BUREAU OF ECONOMICS
FEDERAL TRADE COMMISSION
WASHINGTON, DC 20580

DOES COLLUSION PAY ... DOES ANTITRUST WORK?

by

David F. Lean, Jonathan D. Ogur and Robert P. Rogers

Federal Trade Commission

Washington, D.C.   20580

I. _____ 1

The effect of oligopolistic collusion on profits and the effectiveness of antitrust conduct remedies against such collusion are important industrial organization and policy issues. Yet our understanding of these relationships remains incomplete. To the question, "Does price-fixing enhance profits?", Elzinga (1983, p. 16) suggests two answers: an "introductory economics course" answer, "Yes", and a "more advanced undergraduate" answer, "No, supracompetitive profits will be dissipated through cheating, non-price competition, or rent seeking." In his contracting approach to oligopoly, Williamson concludes (1975, pp. 246-247):

"Except...in highly concentrated industries producing homogeneous products, with nontrivial barriers to entry, and at a mature stage of development, oligopolistic interdependence is unlikely to pose antitrust Xssues tor which dissolution is an appro

authors found (to their surprise) that the conspiring firms were less profitable than those in the control group, other things equal. In another study, Sultan observed a positive but insignificant relationship between price fixing meetings and turbine generator prices. In a subsequent simulation analysis, however, he found a significant impact of conspiracyÇ predicted turbine generator prices for a model including conspiracy effects were about nine percent higher than those for a model without conspiracy (1975, p. 348). In sum, the questions of conspiracy's imp×ct and antitrust's effectiveness remain uncertain.

The present study examines the impacts of collusion and antitrust conduct remedies on profitability in electrical equipment markets. We inquire whether conspiracy raised equipment manufacturers' returns and whether antitrust conÞuct remedies were an effective policy response. We also examine whether market signaling increased turbine generator makers' profitability after antitrust ended the conspiratorial meetings. 7/ In the next section, we provide a short history of collusion in electrical equipment markets between 1950 and 1970. Then, we describe the structure-conduct-performance model that we use to estimate the impacts of collusion and antitrust on profitability. ›ollowing that, we discuss the data used for estimation of the model. And finally, we present the results of that estima", max

1964). The conspirators' illegal meetings covered 20 product lines with annual sales approaching $2 billion in the late 1950's. In July 1959 the meetings ended (Sultan, 1974, p. 71). In that same month, the Department of Justice announced that a grand jury was investigating identical bidding on electrical equip©ent, and in February 1960 the first indictments were handed down (Waõton and Cleveland, 1964, pp. 32-33). Following successful prosecution under section I of the Sherman Act, conspiring companies and individual officers were fined more than $1 million, and some executives received jail sentences. Su£sequent damage suits by privately-owned utilities and by state and local governments obtained refunds from the manufacturers, lowering their after-tax incomes in the early 1960's by more than $150 million. Consent agreements with the manufacturers forbade further price fixing activities, and tìe available evidence indicates that the meetings were not resumed (Ohio Valley Electric et al. ° General Electric et al., 1965, p. 925Å and u.s. ° General Electric et al., 1976, p. 3).

    In 1963, however, The General Electric Company announced major changes in its turbine generator pricing policies (Electrical World, May 27, 1963, p. 27), which were interpreted by the Department of Justice as an attempt to engage in price signaling. These changes included a revised price book that greatly simplified price calculation for the complex, custom-built product and a published multiplier that faciöitated price change computation. Another important change was the initiation of a "price protection" (or most favored buyer) policy in which any discount given to one buyer would be granteà retroactively to

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violations of the Sherman Act's Section I. The conduct remedies imposed were among the strongest ever. The investigation of market signaling involved a novel extension of the antitrust laws to a form of conduct alleged to

performance moÝels in its treatment of conduct. First, conduct
variables appear explicitly in our model--in fact they are the
main focus of our study. Due perhaps to a paucity of data, most
previous studies have examined only structure-performance links.
6/ Ÿecond, we assume that, between 1950 and 1970, the electrical
equipment manufacturers' decision whether or not to conspire on
prices was determined largely by public policy. In other words,
the choice between clearly illegal price fixing meetings and other
(possibly legal) forms of pricing, such as market signaling, is
assumed to have depended primarily on the probabilities of
detection and punishment and on the cost of any resulting
penalties (Becker 1968). These probabilities and penalties are
assumed to have i   h   a   m2m²2x6 m "

70 differs systematically from that of the firms whose data become available in 1957.

   To control for this possible bias, we carried out our analysis using two data samples, one for 1957-70, and one for the entire 1950-70 period. We assumed that the 1957-70 sample would be free of bias because change in the composition of firms and industries was minimal during that period. When we used the 1950-7¾ sample, we included in our model dummy variables that reflect the year of initial data availability for each firm These variables (DATA50, DATA53, DATA55, and DATA56) are designed to capture systematic differences in profitability that could bias our results.

