust authorities so as to deter the formation of cartels or to encourage the break-up of existing cartels (a/k/a encouraging defection, dissuasion of collusion, destabilizing a cartel, or prompting a cartelist to apply for leniency). Both classical deterrence and the newer dissuasion theory start with penalties base on some multiple of damages.

The *optimally deterring* penalty required to make a collusive agreement unprofitable – because the expected cost of conviction are greater than the expected stream of monopoly profits – are significantly higher than the *minimum* size of a promised reduction in fines offered to just one member of the cartel needed to destabilize a cartel by applying for leniency (Harrington 2014). The minimum incentive to effectuate a leniency application depends on two parameters, A and B; A is the probability of cartel detection and conviction in each period of collusion, and B is the depreciation rate of cartel penalties.
Parameter A is conventionally assumed to be in the range of 0.10 to 0.30.\textsuperscript{118} Parameter B is shown to be dependent on the difference between actual collusive duration and the lower duration employed to assess penalties.\textsuperscript{119}

The PIC data set includes 956 non-zero estimates of overcharge rates. Except for Canada, the four intra-regional cartels each have 150 to 200 estimates tailored to the affected commerce in the region (Table 2). The “world” estimates sometime simply repeat the sole regional estimate, except when several regions are involved. Most of the zero overcharges follow from the fact that the cartel had no regional sales; if sales are positive, then a zero overcharge means that the cartel was ineffective in controlling prices.

\textbf{E. Corporate Cartel Participants}

The PIC data set identifies about 49,000 companies that were involved in cartel activity detected during 1990-2017 (Table 1).\textsuperscript{120} Most of these participants are either independent firms identified as a participant (8%) or are ultimate controlling parent firms (90%) that

\textsuperscript{118} Harrington (2014) proposes an upper limit of 0.20, but Connor and Lande (2012) show that even 33% is an acceptable upper limit. The 20\% figure tells a better story, because the overlap is much smaller (see next note).

\textsuperscript{119} There are no empirical estimates of B, but Harrington shows that B depends on the “duration gap” described. When B is very small, the difference in durations is also small. Harrington (2014: 35) hazards that the duration gap probably ranges from 8\% to nearly 50\%, and I agree that that is true for most prosecutions, though there will be many outliers on the high side. Consequently, the reasonable range for most cartels is B= 0.05 to B = 0.125. The minimum penalty sufficient to dissuade collusion will be (A/B) = D, where D is the damages multiplier in the jurisdiction. In theory, A/B can range from 0.05/0.125 = 0.40 to 0.3/0.05 = 6.0. In the U.S., D = 5 is possible for large cartels, but D = 1 to 2 is more likely; all these numbers are dissuadable levels of penalties. In the EU, D = 0.5 to 2 is also a likely range (but see Connor 2010b).

Optimal-deterrence levels of penalties are a special case of the dissuadable penalties, for which B = 1 (because B does not vary with the duration of collusion). Then D = 1/A, which reasonably would vary from 3.33 to 20 times damages. These penalties range higher, but overlap in the 3.33 to 6.0 range.

\textsuperscript{120} The majority of these companies are anonymous, as when a decision states that a banking association with 1000 members was liable for collusion. Slightly over 10,000 companies in PIC are known by their names (Table 1). However, anonymity is not a grave problem. As the analysis of penalties shows, only 7\% of all penalties are associated with anonymous parents, and this limitation is confined to six EU NCAs.
were held responsible for the cartel conduct of lower-ranking units. In addition, there are 1031 intermediate operating companies listed that are typically more recognizable than the ultimate parents. A small number of cartels were comprised of a single entity, usually a trade association or consultancy.

Penalties can be used as an indicator of the relative importance of the companies in PIC: they are unique for each cartelist, so (unlike sales) there is no double counting. Table 1 shows that subsidiaries of parent groups were identified by antitrust authorities as principally responsible for carrying out cartel activities that resulted in 68% of total monetary penalties imposed. That is, the vast majority of monetary penalties were incurred by members of large, diversified multinational corporations.121 The remaining 32% of penalties were imposed on companies with simple corporate structures (single ownership layers) or where antitrust authorities held the top level of a company solely responsible for collusion.

The third panel of Table 1 focuses on the legal status of 10,030 named defendants. Of these companies, 6543 (65%) paid fines and 708 (7.1%) paid private settlements only. These two categories account for all of the $230 billion in monetary penalties paid. An additional 571 (5.7%) were guilty but paid no monetary penalties. The mean penalty paid by fined defendants worldwide is low, a mere $28 million, but the average settlement amount for damages-only defendants is $64 million. The large number of named companies still under investigation (1937) suggests that future announcements could increase penalties by 10% to 20%.

**F. Individual Cartel Participants**

A total of 2152 natural persons have been penalized for “managing” these price-fixing cartels, which is an average of 1.9 managers held liable for each guilty PIC cartel (Table 1). However, just half of the 1289 PIC cartels had no individuals held liable by the authorities. Consequently, the mean average number of penalized executives is about four

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121 A small share of the 68% derived from diversified companies that were headquartered in the convicting jurisdiction.
per guilty cartel. Of course, the vast majority of detected cartels were managed by dozens of executives, but most of the antitrust authorities had no criminal statutes or decided to make an example of only a few of the principal managers.\footnote{The Brazilian authority CADE tends to apply a broad standard to individual guilt in cartel cases (every executive addressed in emails, attending conspiratorial meeting, and the like). It tends to fine 40 to 60 executives in international cartel cases.}

While there is great variation, the median average fine for convicted cartel executives or directors is $52,500, and the median average prison time is 18 months of prison time (Table 1).\footnote{The mean fine of $1.1 million is strongly affected by two restitutions above $100 million. For example, Alfred Taubman, the Chairman and owner of Sotheby’s paid a then-record U.S. fine of $7.5 million and restitution of $156 million to customers of Sotheby’s. The mean average prison time is 14.13 months, but is also somewhat skewed, and rising. Brazil has been active during 2015-2019 in imposing very long prison times because of bribery associated with bid rigging.} Industry bans are infrequent – 15 cases only. These data may exaggerate the severity of personal fines. Outside of North America, spotty information suggests that it is rather common for fined executives to have their employers pay the fines and for courts to convert prison sentences to home detention, community service, or other non-prison sentences (Connor and Lande 2012). Moreover, the international character of the cases in PIC means that a high number of indicted individuals become fugitives; antitrust authorities often prefer to ignore fugitives, but PIC shows that 303 indicted executives are known or likely to be fugitives.

