

Bidding Rings and the Design of Anti-Collusion Measures for Auctions and Procurements

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1. Introduction

Since the mid-1990s, the enforcement of competition laws against cartels has drawn considerable attention to the means by which buyers or sellers establish and manage collusive schemes.¹ High-profile lawsuits against cartels in the food additives and vitamins sectors have made public an unprecedented wealth of information about how cartels operate (Evenett et al. 2002).² Complementing this stream of data is a modern body of scholarship that, working extensively with reported judicial decisions and other materials, has provided informative perspectives on the methods of cartel coordination.³

For the most part, discussions inspired by modern enforcement developments and scholarly contributions have addressed the optimal design of *public* policies against cartels (Marshall & Meurer 2004; 101-09). Key focal points for debate have included the formulation of strategies for improving the detection of cartels (e.g., providing inducements for cartel members or employees of cartel members to inform public authorities about the existence of the cartel);⁴ the establishment or enhancement of private rights of action to supplement anti-cartel enforcement by public agencies;⁵ and the

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¹ See Grossman (2004) (collection of essays examining operation of collusive agreements); Marshall & Meurer (2004) (discussing how competition policy toward cartels should account for the form of auctions and procurements and for the means used by firms to coordinate behavior).

² Considerable information appears in court opinions and publicly available court records dealing with the prosecution of individual and corporate cartel participants. See, e.g., *United States v. Andreas*, 216 F.3d 645 (7th Cir. 2000) (affirming conviction of Archer Daniels Midland executives who helped orchestrate food additives cartel; describing cartel's operation); Gavil et al. (2002; 1017-21) (statement presented by the Department of Justice in connection with the sentencing of Hoffmann-La Roche for its participation in the vitamins cartel). Public statements by government prosecutors (e.g., Guersant 2002; Kolasky 2002) also supply informative accounts of these and other cartels. Further insight is provided by publicly available statements prepared by witnesses who testified in private treble damage cases against the vitamins cartel participants (e.g., Bernheim 2002). The recent secondary literature on the food additives and vitamins prosecutions is varied and voluminous. See, e.g., Connor (2001) and Eichenwald (2000) (discussing food additives cartel); First (2001) (reviewing public prosecution of food additives and vitamins cartels).

³ See, e.g., Genesove & Mullin (2001) (discussing how participants in Sugar Institute collusive scheme detected cheating); Marshall & Meurer (2004; 96-99) (describing operation of bidding rings for used industrial machinery). The more recent literature adds to an older collection of popular and scholarly accounts dealing with the organization and operation of cartels, such as the electrical equipment price-fixing conspiracies of the 1950s. See Fuller (1962); Herling (1962).

⁴ On the development and application of leniency and bounty systems for detecting cartels, see Aubert et al. (2004), Chen & Harrington (2005), Kovacic (2001), Motta & Polo (2003), Spagnolo (2005), Spratling (2001).

⁵ Calkins (1997b); Wils (2003).

choice of remedies (e.g., civil damages and criminal punishment, including imprisonment for individuals).⁶

In this chapter, we explore the implications of the modern data and literature on cartel coordination with a different orientation. Rather than assess refinements in public enforcement policy, we analyze possibilities for precautions that contracting parties can take independently, without necessarily invoking public laws that condemn cartels, to defeat or discourage collusion by sellers or buyers. The strong tendency to emphasize public policy responses to collusion obscures the degree to which a successful anti-cartel campaign might engage the efforts of potential cartel victims to forestall or inhibit successful coordination.⁷

The context in which we examine possible anti-cartel precaution-taking by purchasers and sellers is the event that is integral to the implementation of a collusive scheme: the individual auction or procurement. Cartel agreements ultimately are executed through the behavior of the cartel's participants in the day-to-day episodes of buying and selling through which parties routinely transact business. These individual auction and procurement transactions supply the settings in which the cartel members must translate their ambitions for coordination into practical, operational techniques for curbing rivalry. The capacity of a cartel's members to manipulate and orchestrate the outcome of auctions and procurements determines the success of the entire collusive venture.

In studying the operation of auctions and procurements, we describe some common structures used by bidding rings to support collusion with an eye to provide recommendations for auction designers to combat collusion. By understanding the types of mechanisms that bidding rings commonly use to suppress rivalry and increase their profits, the designers of auctions and procurements may be able to make choices that deter collusion. Some choices may make it more difficult for bidding rings to operate effectively in the first place, and other choices may make it easier to detect and prosecute collusion after the fact.

We begin this chapter by providing some background on bidding rings that have been prosecuted in the past and the different type of cartel organization used in those cases. For ease of exposition our discussion will focus on auctions, although when appropriate, procurements will be explicitly discussed.⁸ In general, our concern is with

⁶ On the strengths and weaknesses of various types of civil and criminal sanctions, see Baker (2001); Breit & Elzinga (1986); Calkins (1997a); Connor (2005); OECD (2005); Wils (2005)

⁷ Our approach is roughly analogous to the perspective embodied in the law and economics literature (Cooter 1985) that considers how the frequency and total cost of accidents and failed contracting episodes might be reduced by adopting tort and contract rules, respectively to give both parties (the tortfeasor and the tort victim, the promisor and the promisee) incentives to take appropriate precautions. On the contributions of auction design as a supplement to antitrust enforcement in deterring collusion, see Klemperer (2002); Marshall & Meurer (2004; 110-17).

⁸ It is simply cumbersome and distracting each time the word auction is used to say, "or a procurement in the case of a single buyer with multiple sellers." This being said, there often are significant differences

allocation schemes where offers are considered simultaneously. Housing transactions do not fit within this context since offers are usually considered sequentially, and without recall. Posted price markets do not fit either. However, many transactions do fit within this context.

2. The Role of Procurements in Collusion

It is natural for bidders to attempt to suppress rivalry and thus capture some of the rents that otherwise would be transferred to the seller (or to the buyer in a procurement). The uniquely large body of U.S. case law is replete with examples of Sherman Act violations for bid rigging (American Bar Association 2002; 89-91), and recent enforcement experience in other jurisdictions underscores the extent and apparent universality of the phenomena.⁹ The record of reported judicial decisions and public enforcement matters cases does not capture the full dimensions of the problem, as these sources only involve episodes of collusion in which the bidders were detected and prosecuted.¹⁰

In addition, many industrial cartels are characterized by activities that appear to be unrelated to bid rigging, such as market share allocations. But, for many of these cartels, the buyers obtain the commodity from cartel firms through “competitive” procurements where the cartel members have rigged bids. In other words, cartels are often characterized by how members divide the collusive gain (market share allocations, geographic divisions, customer allocations, etc.), but at the transaction level, cartel members must prevent competition among themselves when interacting with buyers. When buyers use competitive procurements, the cartel firms invariably rig bids.

Since 1940, the U.S. courts have made clear that cartels would be treated as per se offenses under Section 1 of the Sherman Act.¹¹ Yet it is only in recent decades that the antitrust hazards for cartel participants have become genuinely severe. In that period, among other measures, the United States has boosted sanctions and strengthened leniency mechanisms that give cartel members incentives to report their misconduct.¹² Table 1 below compares key features of the U.S. regime of sanctions in 1970 and 2005:

between auctions and procurements, especially when the commodity being procured is multi-dimensional in nature and bids are scored over the many dimensions.

