

Screens for Conspiracies And Their Multiple Applications

BY ROSA ABRANTES-METZ AND PATRICK BAJARI

COMPETITION AUTHORITIES typically pursue price-fixing conspiracies in three stages: detection, prosecution, and penalization. In the United States and Europe, antitrust authorities historically have relied on leniency applications for the detection stage. Leniency programs have identified cartels in numerous industries including vitamins, DRAMs, graphite electrodes, and fine art auctions. As a result, over \$2 billion dollars in fines have been assessed in the United States alone since 1997.¹

Notwithstanding this success, some collusion remains undetected. Indeed, the very fact that leniency applications continue to be filed at high rates confirms that collusion still occurs. Moreover, leniency programs likely display a bias towards uncovering conspiracies close to the breaking point, meaning that the most successful and durable cartels likely remain undetected. Recognizing the limitations of leniency programs, many antitrust agencies have started to search for alternative (or complementary) approaches to detecting conspiracies. One such approach is screening.

A screen is a statistical test designed to identify industries where competition problems exist and, in such industries, which are the firms involved in a conspiracy. Screens apply statistical tools to commonly available data, such as prices or bids, costs, or market shares to identify patterns in the data that are either highly improbable or anomalous. Broadly speaking, collusion screens employ either of two strategies.

The first type of screen searches for improbable events, much like a casino screens for cheats. For example, the probability that a gambler at a Las Vegas casino will place a winning bet in roulette is roughly 0.5 percent. During her shift, a roulette dealer might see a handful of players win five, or

even seven times in a row. However, the probability of winning twenty times in a row is around one in one million. If a pit boss sees this occur, he may not be able to prove that cheating has occurred, but he would be well advised to watch closely or risk losing a lot of money. One set of collusive screens generalizes this idea by looking for events that are highly improbable unless firms in the industry have coordinated their actions.

The second type of screen uses the concept of a control group to identify anomalous patterns in the data. In the 1980s, organized crime in New York City operated a “concrete club” that rigged bids on contracts over \$2 million. During this period, the price of concrete was 70 percent higher in New York than in other U.S. cities. Prices in other cities where collusion was not suspected served as a control group for evaluating prices in New York. While it is true that prices of many goods and services were higher in New York, few prices were 70 percent higher than in other large cities. Prices that appear anomalous compared to those in control markets suggest a competition problem.

In this article we describe how economists have implemented screens to search for competition problems. The examples we discuss are bid rigging, price fixing, market allocation schemes, and manipulation of commodities markets. Screens are not only useful to antitrust agencies; they can also be a powerful tool for plaintiffs and defendants in antitrust cases. Thus, we also describe the multiple uses that screens have (i) for defendants accused of collusion in assisting to establish the non-existence of a conspiracy or its immateriality; (ii) for *Twombly* applications; (iii) in assisting with decisions on whether to apply for leniency; (iv) at the class certification stage; and (v) in estimating damages.

It is important to emphasize that screens do not prove collusion. Screens merely isolate outcomes that are improbable or anomalous and thus merit closer scrutiny. Screens will exhibit both false positives and false negatives. However, this does not mean that screens lack value. Doctors regularly screen their patients for diseases even though their methods exhibit both false positives and negatives. Even so, they screen patients because the expense of testing all patients for a rare disease is prohibitive. The process of screening identifies a subset of patients that are at a higher risk than others, which then allows the doctor to engage in more extensive testing for a select few. Analogously, a good antitrust screen will narrow the set of possible conspiracies to a manageable few that merit further review.

A good screen should possess the following properties: (i) it should minimize the number of false positives and negatives; (ii) it should be easy to implement; (iii) it should be costly for firms to disguise collusive behavior; and (iv) the screen should have empirical support.

Examples of Screens

Bid Rigging. Bid rigging in competitive tenders is a productive setting to apply screens for three reasons. First, compet-

Rosa Abrantes-Metz is Principal in the Antitrust and Securities practices of LECG, LLC, and a Visiting Scholar at Leonard N. Stern School of Business, New York University. Patrick Bajari is Professor of Economics, University of Minnesota, and Research Associate, National Bureau of Economic Research. The authors thank David S. Evans for discussions on the topic, and Donald Klawiter and Richard Rapp for suggestions. The views expressed are the authors' and should not be attributed to any affiliated organizations or their clients.

itive tenders are widely used not only for public sector procurement but also in financial markets, privatization of public assets, real estate and many other transactions. Second, bid rigging is a common antitrust offense. For example, during the 1980s, bid rigging accounted for more than half of all criminal cases filed by the DOJ Antitrust Division in the Reagan Administration.² Third, markets that use competitive bidding are frequently rich in data. In many countries, statutes require the public disclosure of bids.