Although not shown, the majority of these individuals have held positions in upper management or boards of directors; most of the rest have been sales managers, division directors, and the like. In Germany and some other EU jurisdictions, names of individuals fined are withheld, but anonymous defendants are much less severely fined than are named individuals.

G. Penalties

Worldwide penalties are summarized in Table 1. As of mid-2019, announced antitrust penalties imposed on 1030 international private cartels totals $233 billion, of which 60% are fines and 40% are settlements in private damages suits. Although the penalties are
an impressively large figure, they represent on average only 2% of the affected sales of the guilty cartels.

The 1154 guilty cartels can be placed in four major penalties’ categories (Table 1). The largest number (763 cases) had only fines imposed, which averaged $82 million. A smaller number of cartels paid only settlements to private plaintiffs (100 cases and $404 million paid). Third, those that paid both types of monetary penalties (166 cases) were assessed the majority of penalties (averaging $784 million each). The fourth type of cartels agreed to follow future conduct restraints (124 cases).

H. Dates

More than half of the data cells in the PIC Full Data spreadsheet contain dates. As explained previously, there are two sets of dates listed, cartel duration and the opening and termination of investigations by antitrust authorities.

Duration

The temporal endurance of cartels is an important measure of effectiveness. In brief, cartel injuries are the product of the overcharge rate and cartel duration. Effective antitrust enforcement may be focused on one of three cartel characteristics: preventing the formation of cartels, lowering overcharge rates, or increasing the fragility of cartels (i.e., lowering duration by increasing the incentives for cartel members to defect). Dates of collusion are surprisingly hard to pin down. The end of a cartel usually coincides with the defection of one of its members or a raid by an antitrust authority, but the beginning dates of an agreement are harder to precisely identify because documents were not preserved or witnesses’ memories fail. The decisions of antitrust authorities also tend to be cautious about durations because of standards of proof in appeals courts.

Because one end or the other of the life of a cartel is missing, only 1153 duration periods are published in the PIC data for the 1304 cartels. The mean average length of collusion is 85 months and the median 60 months (five years). The range on cartel durations is
enormous: nine lasted a day or so and 263 (23%) endured for ten years or more, all of which implies that durations are skewed.

*Enforcement Time or “Lags”*

PIC lists all the publicly available dates on which an investigation was known to be launched and to have been essentially concluded. As explained above, “first notice” (discovery dates) often are the same as the dates on which a formal investigation is initiated, but sometimes probes are revealed later because an authority works in secret before announcing indictments or penalties. As for termination dates, they are most commonly the date a decision (fines or closing of an investigation) is announced by an authority covering all cartel participants; this is the practice of the EC and similar competition-law agencies.

Criminal jurisdictions are more complicated, as convictions of each participant may vary over time. To make the ending dates comparable across jurisdictions, in places that announce penalties sequentially, PIC cites the date the first fine or private settlement is announced (the date the cartel “cracks”). The time period between a first notice of an investigation and its resolution is the “enforcement lag”. Therefore, if investigatory secrecy is not employed, the enforcement lag is either correct or slightly shortened; if secrecy is complete, then the two dates are identical, and the enforcement lag is recorded as a zero, otherwise it is positive.

Of the 1304 detected cartels, an enforcement lag is available for 1113, but many cartels were indicted or sued by multiple authorities. Table 3 displays data on enforcement lags related to 1939 cartel cases investigated. First, “secret” probes are quite common but vary across jurisdictions. For the entire body of 1939 cases, 437 (22.5%) were “secret” probes or unreported in the press. In the United States, the use of grand juries leads to a high rate of secrecy (35%), but either the empanelment of a grand jury “leaks” to the press or time is required by the DOJ to secure multiple guilty pleas.124 EC raids of cartel suspects are normally quickly reported, but in 17% of the time Internet searches fail to turn up press reports until a decision is announced. Finally, prosecutions of private damages suits

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124 Leaks of the existence grand juries are not usually illegal, only the testimonies made therein.
ought to be perfectly transparent because court filings are in principle public, but even here sometimes a case receives no publicity until a settlement is announced.

Second, positive lags occur when investigations are transparent or after the existence and focus of a secret grand jury leaks. As a normative matter, assuming no differences in error rates, shorter investigations are preferred to longer ones because of the uncertainty over future liabilities for suspect companies. The speed of the guilty-plea system is supposed to be the most efficient resolution of guilt, but it may take longer than many observers assume. U.S. government lags (the difference in time from when a probe becomes public and the first guilty plea by a participant) average minimums of 2.2 to 2.6 years; typically six more months is required to punish all members of the cartel, so 3 years is closer to the mark (Table 3). The EC has a reputation for long investigations, but the data show an average only six months longer than that of the United States. And the EU NCAs seem to dispose of cases most rapidly. Because they usually must wait to obtain evidence until government investigations are concluded, private cartel-damages cases are drawn out to an average of 5 years or more, roughly double that of the DOJ.

Third, in an echo of Dicken’s Bleak House, some cartel investigations endure for very long times. One EC prosecution over credit card interchange fees was mightily resisted by Visa and MasterCard for 28 years. Even in the supposedly quick U.S. and Canadian criminal-law regimes, nine- and ten-year investigations are noted. One private damages suit persisted for 16 years.

A. Geographic Differences in Cartels

Cartel Numbers

There are two ways of splitting cartel activity geographically. First one can treat the Global cartels as though they are a special Region, making regional categories consist of only cartels that operated totally within a single continent. Second, but more difficult, is to split global cartel numbers and sizes across the Regions; in effect, global cartels are

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125 In this book the fictional legal case Jarndyce v Jarndyce drags on for generations.
then partitioned and *double-counted* as partial cartels in two or more regions. Either view is valid.