⁹ See, e.g., Scott (2004) (reviewing experience in Canada and other jurisdictions with enforcement of competition law provisions against cartels)

¹⁰ The actual frequency of cartel activity defies accurate calculation, although estimates of frequency often figure into the establishment of penalties.

¹¹ The watershed in this development is *United States v. Socony-Vacuum Oil Co.*, 310 U.S. 150 (1940). The historical development of the strict prohibition in U.S. law and policy against cartels is reviewed in Kovacic & Shapiro (2000). By speaking of “cartels,” we refer to arrangements that are unsupported by valid efficiency rationales. The trend in modern competition policy analysis has been to make careful distinctions between “naked” agreements to restrict output and agreements for which the participants advance cognizable, plausible efficiency rationales. For a recent synthesis of the relevant U.S. jurisprudence on this subject, see *Polygram Holding, Inc. v. FTC*, 416 F.3d 29 (D.C. Cir. 2005).

¹² The modern sequence of enhancements in methods for detecting cartels and punishments for cartel offenders is reviewed in Kovacic (2003).

Table 1: Penalties for Cartel Offenders – 1970 and 2005 Compared

Sanction	1970	2005
Status of Offense	Misdemeanor	Felony
Maximum Prison Term	One year	Ten years
Maximum Corporate Fine	\$50,000	\$100 million, twice the loss to victims, or twice the gain to the violator

These reforms have coincided with significant improvements in the effectiveness of the private plaintiffs' bar in obtaining treble damages from cartel offenders.¹³ Noteworthy achievements in recent years have included nine-figure recoveries against the auction house and vitamins cartels.¹⁴

In the past decade, numerous other jurisdictions have embraced a policy norm that favors aggressive measures to police cartels. With the encouragement of the United States and various multinational organizations, a growing number of competition systems today treat cartels as an extremely serious offense (ICPAC 2000; OECD 2005). The U.S. experience with the enhanced leniency regime introduced in the 1990s has inspired many jurisdictions – among them, Australia, Brazil, Canada, the Competition Directorate of the European Union, and many of the EU member states – to adopt or bolster their own leniency measures.¹⁵ One major jurisdiction (the United Kingdom) has revised its laws to treat cartels as crimes, and many nations are experimenting with measures to increase the power of private rights of action to recover damages on behalf of cartel victims (Global Competition Review 2004).

Despite these developments, many bidders may still tend to regard the possibility of prosecution under the antitrust laws of the United States or other jurisdictions as simply an acceptable cost of doing business. Whenever new auction mechanisms are proposed or designed, there seems to be remarkably little attention paid to the issue of bidder collusion. Yet, in terms of foregone revenue, bidder collusion is probably the most serious practical threat to revenue.¹⁶

¹³ The U.S. antitrust laws permit private rights of action and allow private plaintiffs to recover three times their actual damages. See Gavil et al. (2002; 999-1000) (describing U.S. legal framework governing private enforcement). The victorious plaintiff also is entitled to recover its attorneys' fees and costs from the defendant.

¹⁴ See First (2001) (documenting success of private litigants in vitamins cartel cases); Anderson (2001) (reporting on agreement by Christie's and Sotheby's auction houses to pay total of \$512 million to settle private class action antitrust claims).

¹⁵ Vann & Litwin (2004) (reporting that, since enhancement of antitrust leniency programs by United States in 1990s, at least twelve jurisdictions have adopted similar policies).

¹⁶ The theoretical auction literature addresses revenue differentials that can arise between schemes due to risk aversion or affiliated values, to name two prominent emphases. The revenue issue typically concerns whether the second-highest valuation, or something bigger than it (up to the highest valuation), is what gets

At first glance, the extent and apparent success of cartel activity in the United States – even in the face of strong legal prohibitions – and in other jurisdictions over the past half-century might seem surprising in light of the literature that has catalogued the obstacles to effective coordination among buyers or sellers. It is the rare competition attorney or economist who has not studied Stigler's (1964) article on the tasks of cartel formation and operation. Stigler pointed out that in order to succeed, cartels had to reach a consensus on the terms of their cooperation, detect deviations from their agreement, and punish defectors. To this list could be added the challenge of co-opting or forestalling entrants who might be attracted to the market by the high prices fostered by the cartel (Marshall & Meurer 2004; 92-93). As Stigler observed, the accomplishment of these tasks in many settings could be difficult. Thus, many cartels eventually – perhaps quickly – would disintegrate as the centrifugal forces generated by efforts to form and sustain a consensus flung the participants apart.

One possible implication of this literature was that the typical cartel was so unstable and short-lived, even in the absence of antitrust laws that condemned such coordination by rivals, to be a serious concern for contracting parties or for public policy generally. By focusing on the problems of cartel formation and operation, commentators and policy makers may have overlooked a separated body of learning that, at least indirectly, suggested that the obstacles in question were not so formidable as believed. In many episodes of contracting, the parties may face strong temptations to renege on their initial commitments. For various reasons, recourse to enforcement in the courts may provide an ineffective means to ensure performance. Thus, parties have experimented with a variety of mechanisms to improve the monitoring of performance and to improve incentives to fulfill the originally specified terms of agreements.¹⁷

One might expect that, in facing the obstacles identified by Stigler, the same creativity that firms brought to bear in solving contracting problems in legitimate transactions could be applied to promoting the success of illegitimate ventures.¹⁸ Such expectations would be appropriate. The revelation in recent years of detailed information about conspiracies such as the vitamins cartel indicates the ingenuity and perseverance of the participants in finding ways to overcome coordination problems. The durability and success of these illicit collaborations underscore the effectiveness of the chosen methods for covert coordination.¹⁹

paid to the seller. Effective collusion can drop the price paid down to the seller's reserve price, or to the highest value of a non-colluding bidder, which could be quite low.

¹⁷ This is a central insight of the transaction costs literature associated with the work of Ronald Coase (1937) and elaborated by scholars such as Williamson (1989).

¹⁸ See also Baker (2002; 160-62) (reviewing means by which rivals tacitly coordinate conduct).

¹⁹ The vitamins cartel took shape in the early to mid-1980s and functioned successfully until the late 1990s. Reported decisions involving the prosecution of numerous other cartels highlight the longevity of the challenged collusive scheme – a result that confidently can be attributed at least in part to the success of the participants in devising solutions to coordination problems that threaten to unravel efforts to formulate and execute a common plan. See, e.g., *U.S. v. Hal Brown, Jr.*, 936 F.2d 1042 (9th Cir. 1991) (collusive arrangement to suppress competition for billboard sites began in 1964 and operated until attacked by Justice Department in 1988); *U.S. v. Pippin*, 903 F.2d 1478 (11th Cir. 1990) (conspiracy by dairies to rig bids on school milk contracts in Florida operated from the early 1970s until 1988); *U.S. v. Portsmouth*

In what follows, we will distinguish between two types of auctions: ascending-bid auctions and sealed-bid auctions.²⁰ At an ascending-bid auction, the bidders gather at the time of the auction, typically together in a room, but also possibly online. Each bidder can submit multiple bids, and the current price continues to rise until no bidder is willing to raise it further. Bidders are able to observe the current high price. The bidder submitting the final bid wins the object and pays the amount of its bid. At a sealed-bid auction, each bidder submits only one bid, typically in writing, and typically in secret from the other bidders. Once all bids are submitted, they are evaluated by the auctioneer, and the high bidder wins and pays the amount of its bid.²¹