There is a large body of empirical literature on collusion in auctions that implements various types of screens.³ While these papers span a wide variety of industries, researchers have identified common patterns when collusion is known or suspected.

BID-RIGGING SCREENS BASED ON IMPROBABLE EVENTS. The first set of screens looks for improbable events in sealed bid auctions. In sealed bid auctions, firms submit their bids simultaneously. These bids are then read on a set date. In the public sector, the contract is typically awarded to the lowest bidder. If firms do not collude, they cannot condition their bids on the bids of other firms. As a result, we should expect that the bids will be independent after we control for information that is observed by all bidders, such as variables that influence cost or market power.

On the other hand, if firms collude, they need to coordinate their actions. Frequently, this coordination destroys the independence of the bids and can be detected through the use of statistical hypothesis testing. Collusion is suspected when bids are “too highly correlated” with each other to be the result of independent actions by bidders. Searching for identical bids is a limiting case of this sort of screen. A famous example is bids received by the Tennessee Valley Authority to install conductor cables in the 1950s. Seven firms submitted identical bids of \$198,438.24. This is analogous to a gambler making twenty winning bets in a row at the roulette wheel. The chance of seven bidders, acting independently, arriving at bids that agree to eight significant digits is almost zero and sends a very strong signal that firms have explicitly or implicitly arrived at a mechanism for coordinating bids.

This type of screen was illustrated in two papers by Robert Porter and Douglas Zona, in which the authors examined a set of bids submitted by processors and distributors to supply school milk contracts in Ohio between 1980 and 1990.⁴ Porter and Zona argued that a bidder’s costs should be easily explained by a small number of readily observed variables, including foremost the price of raw milk and transportation costs. Recognizing that competition in this market is localized due to transportation costs, the authors built simple econometric models of bid submissions and bid levels as a function of costs (reflected in the distance between a public school, the bidder’s location, and the number of deliveries made by the bidder) and local market power (controlled for by variables measuring the locations of competing firms).

Porter and Zona showed that bids for the non-colluding firms could be explained using a regression model controlling

The chance of seven bidders, acting independently, arriving at bids that agree to eight significant digits is almost zero and sends a very strong signal that firms have explicitly or implicitly arrived at a mechanism for coordinating bids.

for the factors above. But the bids of the accused cartel firms presented a high level of correlation that could not be explained as well by the same data. From this finding plus other corroborating evidence, the authors concluded that the observed bidding behavior was sufficiently improbable to have been reached by competitive conduct.⁵

BID-RIGGING SCREENS BASED ON CONTROL GROUPS. A second prediction of economic theory is that bids should reflect costs in reasonably competitive markets. The act of collusion, on the other hand, attenuates the relationship between bids and costs so that conspirators can earn profits above a normal competitive rate. Therefore, a second type of screen involves determining how well bids reflect costs. In our motivating example about a concrete conspiracy in New York, one of the pieces of evidence we cited was that the cost of concrete was 70 percent higher than in other U.S. cities. In this example, costs in other cities served as a control group for the costs in New York.

Patrick Bajari (a co-author of this article) and Lixin Ye examined bids by highway contractors in the Upper Midwest during the 1990s.⁶ Three of the firms in their sample were convicted of collusion in the last decade. However, market observers believed that the industry was free of a market-wide conspiracy to rig bids. The authors used bids for a type of road repair known as seal coating. The standard job in their data was fairly small—the winning bids were approximately \$175,000. State highway departments prepare cost estimates before bidding occurs. These cost estimates are largely based on bids made in other geographic markets. Companies such as McGraw Hill sell “blue books,” which are essentially price indexes for particular construction tasks with market-specific adjustments. Bajari and Ye found that the ratio of the winning bid to the cost estimate was approximately equal to one with a small standard deviation. This suggests that bids in the Upper Midwest were comparable to properly deflated bids from other markets. The authors took this as affirmative evidence that most bids in the market were competitive.