Using the first concept, almost half (48%) of the 1138 penalized cartels operated exclusively in Europe, mostly in Western Europe (Table 2, 1st row). By contrast, only one-eighth of all international cartels operated exclusively in North America.

Using the second concept, because almost 40% of the Global cartels also fixed prices in Europe, 51% of all international cartels fixed prices in Europe (Table 2, 2nd row). Counting the 25% of Global cartels with North American operations raises this Region’s share to 16%. Given that Western Europe and North America are similar in economic size, the propensity for cartelization in Europe is roughly three to four times the rate per dollar of GDP than it is in North America. Assuming that detection rates are similar in both Regions, the sharp difference in propensities may indicate that business cultures in the United States and Canada are more compatible with antitrust objectives, i.e., more averse to violations of antitrust laws, than their European counterparts.

Asia has a GDP that exceeds that of North America by about 70% and Europe by 45%. Yet, a few stars aside, detection rates of cartels by most local antitrust authorities are probably lower than the other continents (Connor 2008). By either measure, the number of cartels penalized in Asia (149 or 180) in 1990-2019 is roughly the same as in North America. Similarly, cartels confined to other three continents (the “ROW”) are fewer in number (113) than the North American cartels (Table 2). Moreover, the ROW appears to be especially attractive to the managers of global cartels: the increase in numbers of global cartel convictions is much higher in the ROW (almost 100%) than in any other Region.

*Cartel Sales’ Size*

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126 The high share of European cartels found in Western Europe is largely due to the longer history of effective anti-cartel enforcement in the EU and its Member States. Data on penalties were historically heavily weighted by EC prosecutions, but the NCAs have as a group caught up with the EC in the past ten years.

127 North America is defined as Bermuda, Canada, and the United States. Mexico and the Caribbean nations are categorized as part of Latin America.
Figure 3 shows estimated affected commerce of PIC cartels detected from 1990 to 2019 in nominal U.S. The total sales are an almost unimaginable $87 trillion. Global cartels as a group were responsible for 35% of the world’s cartelized sales captured by the PIC data (Table 2). When the sales of global cartels are distributed across the four Regions, cartels operating in Europe and North America each account for about 46% of the worldwide total. Cartels operating in Africa, Asia, and Latin America generated the remaining 8% of affected commerce.


Although the sales data need to be treated with caution, one could infer from data in Table 2 that the typical penalized cartel has mean average affected commerce of $919 billion, but that mean average is deceptively high, as it hides great variation in size.\(^\text{128}\) The

\(^{128}\) In fact the large mean is driven by three global banking cartels (Banks, Interest-rate swaps, LIBOR, and CDS Swaps) with tentative sales estimates of $1.145 trillion. Without these three cartels, the mean average sales for the remaining 965 cartels with known sales becomes $91.5 billion and the median $2.006 billion.
**median** sales size is a better measure of the average: $2.05 billion (Table 2). Looking only at the **median** sales’ size, Global cartels are the biggest ($6.88 billion) compared to cartels operating more locally.\(^{129}\) As expected, Global cartels are several times larger than cartel operating within the four Continents/Regions: North America ($2.65 billion), Europe ($1.58 billion), ROW ($1.03 billion), and Asia ($0.92 billion).

So far, I have discussed the majority of cartels with known sales, which is 85% of the set of penalized cartels. Projecting known sales raises the world total to $126 trillion (Table 2, 7th row). Lags in decisions are shortest in North America, so projections will have the greatest impact in Europe and the ROW. Projected cartel sales are highest for European cartels (50% of the world) and drop for North America (40%). Asian and ROW cartels are the fastest-growing types, but are still relatively small (9%) in size using projected sales (Connor 2015).

**Cartel Penalties**

Penalties are more precise measures of geographic patterns than cartel numbers or affected sales. Monetary penalties are of two types, government fines (and mandatory restitution) and settlements in private damages suits. They are distributed geographically in much the same way as sales.

\(^{129}\) Recall that sales are often revised downward after conviction as detailed decisions become available. Several of the recent banking scandals (most Global) with convictions not yet completed have enormous affected sales estimates.
Of the four Regions, total monetary penalties were highest for cartels active within Europe (18.5%) followed closely by North American-located cartels (16.1%); Asia (3.9%) and the ROW (6.2%) are the smallest, though fastest-growing regions for cartel penalties (Figure 4 and Table 2). Global cartels – often operating in all four of the regions – are the most heavily penalized type of cartel, comprising a hefty 55.4% of all cartel penalties. Overall, worldwide monetary penalties are 60:40 fines-to-settlements. However, at the Regional level, penalties on local North American cartels are heavily weighted toward damages settlements (10:90). Nearly all private settlements are in North America. In the other regions the ratio reverses to 23:10 fines-to-settlements.

The geographic picture is similar when penalties are distributed according to the jurisdiction imposing them. That is, when the penalties on global cartels are partitioned across the penalizing regions, the share attributable to North American enforcement is about
55% of the world total (Figure 5). Europe is a strong second (35%) and the other jurisdictions amount to 10%.

5. **Penalties** Paid by Convicted Cartels, where Penalized, 1990-2019

The source of cartel fines has shifted over time. In the 1990s, 85% of all fines were imposed by authorities in the United States and the EC. However, in the 20 years after 1999, profound changes occurred in the geographic origins of cartel fines. Despite huge increases in fines imposed after 1999 by the DOJ and EC – the two dominant antitrust authorities -- their dual shares of global fines fell to a combined 62% to 65% in 2000-2009 and to a combined 50% to 55% in 2010-2019 (Figure 6).130 In contrast, the shares of

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130 The timing of decisions shown in Figure 4 is somewhat rough. The year shown is *the first year* that any one antitrust authority in the world announced a fine on a cartel. So, for global cartels with multiple fines, in many cases the U.S. DOJ guilty plea agreements preceded the EC’s decision (and other slow antitrust agencies) by a year or two; in effect, the EC’s (and others’) fine was shifted forward to its first or second year of investigation. Settlements in private damages suits grew more slowly than fines over 1990-2019, adding to the decline of North America’s share of total penalties.
worldwide fines accounted for by the EU’s NCAs and the ROW increased by from 12% in the 1990s to 60% in 2015-2019.