Intuitively, ascending-bid auctions are more susceptible to collusion than sealed-bid auctions. At an oral ascending-bid auction, the cartel can use a very simple rule – if a cartel member is actively bidding, then no one else from the cartel can bid. If a cartel member withdraws from the bidding, then another cartel member can bid, but no cartel member can bid against it. In this way the cartel suppresses all intra-cartel competition at the auction. Furthermore, there is no need for ex-ante communication among the cartel members about their values and thus no concern about misrepresentation of information. Note that the cartel member with highest value is prepared to bid up to its value, which is exactly what it is prepared to do acting non-cooperatively. Most importantly, note that there is no incentive for ring members to cheat on this collusive arrangement. Even if a ring member employs a shill bidder²² to act on its behalf, it cannot profitably beat the highest-valuing ring member.²³

In contrast, at a sealed-bid auction, in order to secure a collusive gain, the cartel must drop the bid of its highest-valuing member below what it would have bid acting non-cooperatively. The reduction in this bid opens the door for deviant behavior and misrepresentations by bid members. After all, by slightly outbidding this reduced bid, a ring member may realize a gain that it never could have realized when the highest-valuing bidder acted non-cooperatively. Collusion is therefore more difficult with sealed-bid auctions than ascending-bid auctions. It requires ex-ante communication that is not needed with collusion at an oral ascending-bid auction, and there is the possibility of profitable deviant behavior that cannot be traced to the deviator.

Paving Corp., 694 F.2d 312 (4th Cir. 1982) (road paving conspiracy began in mid-1960s and ran effectively until challenged in early 1980s).

²⁰ Our focus is on single-object auctions or procurements. Additional issues arise when considering multiple-object auctions or procurements, and different auction designs may be appropriate. For example, on the use of a “clock-proxy” auction for auctioning many related items, see Ausubel, Cramton, and Milgrom (2004).

²¹ This is a first-price sealed-bid auction. There are other sealed-bid auctions, such as the second-price auction, where the high bidder wins and pays the amount of the second-highest bid.

²² A shill bidder is an agent of a given bidder who is not recognizable as such by the auctioneer/procurer and the other bidders.

²³ There are environments where consideration of a shill bidder is sensible and others where it is not. It is not reasonable to think of a major aircraft manufacturer using a shill bidder in a defense procurement, but it is certainly reasonable to think of an antique dealer using a shill bidder at an estate auction.

Recommendation: When bidder collusion is a potential concern, use a sealed-bid auction/procurement.

There is another issue of significance pertaining to enforcement. For many cartels the people who take actions to implement the conspiracy are the owners of the firms. However, when the conspiracies involve large corporate entities, and those companies are engaged in bidding in hundreds of procurements around the world, the high-level managers who are running the conspiracy cannot submit all bids for all procurements. They must leave this to their sales forces who, of course, have usually not been informed that there is an explicit cartel in operation. Prior to the existence of an explicit cartel, the sales force is likely to have incentive schemes that reward expansion of market share.

Once the cartel is in place, these incentives are likely to change, emphasizing price elevation subject to maintaining market share. There may be explicit directions to the sales force not to bid certain accounts if their bid is being solicited because a competitor has tried to raise a price. Although these are not direct statements by management that an explicit cartel is functioning, these statements should be viewed as a strong indication by the sales force that the nature of interfirm rivalry has changed substantially and that explicit collusion is likely. It may be that if the sales force unexpectedly wins a large account, then management does not react positively, but rather treats the event as a mistake. This is also an indication that an explicit cartel is at work.²⁴

Recommendation: For those conducting a private or public antitrust investigation, check whether the incentive scheme of the sales force of suspected firms has changed to emphasize price over market share (sometimes referred to as “price before tonnage” or “price before volume”).

In a dynamic setting, prior to the submission of collusive bids, a cartel often finds it necessary to make price announcements so as to prepare buyers (procurement context) for higher bids and reduce buyer resistance to the ensuing increases.²⁵ Of course, price increase announcements are also made when factor costs or demand shifts warrant it. The key to disentangling as to whether an arbitrary communication is non-collusive or collusive is to see if the price announcement is explained by market relevant events. If non-market factors, such as the time between price announcements, are more relevant, perhaps reflecting regular cartel meetings, then collusion looms as a potential explanation.

Recommendation: For those conducting a private or public antitrust investigation, analyze the communications used to implement these price

²⁴ The sales force will recognize the regime shift, and there is a way for enforcement authorities to take advantage of their information for enforcement of antitrust laws. As noted earlier, a growing modern literature has explored the possibility of creating incentives for those engaged in collusion, and employees of colluding firms, to reveal the collusion to antitrust authorities.

²⁵ See Marshall, Marx, and Raiff (2005) (showing how public price announcements by the vitamins cartel facilitated collusive price increases).

increases. Investigate if supply and demand factors can explain the observed price increases or if instead time elapsed between price announcements better explains the observed price increases.

3. Prosecuted Bidding Rings

We begin by considering bidding rings that operated at ascending-bid auctions and then consider rings that operated at sealed-bid auctions. We focus on a selection of bidding rings that were prosecuted in the United States and for which the legal record provides a description of the organization of the ring. Then we discuss the extent to which cartels such as market share cartels must also rig bids.

3.A Bidding Rings at Ascending-Bid Auctions

One way to operate a bidding ring at an ascending-bid auction is for the ring members to meet prior to the auction and designate one of the bidders as the one who will win. Bidders who are not designated as winners do not bid at the auction (or they may submit very low bids in an attempt to disguise the presence of the bidding ring). Bidders can also agree on payments or other arrangements to compensate losing bidders for their participation.

One case in which this type of arrangement was used is *Finnegan v. Campeau Corp.*²⁶ In 1988, R.H. Macy & Co., Inc. and Campeau Corp. were engaged in a bidding war to buy Federated Department Stores, Inc. According to the reported decision in the case, “Macy and Campeau agreed that Macy would cease bidding and let Campeau be the buyer, thereafter dividing the benefits of their conduct between themselves.”²⁷ This is an example of a bid suppression scheme, which the U.S. Department of Justice (DOJ) defines as a scheme in which one or more competitors who otherwise would be expected to bid, or who have previously bid, agree to refrain from bidding or withdraw a previously submitted bid so that the designated winning competitor's bid will be accepted.²⁸

Another way to operate a bidding ring at an ascending-bid auction is for the ring members to designate one ring member to bid on behalf of the ring at the auction, and then, assuming the designated ring member won the object, the ring can meet after the auction to decide which ring member should receive the object and how much should be paid to each ring member as compensation for their participation in the ring.

²⁶ *Finnegan v. Campeau Corp.*, 722 F.Supp. 1114 (S.D.N.Y. 1989) (dismissing antitrust complaint filed by shareholders; dismissal granted on ground that U.S. securities laws permitted challenged conduct), affirmed, 915 F.2d 824 (2d Cir. 1990).

²⁷ 722 F. Supp. at 1115.

²⁸ U.S. Department of Justice, “Price Fixing & Bid Rigging -- They Happen: What They Are and What to Look For, An Antitrust Primer for Procurement Professionals,” *available at* <http://www.usdoj.gov/atr/public/guidelines/pfbrprimer.pdf>.