Distance is an important determinant of costs in seal coating. Bajari and Ye used mapping software to measure the travel time in minutes from a bidder’s location to the project site. They found that the winning bidder was located closer to the customer than was the second lowest bidder, which is consistent with bids increasing in transportation costs. This provides corroborating evidence of a competitive market.

Economists can also screen for collusion by searching for prices that appear to be the result of explicit coordination or that fail to reflect costs.

Backlog is another important determinant of costs. Most firms in the data were small, with annual revenues under \$20 million. As a result, they had limited capacity and could not win all of the projects awarded in a particular year. As firms neared their capacity constraints, their bids should have increased as a result. Bajari and Ye measured an individual firm's capacity by tracking the number of projects it had previously won and the completion dates for those projects. The authors found that bids increased with backlog, providing additional corroboration of the conclusion that the market was competitive.

Finally, the authors used regression analysis as a further check on their initial collusion screens. Their regressions expressed the bid price as a function of the engineer's cost estimate, the distance from the project, the backlog as well as competitive factors, including the distance of the closest rival to the project. The regression analysis allowed bidding behavior to vary for each of the largest firms in the market. Using these regressions, Bajari and Ye screened for collusion by comparing regression results for pairs of firms. The intuition behind the screen is as follows. If A and B are not colluding, their bids should depend only on cost, distance, and backlog. On the other hand, if A and B collude, these factors alone will be insufficient to explain their bids and therefore we should expect A's and B's bid regressions to differ. Bajari and Ye applied this test to the eleven largest firms in their data set. They were unable to rule out the hypothesis that firms were not colluding, with the sole exception of the two firms recently sanctioned for bid rigging.

Screens Based on Price and Cost Information. Economists can also screen for collusion by searching for prices that appear to be the result of explicit coordination or that fail to reflect costs. For example, the Department of Justice suggests that the following patterns might be indicative of collusive behavior. Identical prices may indicate a price-fixing conspiracy, especially when: (i) prices remain identical for long periods of time; (ii) prices previously were different (and start becoming identical) (iii) price increases do not appear to be explainable by increased costs; (iv) discounts are eliminated, especially in a market where discounts historically were given, or (v) vendors are charging higher prices to local customers than to distant customers.⁷

In a recent paper by Rosa Abrantes-Metz (a co-author of this article), Luke Froeb, John Geweke and Christopher Taylor, the authors build on the intuition suggested in the

first pattern noted above.⁸ The authors propose a screen based on a search for pockets of high and low price variances among gasoline stations within a single metropolitan area. The motivation for the screen came from the observation of price and cost behavior during and after the fall of a bid-rigging conspiracy in the sale of frozen perch fillets to the Philadelphia Defense Personal Support Center between 1987 and 1989, prosecuted by the Department of Justice. This conspiracy indicated that collusive prices are less volatile and less responsive to cost shocks than are competitive prices. This empirical finding is consistent with many theoretical models of collusion. A cartel can be thought of as a "filter" that attenuates cost shocks before passing them to price, thereby reducing price variance.

The authors investigated how prices and costs patterns changed from the collusive to the competitive regimes. These data revealed four distinct patterns that were consistent with theoretical models of cartels: (i) there was a structural break when the cartel collapsed, marked by a sudden drop in prices; (ii) the average price was higher during collusion than during competition; (iii) prices were more stable under collusion than under competition; and (iv) prices followed costs movements more closely under competition than under collusion. These features of the data could also be used by antitrust authorities to spot collusion. For example, the higher variance of prices in the competitive regime would be flagged by a well-designed variance screen. Lower price variance has since started to be used by some competition authorities worldwide to flag for potentially anticompetitive behavior.⁹

Screens Based on Market Shares. Another potential screen uses data on market shares. The literature and evidence from prior cartels demonstrate that cartels may attempt to collude by fixing market shares.¹⁰ Two screens are suggested by the literature: (i) market shares that appear to be too stable over time and (ii) market shares for all firms in a particular market are negatively correlated over time. The first screen will detect an agreement by the cartels to divide the market. Examples of cartels with stable market share agreements include cartels in copper plumbing tubes, organic peroxides, and several vitamins (A, E, and folic acid, in particular).¹¹ The second screen is suggested by dynamic models of collusion.¹² In these models, if a cartel member deviates from the collusive agreement, it will need to compensate other cartel members in subsequent time periods. As a result, abnormally high shares for a particular firm in one period should be followed by a reduction in shares in the following period.

