CONSPIRACIES AND SECRET DISCOUNTS: INITIAL LABORATORY RESULTS

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Abstract

Laboratory methods are used to evaluate factors that affect the success of price-fixing conspiracies. In standard posted-offer markets with no discounts, sellers are able to approach joint-profit-maximizing prices when they are allowed to discuss their decisions in advance. But such discussions are not effective when sellers are allowed to offer secret discounts from their posted prices; transactions prices fall to near-competitive levels.

1. Introduction

The most common type of criminal antitrust case in the U.S. involves price fixing. This observation is consistent with Adam Smith's view that sellers who have the chance to communicate freely will invariably try to fix prices. However, the problems of arranging and enforcing an illegal price-fixing agreement are so severe that many economists question whether conspiracies have much of an impact on actual transactions prices. If collusion is relatively ineffective, then antitrust authorities should consider shifting litigation resources to other areas. But if collusion is effective, or if it is facilitated by particular types of contracts and practices, then the antitrust hostility to price fixing is justified.

The main problem with an empirical assessment of the effects of collusion is that good data are rare. Conspirators will try to hide their activities from antitrust authorities and, if possible, from buyers. Moreover, it is difficult for the conspirators themselves to observe secret chiseling on agreements, so it is more difficult for an outsider to determine the effectiveness of the conspiracy. These data problems do not arise in laboratory experiments, where it is easy to

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introduce the opportunity to conspire, holding constant the other elements of the market structure that may affect the success of a conspiracy.

Previous laboratory research has shown that conspiracies are not very effective in double auctions, which allow near-continuous adjustments of price bids and asks as in a centralized stock exchange (Isaac and Plott, 1981). In contrast, conspiracies can raise prices and profits in markets where sellers select prices independently and buyers make purchases at the posted prices on a take-it-or-leave-it basis (Isaac, Ramey, and Williams, 1984). In an important sense, however, collusion may be too easy in a laboratory posted auction. Prices are much more negotiable in markets for producer goods and consumer durables, for example. In such markets, buyer-specific (secret) discounts are often the rule, not the exception. Sellers may conspire in an effort to limit price concessions, and indeed, many of the celebrated price-fixing cases in the U.S. involved producer goods. This paper uses controlled experiments with human subjects to assess the effects of discount opportunities when sellers are allowed to collude.

2. Procedures

Seven two-hour sessions were conducted, each with a different cohort of 6 University of Virginia undergraduates. All subjects had participated previously in a similar market session, but with different parameters and no opportunity to conspire. Participants were paid $9.00 plus earnings from trades, which averaged about $20. Upon arrival, subjects were designated as buyers or sellers and were seated at personal computers that were visually isolated by three-sided partitions. The networked computers displayed the instructions as they were read. Three of the six subjects in each cohort were designated as sellers, each with three units to sell in a market period. They were given (privately) the cost of each unit and were told that they earn the difference between the selling price and the cost of all units that they sold. Similarly, each of the three buyers was given a value for three units, and buyers were told that they would earn the difference between the value and the price of each unit purchased. The experiment software kept track of cumulative earnings from period to period, and all earnings were paid privately, in cash, immediately after the session.

The individual buyers' values and sellers' costs induce aggregate supply and demand curves in the usual manner, as shown in figure 1. Notice the range of overlapping demand and

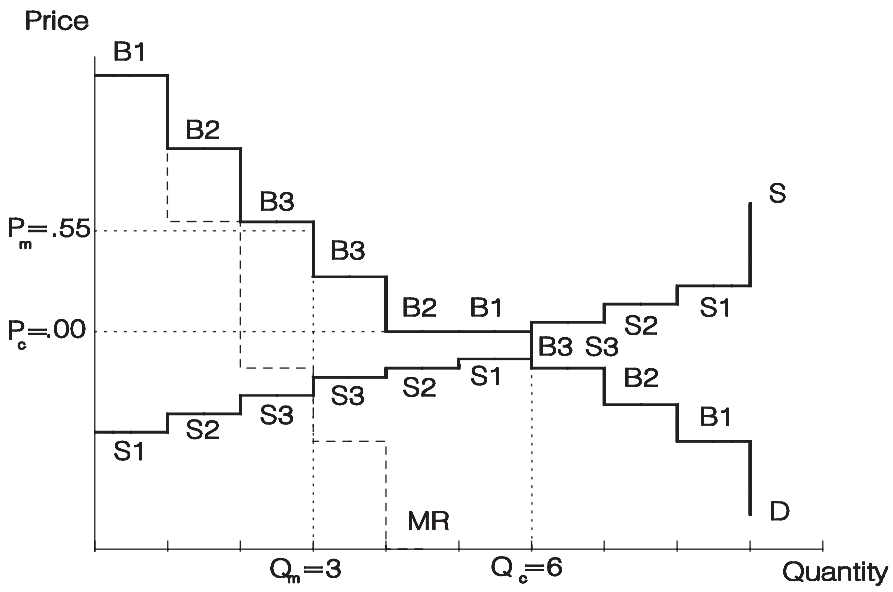

Figure 1. Market Parameters

supply. In the figure, the highest competitive price, P_c, has been normalized to zero, and all values and costs are measured as deviations from P_c. Each unit on the demand curve is labeled by a buyer identification (B1, B2, or B3), and each unit on the supply curve is labeled by a seller identification (S1, S2, or S3). The design is competitive in the sense that excess supply at prices just above the competitive level is as large as the capacity of any single seller.[1]