We now provide three examples in which the collusive mechanism used by the bidding ring involved no communication prior to the auction, except possibly to establish the identity of the cartel members or, in the case of *District of Columbia v. George Basiliko* (described below), to designate a cartel member who would then bid on behalf of the cartel. Then the ring members met after the auction to finalize details of the allocation and transfer payments.

The first example is the case of *U.S. v. Pook*,²⁹ in which a bidding ring operated at antique auctions. As stated in the 1988 decision in the case:

When a dealer pool was in operation at a public auction of consigned antiques, those dealers who wished to participate in the pool would agree not to bid against the other members of the pool. If a pool member succeeded in purchasing an item at the public auction, pool members interested in that item could bid on it by secret ballot at a subsequent private auction (“knock out”) The pool member bidding the highest at the private auction claimed the item by paying each pool member bidding a share of the difference between the public auction price and the successful private bid. The amount paid to each pool member (“pool split”) was calculated according to the amount the pool member bid in the knock out.³⁰

This is an illustration of another type of bid suppression scheme. In the scheme used by the antique dealers, the dealers would not compete against one another at the auction, and then, if a dealer in the ring won the object, it would be offered for sale at a secondary auction, the knock out, to the ring members. If a ring member bid more at the knock out than was paid at the initial auction, then the difference between the two prices was divided up among the ring members. In the absence of collusion, the difference between the two prices is money that would have been received by the auctioneer.

Our second example of a bidding ring that did not communicate prior to the auction is the case of the industrial machinery purchasing cartel in *U.S. v. Seville Industrial Machinery*.³¹ The mechanism used by the cartel in *Seville* resembled the scheme used in *Pook* in the period after 1970. The ring members agreed not to bid against one another at the auction and then used a knock out to allocate any objects won and determine payments between ring members. Prior to 1970, members of the industrial machinery cartel did meet prior to the auction, but in this meeting the ring members only made vague indications of interest in the various objects being offered for sale. Then only the cartel organizer would submit bids at the auction based on its educated guess about the likely high value for the object from among the ring members. The final allocation of the object and transfers among ring members were again determined by a knock out.

²⁹ *U.S. v. Pook*, No. 87-274, 1988 U.S. Dist. LEXIS 3398 (E.D. Pa. April 18, 1988).

³⁰ 1988 U.S. Dist. LEXIS 3398 at 2.

³¹ *U.S. v. Seville Industrial Machinery Corp.*, 696 F.Supp. 986 (D.N.J. 1988).

The third example is the case of *District of Columbia v. George Basiliko*,³² which involved a real estate cartel. There are many similarities between this cartel and the previous two examples. The reported decision in *Basiliko* states that:

The defendants and the co-conspirators discussed and agreed ... not to compete with one another to win the bid; selected a designated bidder to act for the conspirators ...; discussed and agreed on specific payoffs that conspirators present would receive for not bidding, or discussed and agreed to hold a private, secret auction among themselves after the designated bidder won the public real estate auction ...; in many instances, held a secret auction in which the conspirators bid solely among themselves to acquire the property for a price higher than the price paid by the designated bidder at the public real estate auction and agreed to divide the difference between the public real estate auction price and the secret auction price by making payoffs among the conspirators; arranged by contract or other means for the secret auction winner to take title or ownership of the property; and made the payoffs that they had agreed to make.³³

These examples show that at ascending-bid auctions, some bidding rings choose to use collusive mechanisms that operate prior to the auction, and others choose to use mechanisms that involve meetings after the auction is over. There are advantages and disadvantages (from the perspective of the bidding ring) associated with each of these types of mechanism. One goal of a bidding ring would be to win the object whenever there is some ring member who values it more than the non-ring members, and to allocate the object to the ring member who values it most highly.

In general it is not possible to achieve this goal using a post-auction mechanism.³⁴ To see why, note that when a ring operates a post-auction mechanism, it must provide two sets of incentives to ring members. First, it must provide incentives for ring members to bid appropriately at the auction. Typically, this means not bidding against fellow ring members, but bidding against non-ring members if a ring member values the object more than those non-ring members. Second, the ring must provide incentives for ring members to truthfully reveal their values for the object at the post-auction mechanism. In general, one cannot construct a mechanism that provides both types of incentives. So a post-auction mechanism will result in some type of inefficiency--either non-ring members sometimes win the object when there is a ring member who values the object more, or the ring wins the object but awards it to a ring member who is not the highest-valuing ring member, or some combination of the two.

In contrast, a ring can avoid the problem of inefficiency by using a pre-auction mechanism, but this approach has distinct drawbacks, as well. A pre-auction mechanism requires a meeting and transfers prior to every auction, and so may be easier to detect. In contrast, a bidding ring using a post-auction mechanism need only meet if a cartel member wins the object, and transfers may not be necessary under all circumstances. In

³² *District of Columbia v. Basiliko*, 1992 U.S. Dist. LEXIS 1260 (D.D.C. Feb. 10, 1992).

³³ 1992 U.S. Dist. LEXIS 1260 at 6-7.

³⁴ See Marshall and Marx (2004a).

addition, a bidding ring using a pre-auction mechanism either needs to be able to control the bids of its members, for example by explicitly preventing some bidders from participating in the auction, or the ring needs to have someone willing to act as a “banker” to hold and pay out money for the ring members,³⁵ and finding a person willing to play the role of a banker for an illegal bidding ring might be difficult.

Another choice for a ring is to avoid using transfer payments completely, but in this case the ring has few options other than to agree to a bid rotation scheme. The DOJ defines a bid rotation scheme to be one in which conspirators take turns being the winning bidder.³⁶ According to the DOJ, “The terms of the rotation may vary; for example, competitors may take turns on contracts according to the size of the contract, allocating equal amounts to each conspirator or allocating volumes that correspond to the size of each conspirator company.” But as one might expect, a rigid bid rotation scheme produces a pattern of bidding that could not arise by chance and so may be relatively easy to detect and prosecute.

3.B Bidding Rings at Sealed-Bid Auctions

In the absence of a pre-arranged bid rotation scheme, bidding rings at sealed-bid auctions have no choice but to meet prior to the auction since the ring must decide what bids each ring member should submit at the auction. This typically involves figuring out which bidder has the highest value for the object, deciding how much that bidder should bid, and then assigning losing bids to all the other ring members.

In this section, we provide six examples of bidding rings at sealed-bid auctions. Three of the examples, *U.S. v. Addyston Pipe*, *U.S. v. Lyons*, and *U.S. v. Inryco*, involved repeated interaction among the colluding firms, but the illegal behavior described in the other three, *U.S. v. A-A-A Electrical*, *U.S. v. Brinkley & Son*, and *U.S. v. Metropolitan*, involved only a single auction or procurement.

In *U.S. v. Addyston Pipe & Steel Co. et al.*,³⁷ colluding cast-iron pipe manufacturers met prior to the auction, determined which one of the colluding firms would participate in the auction, and agreed on transfer payments (p.3):

When bids are advertised for by any municipal corporation, water company, and gas company, the executive committee determines the price at which the bid is to be put in by some company in the association, and the question to which company this bid shall go is settled by the highest bonus which any one of the companies,

³⁵ More formally, in the language of Marshall and Marx (2004b), there exist efficient pre-auction mechanisms if either (i) the ring operates a bid-submission mechanism under ex-post budget balance (Mailath and Zemsky, 1991), or (ii) the ring operates a bid-coordination mechanism under ex-ante budget balance (Marshall and Marx, 2004b).