Screens Based on Mathematical Laws. Benford's law is a mathematical formula that describes the regularly occurring distribution of digits in many data sets. Studies have shown that the law applies to many diverse data sets, including populations of cities, electricity usage, word frequency, and the daily returns to the Dow Jones. Because Benford's law is a naturally occurring pattern in many data sets, violations of the Benford's law can be used to detect irregularities. In the

past, violations of Benford's law have been used to detect data tampering, manipulation of financial ratios, and tax evasion.¹³ Rosa Abrantes-Metz, Sofia Villas-Boas, and George Judge use Benford's law to test for conspiracies in several applied settings, including testing for alleged manipulation of the Libor rate.¹⁴

Using Screens for Detection by Competition Authorities

Antitrust agencies in the United States and Europe have used screens as a tool for detecting conspiracies, and in some agencies these efforts have intensified over the last few years.¹⁵

United States. Screening efforts in the United States date back to the 1970s when the Department of Justice formed an "identical bids" unit to investigate government procurement auctions in which identical bids were submitted. During the six years of its existence, however, no conspiracies were uncovered.¹⁶ In October 2006 the DOJ created the National Procurement Fraud Task Force to promote prevention, early detection, and prosecution of fraud in federal procurement contracts. The Task Force focuses on defective pricing, false claims, grant fraud, labor mischarging, and bid-rigging.¹⁷ More recently, the DOJ announced proactive efforts in partnership with state and local agencies to protect stimulus funds provided for by the American Recovery and Reinvestment Act of 2009 from fraud, waste, and abuse. These efforts include spotting behavior consistent with red flags for collusion.¹⁸

In 1998, the Federal Trade Commission developed and implemented a screen based on the behavior of prices over the business cycle. FTC staff hypothesized that the exercise of market power would cause prices to increase coming out of a business cycle trough. FTC economists searched for industries that experienced price increases during periods where output was not rising (to rule out demand increases) and when the industry was still in recession (to rule out cost increases).¹⁹ This screen flagged 600 industries for potential collusion, 25 of which were chosen for further investigation. Benign reasons were found for price increases in all but three of the 25 industries. One of the three industries was already under extensive investigation by the Antitrust Division. What happened as a result of the FTC's investigations is not a matter of public record.²⁰

In 2002, the FTC started screening gasoline markets through its official monitoring program.²¹ The Commission uses gasoline prices at major supply points like New Orleans as a competitive benchmark to screen retail prices in 360 cities and wholesale prices in 20 major urban areas. When the screen identifies persistent and significantly high prices, further investigation is conducted. To date, all observed pricing anomalies have disappeared in a short period of time or have been explained by non-collusive events such as pipeline breaks or refinery outages.²²

In 2004, Abrantes-Metz, Luke Froeb (then FTC Chief Economist), John Geweke and Christopher Taylor devel-

oped the price variance screen for collusion described in the previous section.²³ The authors applied the screen to test for conspiracies in gasoline retail stations in a localized area by searching for pockets of low price variance and high average prices. The authors found no such pattern among 279 gasoline stations in Louisville, Kentucky. Similar variance screens were used by the FTC in its post-hurricane Katrina and Rita investigations to test allegations of gasoline price manipulation.²⁴

Europe. In Europe several antitrust agencies are actively considering or already using screens to detect conspiracies. For example, the European Commission's market monitoring program is a two-step, industry-level approach.²⁵ First, the program identifies industries at risk of collusion, using characteristics such as a small number of firms, homogeneous products, and stable demand. Having identified these at-risk industries, the second stage establishes a theory of harm and an in-depth analysis to test the theory of harm, and uses screening methodologies, including high and stable prices, low responsiveness of prices to costs, and other changes in market conditions.

In Great Britain, Paul Grout and Silvia Sonderegger of the Office of Fair Trading identified industry-level variables that predict cartel activity.²⁶ The authors built an econometric model to predict collusion at the industry level using data from prior price-fixing cases obtained from the DOJ and the European Commission. They concluded that industry turnover, cost measures, concentration measures, entry barriers, and employee costs, among other factors, help explain the prevalence of collusion in an industry.

Other national European competition authorities also have started to develop screening programs and are applying these techniques in gasoline and other markets.²⁷

Multiple Uses of Screens

Screens are more than just cartel detection tools for antitrust agencies. They can also be used during litigation in the prosecution and penalty stages by plaintiffs, defendants, and antitrust agencies. Additionally, screens can be quite useful to companies in a pre-litigation setting.