6. **US & EC Share of World Cartel Fines**

Since 1999, fines imposed on international cartels in Europe (principally the EC and EU NCAs) are nearly 19 times the fines imposed by the U.S. and Canadian authorities! Even when corrected for cartel numbers, the ratio is five to one. However, when civil monetary penalties are considered (mostly private damages), North America and Europe are about equal at $26 billion. North American civil settlements are 95% of the total private cases, whereas the reverse is true for Europe (4% civil damages). The ROW more resembles Europe in its settlements/fines composition than North America. For Global cartels, the

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131 Illustration of 2010-2019 is arbitrary. These same points are sustained whether 2005-2019 or 2000-2019 are examined.
most heavily penalized “location type” of cartel, two types of monetary fines are more evenly split because the great majority is penalized in North America.

Global corporate cartel penalties increased almost every year from the early 1990s to about 2012, but has since fallen below the 2012 and 2014 annual peaks of $32 billion. Figure 7 shows the exceptionally well fitting trend in the logarithm of cumulative global cartel penalties. The trend in total annual cartel penalties seems to be downward for the years 2013-2019, thus leading to the nearly flat cumulative-penalties curve in recent years. Unlike the years 1995-2014, when new records were set every few years, no penalty records have been set in the semi-decade 2015-2019.

132 The fit is nearly perfect because conversion to logarithms reduces the effects of large changes in the data and because using cumulative data takes into account both current and previous penalties.

133 Data for 2018 and 2019 are incomplete and are the lowest figures, yet the four years 2012 and 2015-2017 were also well below the dual 2012 and 2014 peaks. It may be premature to base predictions on only six of the past eight years, yet the same comment may be said about U.S., EC, EU NCA, and ROW fines and private damages – for each of five major penalty categories, none has seen new peak years in the most recent five years.
The flatter trend is too recent to isolate the reasons for flagging enforcement, but I suspect that explanations are likely to include fewer additional antitrust authorities capable of convicting international cartels, lower rates of overall cartel detection, failure to detect new supercartels like *Auto-Parts* and *Banking*, substitution of individual penalties for corporate fines, and flagging political support for antitrust goals.\(^\text{135}\)

While the absolute values of monetary penalties are impressive, relative to sales they are not. The average worldwide penalty is merely 0.03% of affected sales, and this ratio is fairly steady across regions, from a high of 2.63% in ROW to a low of 0.126% in Europe (Table 2). Because median overcharges are more than 20% of sales, fines and civil penalties recoup *less than one-twentieth of cartel injuries* (Connor 2014a).

*Cartel Injuries*
Cartel overcharges since 1990 are enormous -- at least $64 trillion worldwide when based on known affected sales (Table 2). When *projected* sales are the base, world overcharges are breathtaking (Figure 8).

\[8. \text{Projected Total Damages by Region of Jurisdiction}\]

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\(^{135}\) The drop-off in U.S. fines is most evident after the Trump Administration took power (Connor 2019a).
Depending on whether one employs median- or mean-average overcharges, estimates range from $259 trillion to $1297 trillion, and global-cartel overcharges account for 65% to 90% of the total (Figure 5). Interestingly, cartel overcharges (known or projected) are many times higher for European-located cartels than for cartels operating in North America. Yet, is the ROW that seems to be the most heavily affected by cartel pricing, out of proportion to its GDP. Only a sliver of economic activity occurs in the ROW jurisdictions well equipped to enforce their anti-cartel laws.

Median average overcharge rates for the worldwide observations are 25.0% of sales (Table 2). The EU average is distinctly higher, while the other regions are close to the worldwide average. Mean averages are much higher (125% for the world), because each of the cells contain a few very high rates. For cartels with all the necessary data, dollar overcharges are known to total at least $64 billion worldwide, of which global cartels account for the lion’s share. Because less than half of the PIC cartels have estimated overcharge rates, but the large majority of cartels have reasonable affected sales estimates, projecting overcharges for most discovered cartels is straightforward. Projected world overcharges during 1990-2019 are in the range of $259 billion to $1.3 trillion, depending on the method used; again global cartels account for the vast majority of PIC overcharges (Figure 5). Cartels that confined their collusion to within the EU generated about three times the projected dollar overcharges of those cartels operating within North America, even though these economies’ respective GDPs are quite similar (Table 2).

**B. Geographic Differences in Corporate Cartelists**

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136 This phenomenon is largely explained by difference in the industry mix and duration of cartels.

137 I refer to Brazil, Korea, Japan, Australia, and South Africa.

138 I hazard that if one were to project overcharges for the 25% of the observations with no sales’ estimates and to include undiscovered cartels (70% to 90% of the sample), total private international cartels most likely generated in the range of $1.15 trillion to $17.3 trillion during the 30-years 1990-2019. Obviously, the wide range is meant to connote a highly uncertain point estimate.
There are at least 8161 parent companies or corporate groups that have been caught or punished (89.5%) for cartel infractions worldwide (Table 2). Because historically antitrust enforcement is largely located there, cartelists by and large hail from rich countries. At the same time, antitrust authorities have imposed fines on significant numbers of companies headquartered outside their jurisdictions.\footnote{PIC data from 1990 to 2010 reveal that 82% of companies fined for price-fixing by U.S. authorities are non-U.S.; for the EC, the comparable percentage is 32%. EU fine regulations specifically require ultimate controlling parents to pay their cartel fines to the EU Treasury, and, while less explicit for guilty subsidiaries, the same requirements hold in North America. Bach (2013), in an analysis of the U.S. balance of payments flows, shows that “A large share of …outward and inward transfers result from the prosecution of international cartels…” (p. 55).}

Sixty-five percent of the prosecuted parent companies are headquartered in Europe, primarily Western Europe (Table 2). One-sixth are headquartered in Asia (includes Oceania), especially in Japan and Korea. North American companies comprise 13.5% of the total, while only 5.5% of the cartelists are from Africa or Latin America.