³⁶ The DoJ describes a bid rotation scheme for a procurement as one in which “all conspirators submit bids, but take turns being the low bidder.” But at an ascending-bid auction (or descending-bid auction for a procurement), all conspirators need not submit bids. They need only agree on the rotation.

³⁷ *U.S. v. Addyston Pipe & Steel Co.*, 1897 LEXIS 2499 (E.D. Tenn. Feb. 5, 1897). See also, *Addyston Pipe & Steel Co. v. U.S.*, 171 U.S. 211 (1899).

as among themselves, will agree to pay or bid for the order. When the amount is thus settled the company to whom the right to bid upon the work is assigned sends in its estimate or bid to the city or company desiring pipe, and the amount thus bid is “protected” by bids from such of the other members of the association as are invited to bid, and by the bidding in all instances being slightly above the one put in by the company to whom the contract is to go. ... Settlements are made at stated times of the bonus account debited against each company, where these largely offset each other, so that small sums are in fact paid by any company in balancing accounts.

The protecting bids described above are also sometimes referred to as complementary bids or cover or courtesy bids.³⁸ They are not intended to win, but are designed to create the appearance of competition. According to the DoJ, “Complementary bidding schemes are the most frequently occurring forms of bid rigging and they defraud purchasers by creating the appearance of competition to conceal secretly inflated prices.”

Another issue facing the bidding ring in *U.S. v. Addyston Pipe* is the issue of how to arrange transfer payments among the ring members without creating a detailed paper trail of the ring's activities. In this case, the bidding ring was active for a long period of time and participated in many auctions, so the participants were able to solve the problem by maintaining records of what payments were owed and then only occasionally clearing the accounts. As mentioned above, many of the required payments offset each other, so that the actually payments made were small.³⁹

In the bidding ring of next example, all payments were made to a single ring organizing. In *U.S. v. Lyons*,⁴⁰ when a sheet metal project came up for bid, Lyons would arrange for a meeting with the other contractors. “The group chose the low bidder and determined the amount of its bid. This was calculated by averaging the cost estimates of interested contractors, then adding a mark-up and an additional amount known as the ‘burden’ which was a cash payment to [Lyons]. The system provided a financial incentive for contractors to refrain from truly competitive bids on a particular job because of the assurance that conformity to the conspiratorial procedure would keep them eligible to benefit from future allocations.” The *Lyons* participants were willing to share part of the profit associated with participating in the ring with the organizer (Lyons) in order to ensure that they would be allowed to participate in the bidding ring in the future. So the on-going nature of the interaction among the ring members was an important aspect in this case.

³⁸ See *U.S. v. Mobile Materials, Inc.*, 881 F.2d 866, 869-74 (10th Cir. 1989) (describing arrangements made by road paving conspirators across a number of procurements to orchestrate presentation of complimentary bids to government purchasing authorities); *U.S. v. Portsmouth Paving Corp.*, 694 F.2d 312, 320-21 (4th Cir. 1982) (discussing use of complimentary bids by road paving conspirators).

³⁹ See also *U.S. v. MMR Corp.*, 907 F.2d 489 (5th Cir. 1990), which provides a fact-intensive narrative of steps that electrical contractors took to track and account for amounts owing among themselves from their participation in past episodes of collusion.

⁴⁰ *U.S. v. Lyons*, No. 81-1287, 1982 U.S. App. LEXIS 22194 (7th Cir. Feb. 1, 1982).

In contrast, the next case relates to a single interaction among electrical contractors. (Of course, it may be that the parties involved had other illegal interaction that was not prosecuted.) In *U.S. v. A-A-A Elec. Co.*,⁴¹ contractors bidding for work at the Raleigh-Durham Airport discussed their bids before submitting them and designated A-A-A as the one who would submit the lowest bid. After receiving final payment for the work, A-A-A made payments to its co-conspirators. In this example, the cartel met prior to the auction to discuss bids, but the transfer payments made by the designated winner to the bidders who agreed to suppress their bids were not finalized until later. The willingness of bidders to wait for their transfer payments may suggest that there was repeated interaction among the firms since otherwise one might expect firms would be concerned that A-A-A would renege on its promise to pay them.

Another concern of a bidding ring is whether bidders who agree to submit non-winning bids will actually do so. In *U.S. v. W.F. Brinkley & Son Construction Company, Inc.*,⁴² Brinkley's competitors for a pumping station and pipeline contract discussed their bids prior to the procurement, agreeing that Brinkley would submit the winning bid. The ring solved the problem of monitoring the bids of Brinkley's competitors by, in at least one case, having the competitor fill out his bid and give it to Brinkley to turn in for him. The threat that ring members who agree prior to the auction to submit a non-winning bid might not do so when they get to the auction plays an important role in how economists think about the differences between collusion at an ascending-bid auction and collusion at a sealed-bid auction. However, in *Brinkley*, it seems the bidding ring was able to overcome this problem.

Finally, the DoJ describes subcontracting arrangements as potentially an important part of bid rigging schemes. In particular, bidders who agree not to bid or to submit a losing bid might be compensated by being awarded a subcontract by the winning bidder. In *U.S. v. Metropolitan Enterprises, Inc.*,⁴³ Broce Construction Company met with a group of other highway paving companies prior to bidding for a number of Oklahoma repaving contracts. These companies agreed not to bid against Broce, which then outbid the remaining bidders for the contracts. In compensation, Broce subcontracted with one of the companies agreeing not to bid against Broce. A subcontracting arrangement is also described in *U.S. v. Inryco, Inc.*,⁴⁴ where concrete construction firm Inryco subcontracted with its competitor Western in compensation for Western's submitting artificially high bids at certain procurements.⁴⁵

Recommendation: Subcontracting can be pro-collusive. If possible, bids should be absent of subcontracting arrangements.

⁴¹ *U.S. v. A-A-A Elec. Co., Inc.*, 788 F.2d 242 (4th Cir. 1986).

⁴² *U.S. v. W.F. Brinkley & Son Construction Company, Inc.*, 783 F.2d 1157 (4th Cir. 1986).

⁴³ *U.S. v. Metropolitan Enterprises, Inc.*, 728 F.2d 444 (1984).

⁴⁴ *U.S. v. Inryco, Inc.*, 642 F.2d 290 (1981).

⁴⁵ See also *State of New York v. Hendrickson Brothers, Inc.*, 840 F.2d 1065, 1069-72 (2d Cir. 1988) (discussing use of subcontract awards as means for cartel members to sustain the commitment of all participants to the collusive scheme).

In summary, bidding rings at sealed-bid auctions typically meet prior to each auction to discuss the bids each ring member will submit. The ring may have to take steps to ensure that ring members who are supposed to submit losing bids actually do so. And, payments among ring members (to compensate ring members who agree to submit losing bids) may be arranged prior to the auction, or after the auction, or may be consummated through subcontracting arrangements.

3.C Bid Rigging by “Standard” Cartels

The bidding rings discussed above had no overarching agreement other than the agreements related to collusion at individual auctions. In contrast, some cartels do have broader agreements, such as market share agreements or customer allocations, even though buyers procure the product through competitive procurements.