During the prosecution and penalty stages, screens can be used in class action suits, to establish or reject certification, and they can also be used for Twombly applications. At a later stage in litigation, plaintiffs and defendants can apply screens to determine if an alleged cartel caused harm. Finally, experts can apply screens when estimating but-for prices and in providing support in damage estimation.

Use of Screens in the Class Action Certification Stage. Screening methodologies might prove very useful in the class certification stage, when factual claims are alleged to be common across class members. The use of screens could help illustrate different price patterns among the alleged cartel participants in the alleged cartel, and in assessing whether the sub-classes have opposing interests as these might have been translated into the observed data.

Use of Screens During Twombly Motions. Suppose plaintiffs file a complaint in which they infer the existence of a conspiracy, based on a screen, and for which there are insufficient facts plausibly supporting the existence of explicitly coordinated behavior rather than independent strategic behavior. If defendants want to apply *Twombly* in such a case, they should bear in mind that although there is empirical evidence that some of these screens are powerful, they nonetheless have a margin of error within which any particular case might fall. Also, screens may yield erroneous conclusions owing to use of inappropriate data, failure to control for relevant market changes, or failure to look into other available data pointing in an opposite direction. And even when screens are correctly applied, independent and collusive behavior might yield indistinguishable patterns in the data. Moreover, screens usually cannot distinguish between explicit and tacit collusion, unless the suspicious behavior is almost impossible under non-explicit communication.

Use of Screens in Damages and Effects Calculations. Screens can also provide useful information for the estimation of overcharges and damages. First, screens can be used to uncover the time periods during which a cartel operated effectively. Studies of previous cartels indicate that they may fail to change prices and quantities from a competitive level during many time periods. Second, many screens require the economist to study the relationship between prices and costs in competitive markets. This can assist the expert in estimating the but-for price in a damage estimate. As earlier noted, Luke Froeb and Mikhael Shor used data from a cartel that fixed the price of frozen perch sold to the Philadelphia Defense Personal Support Center to estimate but-for competitive prices during collusion. This estimate was based on the observed relationship between prices and costs after the break-up of the cartel.²⁸

In addition, screens allow the economic expert to predict which effects and damages a competition authority may estimate when a cartel is alleged. Above, we surveyed the screens used by various competition authorities to detect probable collusion. The alleged effects of a cartel are likely to be closely related to the screen used to detect the cartel in the first place. Many alleged cartels are international. Even if an alleged colluder's business is primarily in the United States, collusion may be detected by screens used by European authorities. If collusion is suspected in Europe, the screen is likely to be used by antitrust authorities in the United States and may become an issue in domestic court rooms as a result.

Uses of Screens in Pre-Litigation. Screens can help firms decide whether it would be beneficial to apply for leniency. Applicants need to compare the benefits obtained from applying versus the risk of prosecution and penalties. Leniency programs differ substantially between the United States and Europe. The leniency program in the United States applies only to the first reporting firm and only before an investigation has begun. In Europe, however, there are also benefits to the second and third reporting parties.

Use of Screens by Defendants in Manipulation Cases. An additional use of screens is by defendants accused of market manipulation. Rosa Abrantes-Metz and Sumanth Addanki developed a screen for manipulation in commodities markets.²⁹ The idea behind the test is to see whether the predictive power of short-run futures prices to spot prices in the future is reduced during manipulation. If markets are manipulated, there may be a (larger) divergence between spot and futures prices, and prediction errors might occur more frequently and span a larger set of values.

This screen was applied on behalf of the defendants in a case and was used as supporting empirical evidence of the absence (or non-materiality) of anticompetitive behavior in a private litigation which settled. As a benchmark to test the method, the authors applied it to the famous Hunt Brothers silver manipulation episode of 1979–1980. The authors demonstrated that this screen was able to detect this well-known instance of market manipulation, and that such behavior was inconsistent with that alleged in their case.

Conclusion

As screens become more popular, and more data and computer power are available, their use by agencies, plaintiffs, and defendants is likely to play an ever increasing role in antitrust litigation. ■

¹ See Scott D. Hammond, Director of Criminal Enforcement, Antitrust Division, U.S. Dep't of Justice: Cornerstones of an Effective Leniency Program, ICN Workshop on Leniency Programs (Nov. 22–23, 2004), available at <http://www.usdoj.gov/atr/public/speeches/206611.htm>.