The dashed marginal revenue line intersects industry supply at a quantity of 3, which determines the joint-profit-maximizing price (P_m). This monopoly price just below the value step for B3, at about \$0.55.[2] Each seller would have a large incentive to defect from a common monopoly price. This incentive serves to balance the design factors that may facilitate collusion: small numbers, product homogeneity, demand and supply stability, and the symmetric market shares at a joint monopoly outcome.

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[1] In addition, a buyer had to pay a 5 cent shopping cost each time a different seller was approached. Although this cost was needed in the treatment with seller discounts to avoid long delays, the shopping cost was also used in all other treatments.

[2] The monopoly price is 5 cents below this value step to allow for the nickel shopping cost that was mentioned in the previous footnote.

There were two basic treatments. In the no-discount treatment, sellers independently posted prices on a take-it-or-leave-it basis at the beginning of each market period. Then buyers were selected in a random order to shop. In the second, "list/discount" treatment, sellers posted prices independently as before, but buyers could request discounts by sending a "DISCREQ" message. Sellers responded to such requests by typing the original list price (no discount) or by typing a lower price.

All sessions in each treatment had seller conspiracies, with one exception to be discussed below. To keep buyers from finding out about the conspiracies, they were taken to another room where they were randomly reassigned their roles as B1, B2 or B3 for each period. After buyers left the room, sellers were read a message that allowed conspiracy, but barred physical threats, side payments, and discussion of nonpublic information such as unit costs, sales quantities, and discounts (if permitted). During the discussion period, sellers slid their chairs back about 3 feet so that they could see each other, but the sides of the foam board dividers continued to obscure the individual sellers' computer monitors. Discussions lasted until one of the experimenters signalled the return of the buyers, or about 3 minutes. The sellers then returned to their separate computers for the trading process. All sessions consisted of 15 trading periods, although subjects did not know when the market would end.

3. Results

The left side of figure 2 shows one of the three sessions conducted with seller conspiracies and no discounts. The competitive price, P_c, and the monopoly price, P_m, are indicated by horizontal dotted lines. The individual seller's posted prices are plotted as plus signs (+). The vertical lines separate the three prices in each period from those in adjacent periods. In period 1, seller S1 (shown on the left) has the high price, and S3 (on the right) has the low price. The dark dots, which are attached to the plus signs, indicate units that actually sold. Sellers agree on a common, near-monopoly price in period 5, but all purchases are made from S1. Then sellers agree on a price rotation scheme, with S1 designated to have the low price in period 6, S2 in period 7, etc. This scheme, which is analogous to the celebrated "phases of the moon" bid rotation of the electrical equipment conspiracy, results in stable, near-monopoly prices. Prices were also very high in the other two sessions conducted under the same conditions, but

conspirators generally relied on quantity restrictions rather than price rotation as a method of equalizing profits.