For example, the recent vitamins cartel⁴⁶ was centered upon a market share agreement, under which each cartel firm received a fixed percentage of the global market. Output of each cartel firm was carefully monitored by the cartel. If firms wavered from their agreed market shares, then within-cartel redistributions occurred to “true-up” shares to the cartel agreement.⁴⁷ But despite this level of organization and coordination, cartel members still had to elevate bids at competitive procurements in order to realize a collusive gain.

Although bidder collusion may not seem to be a big part of cartels using market share agreements or customer allocations, it is still the case that most buyers run competitive procurements to buy product. No matter what the cartel does in terms of organization and coordination as a preamble to interaction with individual buyers, the conspirators must elevate bids in order to realize a collusive gain. But this raises the question: If each and every bid is elevated then why bother with market share agreements, output monitoring, and redistributions?

In the case of the vitamins cartel, the market for the commodity was global and the buyers were numerous. On occasion, some buyers would elect to extend contracts with incumbent suppliers rather than conduct competitive procurements, and there were third party vendors in the market, brokers, who could supply product on a regular basis. These features of the market imply that each firm participating in the cartel would be uncertain as to whether their co-conspirators were secretly selling product to brokers at discount prices, secretly offering discounts to customers in order to secure contract extensions, or secretly chiseling on the terms of their nominal bids at procurements so that, even though they had bid a high amount, they were still awarded the contract under

⁴⁶ The European Commission (2003) decision provides an excellent detailed description of the cartel and its inner workings.

⁴⁷ European Commission (2003) paragraph 196.

the guise of some superior non-price attribute. In other words, secret price cutting behavior would be a constant suspicion by the conspirators of one another.⁴⁸

One way for that suspicion to be removed is to have a global market share agreement among co-conspirators, monitor the output of all conspirators, and conduct interfirm redistributions as needed. With a market share agreement and output monitoring in place, if a given conspirator attempted to cheat on the agreement (oversell their assigned market share), its behavior would be detected and appropriate redistributions would occur. In this context, once the firms have agreed on the collusive price, then collusion at the procurements is a relatively straightforward matter. The firms simply try to get the quantities won at each procurement to aggregate in a way that each cartel firm receives its assigned market share.

In the vitamins industry, procurements were repeated regularly. Any given procurement was tiny relative to the market. There was no reasonable possibility of a shill bidder. Deviations would all be addressed at year end through redistributions that brought all cartel members to their appropriate market share. Thus, even though the procurements were sealed-bid procurements, where collusion might be more difficult, the repetition, monitoring, market share agreement, and redistributions made bidder collusion feasible, profitable, and stable.

4. How Auction Formats Affect Bidding Rings

In this section, we discuss a number of dimensions on which auction formats affect bidding rings. We begin by noting that it may be easier to prosecute collusion at sealed-bid versus ascending-bid auctions. We then continue by discussing how different auction formats, sealed bid versus ascending bid, affect the ability of a ring to induce its members to comply with the instructions of the ring on how they should bid. We then discuss the role of information provided by the auctioneer in facilitating collusion and how the auction format affects the incentives for bidders to participate in a ring in the first place. And we discuss the effects of shill bidders on bidding rings and the effects of having more or less frequent auctions on bidding rings.

4.A Prosecution of Collusion

At a sealed-bid auction, typically all participating bidders submit bids, and the auctioneer should have a written (or electronic) record of all of these bids. As noted by the DoJ, having fewer than the normal number of competitors submit bids suggests the possibility of collusion, so colluding bidders at sealed-bid auctions can be expected to arrange for ring members who are not designated as the winning bidders to submit complementary bids to disguise the presence of the cartel. Thus, at a sealed-bid auction, the auctioneer will have a record of the participants and all of their bids. This paper trail may facilitate the prosecution of collusion at a sealed-bid auction.

⁴⁸ In addition, in the absence of a market share agreement, collusion at any given procurement would entail significant bargaining costs as firms tried to argue that it was their turn to win.

At an ascending-bid auction, such a paper trail typically does not exist. First, the bids themselves may be submitted orally, and so it may be that no formal record of submitted bids exists. Second, depending on the auction format, many bidders may not submit bids at all, even in a non-collusive environment, if the price rises to a level above their willingness to pay before they have an opportunity to enter a bid.⁴⁹ So the observation that only a small number of bidders actually submit bids at an ascending-bid auction may not be suggestive of collusive activity the way it is at a sealed-bid auction. One may not even be able to identify who all the participants are in an ascending-bid auction, since one may only know about those who actually submitted bids. These issues mean it may be more difficult to prosecute collusion at an ascending-bid auction than at a sealed-bid auction.

4.B Susceptibility of Auction Formats to Collusion

It is commonly thought that ascending-bid auctions are more susceptible to collusion than sealed-bid auctions. For example, the U.S. Forest Service held this view and mandated a move towards more sealed-bid auctions in an attempt to deter collusion among bidders at its timber auctions.⁵⁰ Theoretical models in the academic literature have formalized the result that in many environments bidding rings can more easily organize and can be more profitable at ascending-bid auctions than at sealed-bid auctions.⁵¹

The intuition for why an ascending-bid auction is more susceptible to collusion than a sealed-bid auction is assisted with a simple example. Suppose there are four bidders – A, B, C, D – who have privately known values for the one item being sold as follows.⁵²

A:80, B:60, C:40, and D:20.

Acting non-cooperatively at an oral ascending bid auction, D will bid up to 20 before dropping out, C will bid up to 40, B to 60, and A to 80. Thus, A will win the item for a price of 60. At a sealed-bid auction, the bidders need to shade their bids below their values in order to have any positive expected payoff. Suppose they bid as follows.

$b_A=60$, $b_B=45$, $b_C=30$, $b_D=15$

Bidder A wins the item for a price of 60.

⁴⁹ Some auction formats include participation rules that require bidders to participate in early rounds of the auction in order to be eligible to participate in later rounds.

⁵⁰ U.S. Senate. Timber Sales Bidding Procedures: Hearings before the Senate Subcommittee on Public Lands and Resources. 95th Congress, 1st sess. 1077.

⁵¹ Robinson (1985) provides this formalization for the case in which there is perfect communication among ring members (ring members' values are common knowledge within the ring). Marshall and Marx (2004b) provide this formalization for the case in which ring members' values are private information.

⁵² Each bidder knows their own value but not the value of any other bidder, although they will each know the distribution from which bidders draw their values. In the example considered here, the distribution is uniform on the interval from zero to 100.

Now we consider collusion under each scheme. At an ascending-bid auction, a ring must suppress the bids of all members except the bidder with highest value. The ring member with highest value goes to the auction and bids as it would were it acting non-cooperatively. In the example above, if A, B, and C collude, but D does not, then B and C suppress their bids while A remains ready to bid up to 80. The ring wins the item for a price of 20. Any ring member who thinks of breaking ranks and competing at the auction faces the highest ring bidder and the highest non-ring bidder, each submitting bids that are the same as if all were acting non-cooperatively. Thus, there is no gain to deviant behavior. In our example, potential deviant behavior by bidder B will not result in B winning the item – A stands ready to bid up to 80 which exceeds B’s value for the item.