² See Luke M. Froeb & Mikhael Shor, *Auction Models*, in ABA SECTION OF ANTITRUST LAW ECONOMETRICS: LEGAL, PRACTICAL, AND TECHNICAL ISSUES 225 (John Harkrider ed., 2005).

³ This literature includes Robert H. Porter & J. Douglas Zona, *Detection of Bid Rigging in Procurement Auctions*, 101 J. POL. ECON. 518 (1993) [hereinafter *Detection of Bid Rigging*] (examining auctions for highway construction projects in Long Island); Robert H. Porter & J. Douglas Zona, *Ohio School Milk Markets: An Analysis of Bidding*, 30 RAND J. ECON. 263 (1999) [hereinafter *Analysis of Bidding*] (examining the procurement of school milk in Ohio); Patrick Bajari & Jungwon Yeo, *Auction Design and Tacit Collusion in FCC Spectrum Auctions*, 21 INFO. ECON. & POL'Y 90 (2009); Patrick Bajari & Lixin Ye, *Deciding Between Competition and Collusion*, 85 REV. ECON. STAT. 971 (2003).

⁴ The analysis was based on the authors' expert reports for the prosecution on behalf of *State of Ohio v. Louis Trauth Dairies, Inc.*, C-1-93-553 (S.D. Ohio 1995). Robert H. Porter & J. Douglas Zona, *Ohio School Milk Markets: An Analysis of Bidding* (NBER Working Paper No. 6037, 1997); Porter & Zona, *Analysis of Bidding*, *supra* note 3.

⁵ Other studies of the same nature have also been performed in markets suspected of collusion. See Porter & Zona, *Detection of Bid Rigging*, *supra* note 3 (study of paving contracts on Long Island in the 1980s); John A. List, Daniel L. Millimet & Michael K. Price, *Inferring Treatment Status when Treatment Assignment Is Unknown: With an Application to Collusive Bidding Behavior in Canadian Softwood Timber Auctions* (presented at the PERC Applied Microeconomics Seminar, Texas A&M Univ. Dep't of Econ., Spring 2005)) (a study of bids for Canadian timber).

⁶ Bajari & Ye, *supra* note 3.

⁷ See Antitrust Div., U.S. Dep't of Justice, *Price Fixing, Bid Rigging, and Market Allocation Schemes: What They Are and What to Look For*, available at

<http://www.usdoj.gov/atr/public/guidelines/primer-ncu.htm>.

⁸ Rosa M. Abrantes-Metz, Luke M. Froeb, John F. Geweke & Christopher T. Taylor, *A Variance Screen for Collusion*, 24 INT'L J. INDUS. ORG. 467 (2006).

⁹ At the Italian Competition Authority, two economists "tested" the price variance screen on actual cartels in two different industries: the motor fuel market (gasoline and diesel); and the market for personal care and baby food products sold in pharmacies. The authors found that had the variance screen been applied to the data, it would successfully have detected these cartels. See Fabio Esposito & Massimo Ferrero, *Variance Screens for Detecting Collusions: An Application to Two Cartel Cases in Italy* (Italian Competition Authority Working Paper 2006).

¹⁰ See Joseph Harrington, *Behavioral Screening and the Detection of Cartels*, in EUROPEAN COMPETITION LAW ANNUAL 2006: ENFORCEMENT OF PROHIBITION OF CARTELS (Claus-Dieter Ehlermann & Isabela Atanasiu eds., 2007).

¹¹ *Id.*

¹² See Susan Athey & Kyle Bagwell, *Optimal Collusion with Private Information*, 32 RAND J. ECON. 428 (2001); Susan Athey, Kyle Bagwell & Chris Sanchirico, *Collusion and Price Rigidity*, 71 REV. ECON. STUD. 317 (2004).

¹³ Others who have used Benford's law to check the validity of purported scientific data in the social sciences include Hal Varian, *Benford's Law*, 26 AM. STATISTICIAN, 65 (1972); Mark Nigrini, *A Taxpayer Compliance Application of Benford's Law*, 18 J. AM. TAXATION ASS'N 72 (1996); George Judge & Laura Schechter, *Detecting Problems in Survey Data Using Benford's Law*, J. HUMAN RESOURCES (forthcoming 2009).

¹⁴ Rosa Abrantes-Metz, Sofia Villas-Boas & George Judge, *Tracking the Libor Rate*, Working Paper (2008). See also Rosa Abrantes-Metz, Michael Kraten, Albert Metz & Gim Seow, *LIBOR Manipulation?* (Working Paper 2008), available at http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=339863.