Affected sales associated with the region of the parents has a similar geographic distribution (Table 2), but the dollar figures shown involve considerable double-counting. Fines and other monetary penalties imposed are a cleaner measure of the corporate origins and liabilities for price fixing, and the geographic distribution of penalties is roughly proportional to company numbers (Figure 9).\footnote{Counts of company numbers are affected by serial collusion. By using monetary amounts, these figures avoid the problem of double-counting of parents that engaged in serial collusion during 1990-2019. There are 7300 companies included in this figure; including the 860 companies punished with consent decrees, banning, etc. would not change the outcome appreciably.} Western European companies incurred 53% of all the corporate cartel penalties, followed by North American (27%), Asian (14%), Latin American (4.3%), and other headquarter locations (1.5%).\footnote{The share of penalties paid by North American companies is about double the share of their numbers, which implies that North American companies had relatively large affected commerce, most likely because of their industry mix, and because they more frequently paid private settlements than did European firms.}
C. Geographic Differences in Individual Cartelists

As of 2019, the PIC data contain at least partial information on 2266 individuals cited for involvement in collusion. Some are indicted awaiting disposition of their cases, a small number have been acquitted, and some are as yet anonymous. Here, I focus on the 1349 individuals that have been prosecuted for price fixing; that is, they have been fined, imprisoned, or declared guilty by an antitrust authority but not yet penalized.

Like corporate cartelists, a high share of the 1349 convicted cartel executives were citizens or residents of high-income, industrialized nations: Europe (27%) and North America (22%) (Table 2). However, Asian executives comprised the largest share (29%), mostly

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142 As mentioned above, Germany and a few other authorities keep the names of cartel managers or directors of guilty companies confidential, mentioning only their employer, position, and often the aggregated fines imposed. Brazil is another difficult case because the indictments and decisions on the Ministry of Justice Website sometimes mention only the number to be indicted; later, when names are first released, links to employers are unavailable. Getting the full information can take years, which results in an undercount of individuals guilty in Brazil of price fixing.
from Japan (14.3%), Korea (2.5%), and Taiwan (2.1%). Interestingly, 71% of these fines were imposed on cartelists were associated with global cartels.

Fines imposed on these executives are typically slaps on the wrist: the mean average of $3.8 million is distorted by a handful of very large penalties; the median fine is $50,000. North American executives have paid the most -- 43% of the total personal fines -- followed by European executives and directors (36%).

Until 2005, most fines and nearly all prison sentences were meted out by U.S. courts, and U.S. managers were the most frequent recipients. But since 2005, Brazilian judges have been exceedingly aggressive in imposing long sentences on construction-company executives involved in bid rigging of public works projects, a scandal known as the Lava Jato affair. Consequently, the length of prison sentences rose markedly in 2005-2019 to a total of 22,000 hours (Table 2). Incarceration of 8816 months have been imposed on international cartelists. The largest recipients of prison sentences have been imposed on Brazilian citizens, followed by U.S., Japanese, Korean, and Taiwanese cartel managers.

IV. CONCLUSIONS AND FURTHER RESEARCH

The major findings of this paper are summarized in the Abstract above. As interesting as these bullet points may be, my analyses above barely scratch the surface of what can be gleaned from the PIC data.

These data can serve as a basis of several kinds of economic analyses of cartels, from descriptive essays to industry studies to more technical statistical treatments (see Connor 2004 to 2014a). Empirical regularities can be used to identify “stylized facts” that guide the design of economic models of cartels. The economic dimensions of the newest international cartels can be compared to all economic activity or to those active during the interwar period of 1920-1940; such a comparison may reveal insights about the influence of broad historical conditions (degree of globalization, rigor of anti-cartel regimes, etc.) on cartel formation or effectiveness. Other quantitative analyses measure the determinants of cartel duration or overcharges (Abrantes-Metz et al. 2013).
Penalties’ data are valuable simply as a way of charting the implementation of new antitrust policies but are also useful as elements in a variety of legal-economic analyses. For example, it is possible to justify the expense of operating antitrust authorities in even low income countries (Ivaldi et al. 2014). Also, one can evaluate the government-imposed and private antitrust sanctions relative to the economic harm caused by these cartels (see Connor (2013, 2014) and Connor and Lande (2012)). Such analyses have important implications for the deterrence power of antitrust sanctions.

More rigorous research on such patterns is measured by economists through applying multivariate statistical techniques to individual observations of cartels or cartelists. One can use these data to analyze the pattern of cooperation discounts from the fines imposed by the world’s major antitrust agencies, including the fast-spreadiing leniency programs (Marvão 2012). Linked with other data, PIC data can enrich other data sets; see Fosfuri et al. (2014), who link R&D and patent data to measure the degree to which joint patents can become platforms for collusion. Other multivariate analyses are Connor and Miller (2013, 2013a), Fosfuri et al. (2014), Gaertner and Roux (2011), Marvão (2014), Marvão and Spagnolo (2014), and Gonzalez et al. (2013).

Research employing PIC data is being pursued on business and financial topics, usually adding information about corporate managerial and strategic decisions. For example, Gonzalez et al. (2013) find that executives working at companies convicted of price fixing engage in numerous activities that obfuscate their companies’ financial performance (more frequent earnings smoothing, segment reclassifications, and earnings restatements) and follow undesirable governance policies (non-replacement of directors who resign and rarely engaging new auditors). Another example is Dong et al. (2014), which demonstrates that after being penalized by authorities for cartel violations, firms react to their decline in profitability by increasing their rate of horizontal mergers and acquisitions. See also Campobello et al. (2015). Finally, a paper applies the Fama-French event-studies model to estimate the effects on stock prices of 353 listed U.S. firms convicted of price fixing (Bianconi et al. 2015). These authors find that the long-term effect of conviction reduces the average stock price by 1.7%, except for 37 amnestied firms,
which suffer no negative stock-market consequences. The equity losses are three times the antitrust penalties imposed.\textsuperscript{144}

\textsuperscript{144} In a fascinating, if somewhat speculative analysis of what accounts for this gap, the authors suggest that it is the market’s estimate of the firm’s loss of future monopoly profits due to the cartel’s unmasking and premature termination.
V. REFERENCES

[https://www.researchgate.net/profile/John_Connor7/publication/256063023_The_Determinants_of_Cartel_Duration/links/0c96052b3387a0905c000000.pdf]


[https://www.researchgate.net/publication/262069317_The_Supportive_Factors_of_Firms_Collusive_Behavior_Empirical_Evidence_from_Cartels_in_the_European_Union]


145 Chosen as one of the year’s 12 best articles by the editors of CPI in January 2011.


Ivaldi, Marc, Frédéric Jenny, and Alexandra Khimich. *Cartels in LDCs Survey Summary: Spreadsheet Dated August 26, 2012.* (Available from the author(s) upon request).