The sealed-bid auction is quite different. In order to secure a collusive gain, the ring member with the highest value must lower its bid below what it would have bid acting non-cooperatively, and other ring members must suppress their bids. In our example where A, B, and C collude but D does not, suppose that B and C again suppress their bids and that A submits a bid of 20. This bid will prevail against D.⁵³ But when the highest-valuing ring member lowers its bid, the opportunity is created for a non-highest-valuing ring member to secure the item by entering a bid at the auction, either on its own or through a shell (for example, it may be possible for a ring member to have another person or firm submit a bid on its behalf, thereby disguising its identity and potentially avoiding any penalties that the ring would impose on it if the ring discovered it had not followed the instructions of the ring). This possibility jeopardizes the feasibility of a cartel at a sealed-bid auction. In other words, if B were to deviate from the agreement and bid 30, they would win the item and secure a relatively large surplus. For the ring to guard against such deviant behavior requires bidding behavior that mitigates the collusive gain, if one is possible at all. This a fundamental difference between the oral ascending and sealed-bid auction.⁵⁴

At this point, we emphasize our previous recommendation that a sealed-bid auction should be used instead of an ascending-bid auction if collusion is a potential concern.

In addition, the auctioneer or procurement official can oppose the collusion through some strategic actions. A reserve price, more aggressive than would be used were bidders not suspected of collusion, can be employed in many circumstances.⁵⁵ Their threat of using such a reserve will deter collusion. This leads to the following additional recommendation.

⁵³ We have not specified how D bids when confronting a cartel but it will never be as much as 20 since bidding 20 or more leaves D without the hope of any positive surplus.

⁵⁴ The issue described here has nothing to do with an oral auction being “open outcry.” The same contrast in susceptibility discussed here is present if the oral ascending bid auction is replaced with a second-price sealed-bid auction.

⁵⁵ In a procurement context, there are circumstances where an aggressive reserve price is not possible because it is not credible that the procurement official will not procure. Alternative strategies can be employed in these cases, such as securing a supply agreement from a seller who acts as a producer of last resort and thus makes credible the threat not to buy from others.

Recommendation: The auctioneer or procurement official can use an aggressive reserve price policy to increase their payoff and simultaneously help deter collusion.

4.C Role of Information

Another aspect of auction formats that affects the ability of bidders to collude is the amount of information provided by the auctioneer on auction outcomes. For example, if the auctioneer reveals the identity of the winner and the price paid at the auction, then a bidding ring might be able to operate with greater efficiency, or with less risk of detection, by utilizing that information.⁵⁶ If an auctioneer at a sealed-bid auction reveals the amounts of the bids of all the bidders, then the problem that a bidding ring faces in policing the bids of its members is made much easier. In general, the less information provided on auction outcomes, the more difficult it is for a bidding ring to operate. Unfortunately, in many settings it will be impossible to hide the identity of the winner, but certainly the full range of bids at a sealed-bid auction need not be revealed.

Recommendation: Losing bids made at a sealed-bid auction/procurement should not be revealed.

Although it may be possible to deter collusion by not revealing information from auctions, from the standpoint of detecting and prosecuting collusion, it is important that auctioneers retain all available information from the auctions held. In particular, complete information on all bids submitted should be retained. This is particularly true when a bidding ring does not include all the bidders since then the bids of the ring members may not be the highest bids submitted, but those bids may still be used to identify the presence of the ring and identity of its members.⁵⁷

Recommendation: Whenever possible, every aspect of the auction/procurement should be documented, and the records should be retained for a long period. The recording and documentation should include, but not be limited to, announcement of the auction/procurement, who was invited to bid, who actually bid, all discussions and conversations, and all bids. All bidders should be notified ex ante that the entire record of all auctions/procurements will be made available to public enforcement authorities and/or private litigants should an investigation of collusive bidding occur.

⁵⁶ For a mechanism that uses the identity of the winner and the price paid at the auction, see Graham and Marshall (1987).

⁵⁷ See Marshall and Marx (2004b) for a characterization of ring members' bids at a sealed-bid auction when the ring is not all inclusive.

Losing bids at a sealed-bid auction (procurement as well) can contain information of relevance for inferring collusion. Although a bidding ring always attempts to suppress bids, for collusion to be effective at a sealed-bid auction, a ring must prevent its own ring members from cheating on the collusive agreement. The incentive for ring members to cheat is mitigated if bidders elevate their bids somewhat, but to enforce these elevated bids, the cartel may need to have a ring bidder submit a bid that is just underneath the highest ring bidder's bid. This implies that sequential bids may be very close to one another, even when they are losing bids. Bids of this nature are an indication of potential collusion.⁵⁸

In a procurement setting, it is often the case that the incumbent supplier is given a right of last refusal. In other words, before the close of the procurement, the incumbent is notified of the leading competitive bid and offered the opportunity to meet the bid to retain the business. Notifying an incumbent of the bids of others before the procurement is over provides the incumbent with a way to monitor the bidding behavior of potential co-conspirators and react in real time to deviations from agreed collusive bidding. It deters deviations by ring members.

Recommendation: If the costs of switching suppliers are not very high, the practice of offering "right of last refusal" should be avoided since it is pro-collusive.

Finally, there are auction/procurement environments in which bidders have considerable expertise relevant to the evaluation of the item or project. For example, antique dealers have expertise in assessing the authenticity of a period piece or timber mills have expertise in assessing the quality of standing timber in a particular drainage area. In such cases, bidders will have an extra incentive to collude since their competitive bidding will transfer all expertise rents to the seller/buyer. The auction or procurement official can mitigate this incentive by providing detailed and high quality information to the entire bidding public prior to the auction/procurement. Providing this information has the added benefit of reducing the "winner's curse."⁵⁹ Reductions in the winner's curse lead to more aggressive bidding, especially by less well-informed bidders, which might typically be the non-cartel bidders.⁶⁰

Recommendation: All information of relevance known to the auctioneer/procurer about the item for sale/procurement should be revealed ex ante to the entire bidding public.

4.D Participation

⁵⁸ This bidding behavior is discussed in Marshall and Marx (2004b).

⁵⁹ See Hershleifer and Riley (1993, p.395) for a discussion of the winner's curse.

⁶⁰ See Marshall and Meurer (2004) for the details of this argument, and see Hendricks and Porter (1984) for the role of the winner's curse in OCS auctions.

At a sealed-bid auction, in order for there to be any gains from collusion, the ring member designated as the winner must submit a lower bid (higher bid at a procurement) than it otherwise would. If the ring member submits the same bid as it would in the absence of collusion, then there is no benefit from the collusion. But, if there are bidders who are not included in the ring, then the selected ring member must be careful not to distort its bid too much since the bid must still be competitive relative to the bids of the non-ring bidders.

This problem is not faced by a bidding ring at an ascending-bid auction since in that case the designated ring member can respond in real time to any bids made by bidders not in the ring. At a sealed-bid auction, the designated ring member must commit to a bid without knowing the bids of the non-ring bidders. This potentially reduces the gains from collusion at a sealed-bid auction relative to an ascending-bid auction. And this reduction in the gains from collusion may mean that at a sealed-bid auction, some bidders would prefer not to participate in the ring--they might prefer to bid on their own rather than participate in the ring, and potentially have to make transfer payments to the other ring members in exchange for the suppression of competition. This is particularly true for bidders at sealed-bid auctions with very high values for the object being sold (very low cost suppliers of the object being procured). It is these high-value bidders who are most likely to decline to participate in a bidding ring at a sealed-bid auction.⁶¹ In contrast, even high-value bidders would be expected to be willing to participate in a bidding ring at an ascending-bid auction.