¹⁵ A more detailed discussion of these efforts can be found in Rosa Abrantes-Metz & Luke Froeb, *Competition Authorities Are Screening for Conspiracies: What Are They Likely to Find?* ABA Section of Antitrust Law Economics Committee Newsletter, Spring 2008 at 10.

¹⁶ Abrantes-Metz et al., *supra* note 9.

¹⁷ The National Procurement Fraud Task Force Web page is located at <http://www.usdoj.gov/criminal/nptff/>.

¹⁸ See Scott D. Hammond, Director of Criminal Enforcement, Antitrust Div., U.S. Dep't of Justice, *Follow the Money: An Update on Stimulus Spending, Transparency and Fraud Prevention*, Testimony Before the Committee on Homeland Security and Governmental Affairs of the U.S. Senate (Sept. 10, 2009), available at <http://www.usdoj.gov/atr/public/testimony/250274.htm>.

¹⁹ Jonathan B. Baker & Peter A. Woodward, *Market Power and the Cross-Industry Behavior of Prices Around a Business Cycle Trough* (FTC Working Paper No. 221, 1998), available at <http://www.ftc.gov/be/workpapers/wp221.pdf>.

²⁰ FTC History: Bureau of Economics Contributions to Law Enforcement, Research and Economic Knowledge and Policy Roundtable with Former Directors of Economics (Sept. 4, 2003), available at <http://www.ftc.gov/be/workshops/directorsconfendex.htm>.

²¹ Federal Trade Commission, *Gasoline and Diesel Price Monitoring*, available at http://www.ftc.gov/ftc/oilgas/gas_price.htm.

²² As reported by Abrantes-Metz et al., *supra* note 8.

²³ *Id.*

²⁴ Fed. Trade Comm'n, *Gasoline Price Changes: The Dynamic of Supply, Demand, and Competition* (2005), available at <http://www.ftc.gov/reports/gasprices05/050705gaspricesrpt.pdf>.

²⁵ Hans Friederiszuck & Frank Maier-Rigaud, *Triggering Inspections Ex Officio: Moving Beyond a Passive EU Cartel Policy*, 4 J. COM. L. & ECON. 89 (2008).

²⁶ Paul A. Grout & Silvia Sonderegger, *Predicting Cartels* (Office of Fair Trading, Economic Discussion Paper No. 773, 2005).

²⁷ The Austrian Competition Authority is currently using a variance screen to detect collusion in gasoline markets. See *Annual Report on Competition Policy Developments in Austria submitted to the OECD*, para. 38, 8 (Oct.

2008), available at [http://www.oecd.org/olis/2008doc.nsf/ENGDATCORPLOOK/NT00005A72/\\$FILE/JT03251655.PDF](http://www.oecd.org/olis/2008doc.nsf/ENGDATCORPLOOK/NT00005A72/$FILE/JT03251655.PDF). The Netherlands Competition Authority is currently developing its screening program. See Madeline Buijs, *Pointers to Competition Problems. An Integrated Approach in the Netherlands*, Office of the Chief Economist, Netherlands Competition Authority (Dec. 10, 2008), available at <http://www.encore.nl/identifying-competitionproblems.htm>.

²⁸ Froeb et al., *supra* note 2.

²⁹ Rosa M. Abrantes-Metz & Sumanth Addanki, *Is the Market Being Fooled? An Error-Based Test for Manipulation* (Working Paper 2007), available at http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=339863.



Issues in Competition Law and Policy



Product Code: 5030522
Publication Date: 2008
Page Count: 2,450
Trim Size: 7 x 10
Format: 3 Volumes, Hardbound
Pricing: \$550.00 Regular Price / \$495.00 AT Section Members

Competition policy in the United States, Europe, and elsewhere is embedded in a complex regime of laws predicated on the public policy choices of each jurisdiction. While other books provide a comprehensive treatment of the current state of antitrust law in the United States, this 3-volume hardcover set examines directly and in detail, the technical legal framework of competition law and the policy issues that lie behind the law. The focus of the book is a complete and detailed perspective on issues in the design and enforcement of competition law, and is not a treatise on the case law. *Issues in Competition Law and Policy* now fills this informational void for the first time.

Visit our Web site at www.ababooks.org/antitrust.html