### Table 1. Dimensions of the PIC Data Spreadsheet (Edition 2019.5), Cartels Discovered Worldwide, January 1990 to December 2017

<table>
<thead>
<tr>
<th>Units of Observation</th>
<th>Number</th>
<th>Known Cartel Affected Commerce</th>
<th>Govt. Fines Imposed</th>
<th>Other Money Penalties</th>
<th>Total Money Penalties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AFFECTED SALES:</strong></td>
<td>$ billion</td>
<td>$ billion</td>
<td>$ billion</td>
<td>$ billion</td>
<td>$ billion</td>
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<tr>
<td>Guilty (Penalized):</td>
<td>1151</td>
<td>887,264</td>
<td>140.6</td>
<td>92.1</td>
<td>232.9</td>
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<tr>
<td>Fined only</td>
<td>763</td>
<td>12,523</td>
<td>62.3</td>
<td>0</td>
<td>62.3</td>
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<tr>
<td>Damages paid only</td>
<td>98</td>
<td>214,543</td>
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<td>40.4</td>
<td>40.4</td>
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<td>Paid fines and damages</td>
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<td>651,076</td>
<td>78.4</td>
<td>51.7</td>
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<td>Consent Decree &amp; Other</td>
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<td>9,123</td>
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<td>0</td>
<td>0</td>
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<td>345,436.a</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>Sub-Total: Suspect &amp; Guilty</td>
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<td>1,232,700</td>
<td>140.6</td>
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<td>232.9</td>
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<tr>
<td>Not Proven or Dismissed k</td>
<td>150</td>
<td>345,436 b</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Companies: a

**By Type:** b
- Ultimate Parents, named: 8,503 -- 141.7 75.0 215.8
- Ultimate Parents, anonymous: 36,586 -- 1.1 15.5 16.6 d
- Subsidiaries, total: 3,768 -- 99.2 57.7 157.1
  - of which report through Operating Companies: 1,013 -- NA NA NA
- Total: 48,858 -- 139.7 91.0 230.7

**By Legal Status, Named Companies:**
- Fined: 6543 -- 140.5 45.7 185.0
- Paid Damages only: 708 -- 0 45.0 45.0
- Consent Order, no Monetary Penalty: 520 -- 0 0 0
- Bans, no Monetary Penalty: 51 -- 0 0 0
- Amnesty Recipient: 237 -- 0 0 0
- Investigation time-barred: 34 -- 0 0 0
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<th>Under Investigation or No Information</th>
<th>Total rows</th>
<th>Executives &amp; Directors Penalized: c</th>
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<td></td>
<td>10,030</td>
<td>Number Persons</td>
<td>Number Parent Companies</td>
<td>Personal Fines Imposed</td>
<td>Other Money Penalties</td>
<td>Months of Prison</td>
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<td></td>
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<td>--</td>
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<tr>
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<td>500</td>
<td>0.001096</td>
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<td>9,433</td>
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<td>0.000059</td>
<td>--</td>
<td>12,588 (i)</td>
<td></td>
</tr>
</tbody>
</table>

a) Excludes companies of cartels that were cleared, dismissed, or no longer under investigation.

b) These are unique categories. Where a subsidiary is identified, it is typically the legal unit that was penalized. If no subsidiary is listed, then “Operating Companies” are the legally sanctioned businesses. If a subsidiary is identified, then “Operating Companies” are well-known companies or legal intermediaries in the ownership chain between subsidiaries and an ultimate parent group (or holding company, government, or family) that owns the subsidiary. Some guilty companies are “anonymous” because the decision-documents of antitrust authorities suppress their names. Note that the sales of “companies” are in fact double-counted *cartel* sales.

c) Managers of the cartels and directors or corporations held personally responsible. Where the size of fines or lengths of imprisonments are known, these facts are listed. It is the practice in Germany and other jurisdictions to name the number or positions of individuals penalized but not their names.

d) Nearly all of the antitrust penalties imposed on companies that are not named are found in a few Member States of the EU, viz., Germany, the Netherlands, Portugal, Norway (rarely), Spain, and Lithuania (rarely).

e) Estimated

f) Of the nearly 1304 cartels that were either found guilty or are still under investigation, affected-sales figures are available for 978 (75%) of them. Of the 1154 guilty cartels, 925 (80%) have estimated sales. Consent-Decrees and Other cartels had 87 (68%) sales estimates available.

g) Only 53 of the 150 cartels under investigation have estimated sales (35%).

h) Unreliable or noncomparable figure because sales estimation stops when a cartel is cleared.

i) A huge increase in 2015-2019 due mainly to long Brazilian prison sentences in the “*Lava Jato*” supercartel, many quite high because of bribery.

j) There are 284 U.S., 14 Canadian, and 78 ROW prison sentences, amounting to 5337, 85, and 16241 months, respectively. Many outside the United States are commuted.

k) About 25 (1.8%) of the suspected cartels have had all or most of its participants dismissed from prosecution during 2017-2019, but no definitive evidence of closure was found.