4.E Role of Shill Bidders

As mentioned above, if ring members at a sealed-bid auction have the ability to submit bids under disguised names, it may make it more difficult for a bidding ring at a sealed-bid auction to police the bids submitted by its members. In particular, ring member who have been instructed by the ring to submit losing bids, may have an incentive to try to win the item under a disguised name, thereby avoiding any retaliation from the ring. For ascending-bid auctions, there exist collusive mechanisms that are not susceptible to the ability of ring members to use shill bidders.⁶² Thus, the ability or inability to use shills need not affect bidding rings at ascending-bid auctions.

Because of the potentially destabilizing effect of shill bidders on bidding rings, particularly at sealed-bid auctions, the auctioneer may have an incentive to facilitate the use of shill bidders. For example, the auctioneer might keep private the identities of the bidders, perhaps referring only to bidder numbers. The auctioneer might allow bids to be telephoned in or mailed in, rather than requiring that bidders turn in their bids in person at a designated time and place where all can observe. And, the auctioneer can allow a bidder to submit more than one bid under different bidder numbers, or under different identities.

4.F Frequency of Auctions

⁶¹ See the results on individual rationality constraints in Marshall and Marx (2004b).

⁶² See Marshall and Marx (2004b).

As discussed above, some bidding rings make transfer payments among themselves after the auctions at which they collude, or perhaps keep records of amounts owed and only infrequently make payments to clear the accounts. Such behavior is made easier if the bidding ring knows there will be a regular stream of auctions in which they can participate. When there are auctions at regular intervals, a bidding ring can more easily implement a bid rotation scheme and can threaten to punish ring members at future auctions if they do not follow instructions. If the value of the items being sold at any individual auction is small, then ring members may have little incentive to disobey the instructions of the ring because the gains to doing so are small relative to the threat of future punishment.

For these reasons, an auctioneer concerned about collusion may prefer to hold fewer auctions, each with a larger number of items being sold. Or the auctioneer may prefer to create higher-valued items by bundling a number of lower-valued items. And an auctioneer may prefer not to announce a fixed schedule for future auctions, instead bringing objects up for sale at irregular intervals. Longer time intervals between auctions may encourage ring members to defect from the ring since the potential for retaliation by the other ring members is pushed farther into the future.

5. Conclusion and Discussion: Auction Design and Countermeasures

Collusive schemes ultimately are executed through individual auctions and procurements. The manner in which sellers conduct auctions and buyers conduct procurements can increase or reduce their vulnerability to collusion, regardless of the availability of antitrust statutes or other legal commands that forbid such forms of coordination. Thus, the design of auctions and procurements provides an important opportunity for firms to supplement by private means safeguards against collusion embodied in public law.

As discussed in this chapter, modern experience in prosecuting cartels has generated a valuable body of information that can inform the design of collusion countermeasures in auctions. Among other steps, auctioneers can take the following measures to deter collusion. We summarize the main points below:

1. If collusion is a major concern for auction designers, then use a sealed-bid auction rather than an ascending-bid auction. Auctioneers and procurement officials should use an aggressive reserve price policy whenever possible.
2. Auctioneers and procurement agents should maintain a record of all bids, not just those of winners as well as all other aspects of the auction/procurement. It should be made known *ex ante* that these record will be made available to public enforcement authorities and/or private litigants should an antitrust investigation occur.
3. To the extent possible, auctioneers and procurement agents should limit the amount of information provided to bidders regarding the auction outcomes or the bids of their competitors. In addition, in the absence of a compelling reason, the right of last refusal

should not be granted to an incumbent supplier. However, auctioneers and procurement agents should provide detailed information to the entire bidding public prior to the auction about the item being sold/procured.

4. To the extent possible, auctioneers should allow bidders to submit multiple bids, with some under disguised identities.

5. To the extent possible, auctioneers should hold auctions at long, irregular time intervals.

These steps have potential benefits for all categories of auctioneers and procurement bodies, but they have special significance for public purchasing authorities. A striking number of cartel cases prosecuted by antitrust agencies in recent decades have involved scenarios in which the victim of the collusive scheme is a public purchasing authority.⁶³ The apparent attractiveness of government auctions and procurements as targets for collusion suggests the gains to be had for public agencies by strengthening anti-cartel countermeasures, including the safeguards suggested here.

In addition to the points discussed above, there are a number of other ways in which an auctioneer or procurement official can attempt to mitigate collusion. Although a detailed discussion of these is beyond the scope of this article, we provide some general discussion below.

A number of tactics for mitigating collusion involve the use of market power and/or discretion by the auctioneer or procurement official. Examples include the use of an aggressive reserve price or the right not to sell. The latter could be invoked through an ambiguously defined scoring function, which then a judicious procurement official uses to assess the non-cooperative nature of the bids, penalizing apparent collusive bidding. Although good discretion is common, when discretion is retained in the hands of an auctioneer or procurer who is working as an agent of the owner or ultimate buyer, bad decisions can occur because of a breakdown in the agency relationship. Much of the U.S. Federal Acquisition Regulations are about controlling discretion by government procurement officials. A recommendation about the retention of discretion to oppose collusive bidding would be in direct contrast with regulations that limit discretion, and thus it is not offered.

One tactic used by auctioneers and procurers to mitigate potential collusion by bidders involves the use of protecting bidders. These bidders are available to the auctioneer or procurer on a favored basis. Firms who have demonstrated aggressivity in the past, sometimes referred to as “maverick” bidders, are a good potential choice for this role.

It is often the case that procurers point to split awards and “benchmarking” as safeguards of their buying process. In general, not only is neither robust to collusion, but

⁶³ See Haberbusch (2000) (examining experience with cartel prosecutions involving government procurement in the United States).

each is inherently susceptible to manipulation by a cartel. Benchmarking, whereby a firm would obtain information from a third party about what others in the market are typically paying for the items being purchased, allows detection of inadequacies of a procurement official or some other idiosyncratic shortcoming of a firm's procurement practice, but it does not allow a procurer to detect collusion since a cartel will elevate bids for all buyers in the industry. In other words, benchmarking is particularly poor at providing information about highly correlated events that similarly impact procuring firms.

Split awards suffer from a significant deficiency as well. Namely, split awards or multi-sourcing in a procurement context can produce results that look like collusion, which is counter-intuitive. Maintaining multiple sources of supply simultaneously seems to suggest that one supplier can be used to implicitly monitor another. But, initial bidding behavior can be dramatically distorted by split awards. Consider two firms, A and B, who can each produce three units. For each, the first two units can be produced at a marginal cost of 5, while the third unit can be produced at a marginal cost of 100. Suppose a buyer wants two items. If the buyer runs a sole-source procurement, then the bidders pay a total of 10 for two objects. A split award also results in the purchase price being 10 for two objects. The issue arises if each of the suppliers can produce one fewer object so that the marginal cost of producing the first item is 5, but the marginal cost of producing the second item is 100 for each. In this case, a sole-source procurement results in the buyer paying 105 for two objects. However, a split award results in the buyer paying 200 for two objects. This outcome is counter-intuitive and looks like collusion, but we arrive at it through wholly non-cooperative bidding. The collusion comes before the procurement through the restriction of supply to the market. Thus, two safeguards that are often used in practice, benchmarking and split awards, are not without significant limitations.

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