   Another possible source of bias is the accounting treatment of antitrust damage payments by some electrical equipment manufacturers. 14/ Some firms subtracted damages from net sales and/or added them to cost of operations. If these ad¨ustments were allocated to   p/oØu° t¼ne ¼àWel

more effective in the latter part of the 1950's than earlier in that decade. The intervening year, 1955, was the time of the "white sale" when meetings were discontinued and prices fell sharply (Sultan, 1974, pp. 40, 46, and 63). The results again suggest that meetings raised profitability. Profit/sales ratios w¤re over six percentage points higher in 1950-54 and over three percentage points higher in 1956-59. By contrast, profit/sales ratios were not significantly higher in 1955. No support is given, however, to the notion that the meetings were more effective after the white sale than before. To the contrary, the coefficient of CON5054 is larger than that of CON5659.

In equations (4) and (8), we replace the three conspiracy variables with a variable equal to one for the entire 1950's (CON5059). With this regression, we estimated that profit/sales ratios were over four percentage points higher over that decade. Thus, even when we include the white sale year, the conspiracy appears to have raised average returns for sellers in the ¤ight product markets in our sample. Á /

These findings suggest that, in general, electrical equip©ent sellers were not able to maintain prices as much above costs by non-conspiratorial pricing methods during the white sale and after antitrust investigation ended the conspiracy. The possible exception to this conclusion is turbine generators. The results in equations (1), (2), and (5) suggest that turbine generator price signaling succeeded in raising prices relative to costs. These equations provide estimates indicating that signaling caused an increase in turbine generator profitability ranging from 4 to 11 percentage points. In the remainh   se

equations, however, we observe no significant increase in turbine generator profit/sales ratios during 1964-70.

CONC2's coefficients provide only partial support for the hypothesis that seller concentration facilitates collusion. CONC2 is positively related to profitability in four of the eight equations in Tables 1 and 2. Although not significant in the OLS regressions, CONC2's coefficient becomes significant after we correct for heteroskedasticity. In the other four equations, however, CONC2 is negatively related to profitability. While inconsistent with the findings of most industry-level concentration-profitability studies, this result is consistent with the results recently obtained by Ravenscraft (1983) using line of business data and by others r   Ü

appears to have done so. Because the public communication aspect of signaling is probably less effective than face to face communication in meetings, it may be that the facilitating practices element of signaling was the key to its apparent success.   /

Our analysis suggests that, where collusion has raised sellers' returns, antitrust prosecution can lower them and reduce any social losses that were occurring. However, our analysis also suggests that, if antitrust intervention is limited to traditional çorms of conspiracy (e.g. meetings in hotel rooms or other private coᵃmunications), it may leave other forms of effective collusion untouched. In other words by devoting some attention to public communication and facilitating practices, the antitrust authorities may increase the benefits of their activities to society.

Table 1. OLS Regression Results
(t-statistics are in parentheses).

Independent Variables	Equations			
	(1)	(2)	(3)	(4)
Intercept	-5.00 (-0.83)	-6.02 (-0.86)	14.90 (2.07)	14.26 (1.98)
GROWDEV	4.72* (6.03)	5.00* (5.32)	4.92* (8.53)	4.98* (5.91)
CONC2	8.00 (1.07)	9.75 (1.13)	-16.56 (-2.18)	-15.91 (-2.06)
SELLER3	116.02* (7.16)	114.46* (6.42)	20.36 (0.99)	22.50 (1.09)
COMSIZE	0.45 (1.03)	0.05 (1.05)	0.02 (0.05)	-0.01 (-0.03)
SHARE	30.34* (6.47)	30.31* (6.42)	28.09* (6.06)	28.31* (6.10)
ASALIND	-23.60* (-4.70)	-23.24* (-4.00)	-13.76* (-3.84)	-14.22* (-3.98)
ASALPÓLN	-1.03 (-1.29)	-1.03 (-1.27)	-1.26 (-1.62)	-1.29 (-1.65)
IMPORTS	-™.17 (-0.13)	0.06 (0.05)	0.35 (0.25)	0.10 (0.07)
CUSTOÑ	-8.50* (-5.36)	-9.23* (-5.01)	-3.95* (-2.47)	-3.87* (-2.42)
CON5059				4.46* (3.41)
CON5054			6.77* (3.45)	
CON55			2.78 (0.88)	
CON5659			3.98* (2.89)	
CON5759	2.65* (1.91)			
INSULCON		3.08 (1.24)		