Source: PIC Data Spreadsheet (Dated August 30, 2019)

\(---\) not available or not applicable
Table 2. Geographic Dimensions of Penalized Cartels and Cartelist, Discovered January 1990 to December 2017

<table>
<thead>
<tr>
<th>PENALIZED CARTELS</th>
<th>Regions within which Cartels Fixed Prices:</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>North America</td>
<td>Europe</td>
</tr>
<tr>
<td>Total Number Penalized by Region</td>
<td>143</td>
<td>550</td>
</tr>
<tr>
<td>Total Number Penalized by Region (Global distributed)</td>
<td>188</td>
<td>618</td>
</tr>
<tr>
<td>Number Penalized with Sales Data</td>
<td>142</td>
<td>424</td>
</tr>
<tr>
<td>Known Affected Sales, Region of Operation ($ billion)</td>
<td>19,097</td>
<td>33,992</td>
</tr>
<tr>
<td>Median sales size ($ billion)</td>
<td>2.60</td>
<td>1.56</td>
</tr>
<tr>
<td>Known Affected Sales, including Global ($ billion)</td>
<td>40,290</td>
<td>41,318</td>
</tr>
<tr>
<td>Projected Affected Sales, including Global ($ billion)</td>
<td>51,355</td>
<td>63,071</td>
</tr>
<tr>
<td>Fines Imposed ($ billion)</td>
<td>3.53</td>
<td>41.08</td>
</tr>
<tr>
<td>Other Penalties ($ billion)</td>
<td>33.61</td>
<td>1.59</td>
</tr>
<tr>
<td>Total Monetary Penalties by Region ($ billion)</td>
<td>37.16</td>
<td>42.67</td>
</tr>
<tr>
<td>Monetary Penalties with Global ($)</td>
<td>127.09</td>
<td>79,967</td>
</tr>
<tr>
<td>Consent Decrees, no fines (number)</td>
<td>5</td>
<td>63</td>
</tr>
<tr>
<td>Penalties per Cartel ($ million)</td>
<td>357.9</td>
<td>77.6</td>
</tr>
<tr>
<td>Penalties/Sales (%)</td>
<td>0.196</td>
<td>0.126</td>
</tr>
<tr>
<td></td>
<td>151</td>
<td>71</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Known Overcharge Rates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(number)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mean Non-zero Overcharge (%)</strong></td>
<td>221.2</td>
<td>158.6</td>
</tr>
<tr>
<td><strong>Median Non-zero Overcharge (%)</strong></td>
<td>26.9</td>
<td>24.22</td>
</tr>
<tr>
<td><strong>Known Overcharges ($ billion)</strong></td>
<td>545.0</td>
<td>2018.3</td>
</tr>
<tr>
<td><strong>Projected Overcharges ($ billion)</strong></td>
<td>552.7</td>
<td>6,033.0</td>
</tr>
<tr>
<td><strong>Median duration (months)</strong></td>
<td>53.0</td>
<td>61.0</td>
</tr>
<tr>
<td><strong>World GDP in 2007 ($ billion PPP basis)</strong></td>
<td>15,051</td>
<td>18,430</td>
</tr>
</tbody>
</table>

**PARENT COMPANIES:**

| Nationality of Penalized Companies (Ultimate Parents) | 1102 | 5268 | 1339 | 452 | -- | 8161 |
| Known Affected Sales, Associated with Penalized Companies ($ billion) | 2,505,738 | 9,340,283 | 70,863 | 5,517 | -- | 11,920,401 |
| Penalties, by Nationality of Penalized Companies ($ billion) | 63.3 | 123.9 | 33.5 | 11.7 | -- | 232.30 |

**EXECUTIVES:**

| Nationality of Penalized Executives (number) | 298 | 359 | 388 | 304 | [681] | 1349 |
| Total Affected Sales of Cartels Associated with Nationality of Penalized Executives ($ trillion) | 15,486 | 5,785 | 3.2 | 21 | [21,247] | 21,295 |
| Fines Imposed, by Nationality of Penalized Executives ($ million) | 269.6 | 225.5 | 17.3 | 122.7 | [388.0] | 635.1 |
| Imprisonment, by Nationality of Penalized Executives (months) | 5,779.5 | 677 | 891 | 14,648 | [3,354] | 21,996 |
Source: PIC Data Spreadsheet (Dated August 30, 2019)
-- = not available or not applicable

a) I projected sales (and overcharges) within each region or for global cartels by using the ratio of the total number of cartels to the number with known sales as the multiplier. Of the 1138 guilty cartels, only 14% had no estimated affected sales and about 54% had no estimated overcharges.

b) The cartels in the four broad regions to the left had their operations confined to one of six inhabited continents (Africa, Asia (including Oceania), Europe, Latin America (including Mexico), North America, or Oceania) or to one jurisdiction (EU, U.S., Canada, and the like). In contrast, Global cartels operated in at least two continents and typically three or four. Global also includes eight cartels that were separately operating branches of larger worldwide cartels, according to the prosecuting authorities. Global-cartels’ data enclosed by square brackets signals that these data are in fact distributed to the four Regions’ cells to the left.

c) World is usually the sum of North America, Europe (Eastern and Western), Asia (including Oceania), Rest of the World (Africa, Asia, and Latin America), and Global; moreover, the four regions do not include Global. However, for some rows Global numbers are bracketed, it is just a sub-total and not added into in World.

d) This number is the announced amount of fines imposed by an antitrust authority. It may exceed the amount eventually collected. This is especially the case in many Latin American and ROW jurisdictions because of lengthy appeals in many ROW jurisdictions. In North America and Europe, announced fines are generally collected either immediately or according to strictly observed installment plans.

e) Estimated by adding $4 trillion to the EU figure.

f) A sales-weighted average of the 560 cartels with both sales and positive monetary penalties. Four large problematic global banking cartels are excluded.

g) Imposed by UK and NL.

h) Imposed by JP, KR, IL, and ID.

i) Imposed by Brazil, mostly the large Lava Jato cartels.

j) Not cartels, rather cartel-region counts.

k) One U.S. and two global financial cartels excluded with $1,145 trillion in estimated sales.
APPENDIX:
CODING PROTOCOLS

Numerical Coding

Columns B and C allow users to sort rows of data into three levels. Column B assigns a unique number to each target Company or association. Similarly, Column C assigns a unique number to any Person or executive mentioned as culpable parties; for such individual data, each person is assigned to the cartel and his employer. If B=0 and C=0, then the row refers to data for the whole cartel (the company and executive names are absent). If C=0 but B>0, then the row of data are for the whole company (including, for example, fines on the company’s employees).