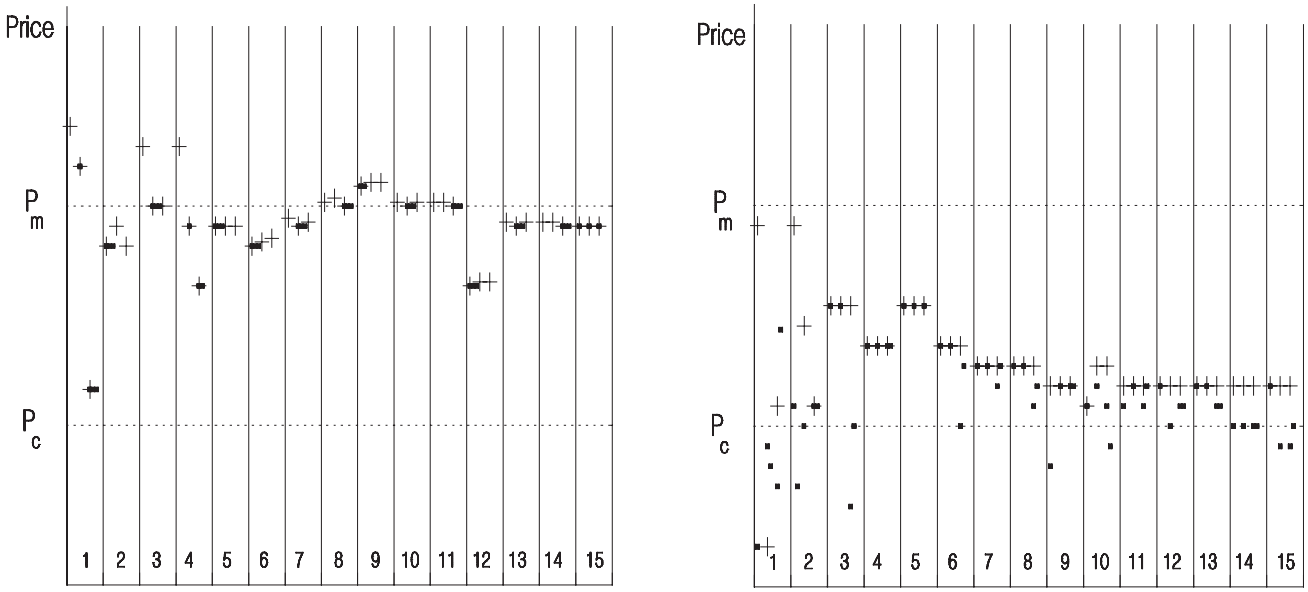

Figure 2. Price Sequences with No Discounts (Left Side) or Discounts (Right Side) (Key: + price postings, ▪ contracts).

The right side of figure 3 shows one of the three sessions conducted with seller conspiracies and the opportunity for secret discounts. A dot below a plus sign indicates a unit that was sold at discount. By period 5, sellers had agreed on a common price, with each limiting sales to 1 unit. The dots falling below the righthand + sign in periods 6-8 reveal that seller S3 discounted from the common price that had been selected. Then the other sellers began to discount, and transactions prices fell to near-competitive levels in the final 5 periods.

The dramatic effect of discounts on transactions prices in figure 3 is found in the other sessions. In table 1, the average price for all 3 sessions of each treatment is shown in column (2). With conspiracy and no discounts, the average price is 45 cents, just below the theoretical monopoly prediction of 55. With conspiracy and discounts, the average price is 8, just above the highest competitive price of 0. This difference is statistically significant at the 5% level, using a nonparametric Mann-Whitney test, with session price averages for the final 5 periods as the

Table 1. Mean Performance Measures, by Treatment, for the Last Five Periods

(1) Treatment (number of sessions)	(2) Price Deviation $P - P_c$	(3) Market Efficiency E	(4) Monopoly Effectiveness M
Joint Monopoly (theoretical prediction)	55	82	100
Conspiracy, No Discounts (3 sessions)	45	77	44
Conspiracy, Secret Discounts (3 sessions)	8	81	-48
No Conspiracy, No Discounts (1 session)	-3	98	-24
Competitive (theoretical prediction)	0	100	0

data points. In addition, we conducted a single session with no conspiracy and no discounts, which yielded an average price that was 3 cents below the highest competitive price.

It is useful to introduce two measures of the extent to which the actual outcome deviates from the competitive level. Since total earnings of buyers and sellers are maximized at the competitive outcome, market efficiency can be measured by expressing the total earnings of all subjects as a percentage of the maximum possible aggregate surplus. Thus the competitive outcome is 100% efficient, as shown at the bottom of column (3) in table 1. The efficiency of a perfect cartel can be calculated to be about 82% for the supply and demand structure used. Besides reducing efficiency, a joint monopoly outcome will increase the sellers' earnings above the competitive level. The index of monopoly effectiveness, M, is defined to be the actual sellers' earnings expressed as a percentage of the difference between the sellers' earnings at the monopoly and competitive levels.[3] It follows that monopoly effectiveness is 100% for the joint

[3] These measures are discussed in more detail in Davis and Holt (1993a), chapters 3 and 4.

monopoly outcome. These theoretical predictions for joint monopoly are shown in the top row of table 1.

Consider efficiency and monopoly effectiveness averages in table 1. The session with no conspiracy and no discounts was 98% efficient, and the lowest efficiency was for the treatment with conspiracy and no discounts. Given the high prices for this conspiracy/no-discount treatment, it is not surprising that monopoly effectiveness is highest for this treatment, but it is surprising that monopoly effectiveness is much lower than the theoretical joint monopoly prediction of 100. This combination of high prices and low seller profits is due in part to the inefficient concentration of production with one or two sellers in many periods. The large negative monopoly effectiveness measure of -24 for the no-conspiracy/no-discount session was a consequence of the below-competitive prices and inefficient allocations arising from the failure of one seller to sell a second unit in two of the last five periods.

4. Conclusions

Laboratory methods are especially useful in the study of price fixing, since it is possible to listen to the discussions and to observe secret discounts. Moreover, it is straightforward to introduce the opportunity for secret discounts, holding constant all other structural and institutional features of the market.

When prices are posted on a take-it-or-leave it basis, financially motivated subjects who collude are able to discover and agree on a joint-profit-maximizing price, despite cost asymmetries and incomplete information about demand and supply conditions. The possibility of secret discounts, however, creates monitoring and enforcement problems that can cause transactions prices to collapse to near-competitive levels.[4] The implication is that antitrust hostility to agreements to limit or coordinate discounts is well founded.

[4] The importance of secrecy is indicated by the substantial recovery of price-fixing agreements in sessions where discounting is permitted but each seller's aggregate sales quantity is subsequently revealed to others. This treatment, which is reported in Davis and Holt (1993b), suggests the possible anticompetitive effects of some trade association activities.

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