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Independent Variables	Equations			
	(1)	(2)	(3)	(4)
CDSRCON		3.31 (0.67)		
TURBNCON		0.56 (0.13)		
METERCON		4.57 (0.88)		
DISTCON		1.21 (0.43)		
PTRANCON		2.59 (0.77)		
BREAKCON		8.62* (1.86)		
CAPCON		1.22 (0.29)		
SIG6470	10.64* (3.15)	9.83* (2.69)	3.03 (0.91)	3.05 (0.92)
DATA50			4.02* (3.15)	4.46* (3.64)
DATA53			14.75* (4.78)	14.74* (4.77)
DATA55			12.54* (3.26)	12.26* (3.19)
DATA56			1.23 (0.35)	1.18 (0.34)
R2	0.39	0.39	0.39	0.39
F	27.13	16.56	20.64	23.17
Sample Size	446	446	527	527
Years	57-70	57-70	50-70	50-70

Note:* Coefficient has the predicted sign and is significantly different from zero at the 5-percent level or higher. (7t   h–

Independent Variables	(5)
Intercept	-12.09
	(-3.04)
GROWDEV	5.42*
	(9.26)
CONC2	13.09*
	(2.33)
SELLER3	127.99*
	(12.51)
COMSIZE	0.20
	(0.81)
SHARE	32.59*
	9.07)
ASALIND	-18.59*
	(-4.51)
ASALPRLN	-1.96
	(-1.67)
IMPORTS	0.47
	(0.50)
CUSTOM	-8.74*
	(-6.47)
CON5059	
CON5054	
CON55	
CON5659	
CON5759	2.02*
	(2.

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Independent Variables	Equations			
	(5)	(6)	(7)	(8)
CDSRCON		0.70 (0.16)		
TURBNCON		-4.39 (-1.72)		
METERCON		0.28 (0.11)		
DISTCON		0.10 (0.06)		
PTRANCON		2.44 (1.13)		
BREAKCON		10.49* (3.45)		
CAPCON		2.28 (0.54)		
SEG6470	7.00* (2.69)	4.73 (1.62)	0.41 (0.13)	0.41 (0.13)
DATA50			3.15* (2.58)	3.77* (3.23)
DATA53			13.84* (4.77)	13.94* (4.80)
DATA55			11.48* (3.11)	11.22* (3.03)
DATA56			-0.54 (-0.16)	-0.59 (-0.17)
R2	0.32	0.32	0.26	0.26
F	20.45	12.58	11.78	13.26

Sample and

Table 3. Definitions of Variables

OPSALE -- operating income/net sales

CONC2 -- the two firm concentration ratio

GROWDEV -- the deviation of real industry sales about trend

ASALIND -- industry assets/sales

ASALPRLN -- product line assets/sales

CUSTOM -- 1 if industry's product is made to order

IMPORTS -- 1 if import competition is present

CON5054 -- 1 in conspiracy years 1950-54

CON55 -- 1 in white sale year 1955

CON5659 -- 1 in conspiracy years 1956-59

CON5759 -- 1 in conspiracy years 1957-59

CON5059 -- 1 in conspiracy years 1950-59

SIG6470 -- 1 in turbine generator market signaling years 1964-70

COMSIZE -- real company net sales

SHARE -- company market share

SELLER3 -- third-largest seller's market share

DATA50 -- 1 if 1950 is the year of initial data availability

DATA53 -- 1 if 1953 is the year of initial data availability

DATA55 -- 1 if 1955 is the year of initial data availability

DATA56 -- 1 if 1956 is the year of initial data availability

INSULCON -- 1 in insulator conspiracy years 1957-59

CDSRCON -- 1 in condenser conspiracy years 1957-59

TURBNCON -- 1 in turbine generator conspiracy years 1957-59

METERCON -- 1 in meter conspiracy years 1957-59

DISTCON -- 1 in distribution transformer conspiracy years 1957-59

PTRANCON -- 1 in power transformer copspiracy years 1957-59

BREAKCON -- 1 in circuit breaker conspiracy years 1957-59

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CAPCON .ıl in power capacitor conspiracy years 1957-59

Footnotes

1/ The analysis of this paper has benefited froø critical commeüts by Keith Anderson, John Kwoka, James Langenfeld, William Long, John Peterman, David Ravenscraft, Donald Sant, F.M Scherer, and Robert Tollison. However, any remaining errors are the authors'.

2/ Market signaling can be thought of as the attempt by rival°sellers to increase prices, using public communication (e.g. in the media or in published price books) and facilitating practices such as "most favored buyer" contractual arangements. Signaling, which was also the focus of the FTC´s Ethyl case (Elzinga, 1983, pp. 10-12), is thus an alternative form of conduct to conspiratorial meetings. To the best of our knowledge, no previous studies have tried to estimate the effect of market signaling on rates of return.

3/ In this paper, we will use the following terminology: "comany" will refer to data for an entire firm, which may include operations in several industries: "industry" data will consist of the sum of all companies' data pertaining to a particular product market: and "product line" will mean the data of a single company that relate to its operations in a single industry. For example, data for General Electric

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References

Asch P. and J.J. Seneca (1976). "Is Collusion Profitableš" *Review of Economics and Statistics*. February, pp. 1-10. Reprinted in *Journal of Reprints for Antitrust Law and* *and*
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