Geographic Coding

Columns E, F, and G of PIC provide quick, sortable information of the geographic location of the cartel. First, the column labeled CONT classifies the continent within which the cartel fixed prices. There are seven “continents.” Five are conventional continents: Africa, Asia, Latin America (includes Mexico), Oceania, and North America (Canada and the United States). Because historically anti-cartel enforcement began in Germany and the EU-6, Europe is divided into Western Europe and Eastern Europe.\textsuperscript{146} If a cartel operated across two or more of these PIC continents, it is classified as GLOBAL. Second, the column labeled GEOG is a finer geographic specification: it may be within one nation or one multinational customs union (EU); if that is not the case, GLOBAL is repeated.\textsuperscript{147}

\textsuperscript{146}Geographic names closely follow the definitions of the United Nations Statistical Agency. In PIC, “Eastern Europe” includes most of Central Europe (Poland, the Czech Republic, Hungary, etc.). Specifically, it is the Baltics, Poland, Czech and Slovak Republics, Slovenia, Slovakia, Albania, Greece, Cyprus, and all other Europe to the east of these nations. All of what is often termed Southern Europe (Portugal to Greece) is considered in PIC to belong to Western Europe. Turkey is in Asia.

\textsuperscript{147}Although rare, a cartel for which CONT=GLOBAL may have GEOG=NL or some other national symbol. This only happens when a global cartel had a completely separate management unit for a single nation, according to the decision of an antitrust authority. For example, PIC Cartel #422 consists of international moving and storage companies that sent household property from France to the United States; they were fined exclusively by the French Conseil de la Concurrence.
Third, the column labeled LEAD JURISDICTION lists the location of the first, principal, and oftentimes sole prosecuting authority; if multiple agencies took the lead with simultaneous raids, then slashes are used (e.g., EC/US/JP).

Categorizing cartels according to their geographic locus of operation is usually straightforward. The corporate members of global cartels subject to U.S., Canadian, or EU prosecution usually are identified as such by the press releases or reports of the prosecuting authorities. Joint raids or investigations by two or more of the major antitrust agencies are further indicators of probable global scope. In a small number of cases, the composition of the cartel allows one to infer how widespread the cartel operated. However, a few cartel cases required judgment about their geographic locus of operation.

Red Flags

Some cells contain extra information in a comment underlying a cell. For example, an estimated sales figure may have an upper and lower range. Or the method and source used to calculate an overcharge may be explained.

Missing Data

Some columns are always filled in: cartel name, industry, type, location, etc. There should always be at least one “begin” date, the day the first investigation (or private suit) appeared in a publication. However, affected sales and overcharges are frequently missing because no reliable information could be found or because the cartel is still being investigated. Fines are missing until a decision is announced. Even after a decision with fines is published, some antitrust authorities (Germany, the Netherlands, South Korea, and others) occasionally reveal only the top fines. From time to time, smaller settlement amounts are withheld from the public. If the amounts of penalties are small (not “material”), stockholders’ financial reports also fail to disclose them.
Rather than leave non-disclosed corporate penalties blank, for a few cartels I have estimated the missing penalties.\textsuperscript{148}

Missing data fields are left blank with a “?” to the cell on the right. If a number is entered with an “e” to the right, that means that the number given is approximate. If a number is entered with an “?” to the right, that means that the number given was reported by some source but seems to be inaccurate or inconsistent.

Sometimes the names of defendants are missing and are replaced by “1 anon. company,” “12 anon. directors,” or similar wording. Missing names occur because certain antitrust authorities (Germany, the Netherlands) do not publish the names of fined cartelists. Every effort is made to locate these missing names in the local press.

I judge that for aggregate descriptions of cartel activity, it is better to work with the partial information given by estimates and suspicious numbers than to omit this information. However, some users aiming at greater statistical accuracy may wish to exclude the iffy observations tagged with the “e” and “?” symbols.

\textbf{“Discarded” Cartels}

Next to the bottom of the spreadsheet, are rows of data (highlighted in dark brown) on alleged cartels that after a few years of investigation by one or more antitrust authorities were not prosecuted. Either the suspected firms were innocent of illegal collusion, the collusion did not rise to the level of a prosecutable offence under the jurisdiction’s laws, or the firms were in fact guilty but the evidence was considered insufficient to convict. Approximately 5% of all cartels formally investigated end up being discarded in this way.

Note that not all cartel numbers are used. A cartel is temporarily assigned a unique number when it is under formal investigation and it appears to be an international hard-core cartel. However, as information becomes available, what appeared initially to be a hard-core cartel evolves into a vertical price maintenance case or some other non-cartel

\textsuperscript{148} If the some of the missing-data defendants are large or are recidivists, market shares may guide my estimation of the penalties of leading firms. The smaller defendants will receive equal estimated penalties. The estimated penalties tend to be very small dollar amounts.
offense, so it is dropped. Alternatively, ownership relationships are revealed to be entirely domestic so that the international requirement is not met. Finally, what at first appeared to be two separate cartels later is found to be a single cartel (operating across jurisdictions, two time periods, or under two similar product names). The Cartel Index (spreadsheet Table A0) has a list of discarded and duplicated cartel numbers.

“Supercartels”

Sometimes jurisdictions may differ about whether a conviction applies to one cartel or to multiple cartels. The bulk cartels are a good example. The DOJ treated six products as though they were in a single cartel. The EC decision considered each vitamin product a separate agreement. Economists would classify each vitamin market as separate because the products were not substitutes. In PIC, 17 separate vitamins cartels are identified, but a special code (#27) was created to aggregate information from the 17 cartels. These are complex global cartels that overlap in time, product group, and memberships.

Cartel 27 (All Vitamins) is one of four “Supercartels” in PIC; the other three are the 83 Auto Parts (#631), 81 Banking cartels, and the seven Lava Jato cartels. Connor (2013) coined the term and defines it thusly:

“Supercartels are unique. They are: (1) global in scope and (2) have a large number of distinct products (i.e., separate cartels) with partially overlapping corporate membership, and (3) direct their price fixing at customers in one vertical production-distribution channel. In short, supercartels have wheels within wheels” (p.1).

A detailed legal-economic study of the Vitamin supercartel can be found at Connor (2008). A case study of the Auto-Parts supercartel is in Connor (2019). Their 188 individual cartel components are identified in the main part of the spreadsheet. Although small in number (14.4% of detections), the four supercartels account for 53% of all monetary penalties (and the remaining global cartels another 22%, adding up to 74%).

149 Two other bulk vitamins (B3 and B4) were always treated separately.