COMPETITION AND COLLUSION IN ELECTRICAL EQUIPMENT MARKETS: AN ECONOMIC ASSESSMENT

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David F. Lean
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Bureau of Economics Staff Report
to the Federal Trade Commission

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PREFACE

This study originated in the 1970's as part of a project to evaluate economic performance in several highly concentrated industries. More than 10 years had elapsed since the widespread price fixing and antitrust prosecution of electrical-equipment companies and executives, and an opportunity existed to estimate the impacts of the conspiracy and of the remedies. Using survey data obtained from the manufacturers, the study seeks information to help answer the following questions: Did conspiratorial meetings permit sellers to raise profits, other things equal? Did fines, treble damage awards, and incarceration cause returns to fall below conspiracy levels? In other words, how effective were antitrust conduct remedies in improving performance in an oligopolistically structured industry? Although protracted litigation with some of the surveyed companies delayed completion of the study for several years, the central issues of oligopoly, conspiracy, and antitrust remain relevant to both makers and students of public policy.

The authors would like to thank the many Bureau of Economics and Office of the General Counsel staff members who made important contributions to this study. Numerous Bureau Directors gave their support to the study at critical points, starting with H. Michael Mann and continuing with F. M. Scherer, Darius W. Gaskins Jr., William S. Comanor, Michael P. Lynch, and Robert D. Tollison.

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Chapter I

INTRODUCTION

BACKGROUND

During the 1950's, more than 30 electrical-equipment manufacturers engaged in an elaborate conspiracy to fix prices charged utilities.[1] The conspirators' illegal meetings covered 20 product lines (including, for example, steam turbine generators, demand and watt-hour meters, and power circuit breakers) with annual sales approaching $2 billion. After TVA complaints about identical sealed bids, Justice Department investigations began in 1959, and a grand jury handed down indictments in the next year. As the result of successful prosecution under the Sherman Act's section I,[2] conspiring companies and individual officers received fines exceeding $1 million, and some executives were given jail sentences. Subsequently, State and local governments and privately owned utilities sued the equipment makers for damages imposed by conspiracy-raised prices. The resulting refunds reduced manufacturers' after-tax incomes in the early 1960's by more than $150 million.[3] By historical standards, these penalties were severe, likely to have a significant impact on seller

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[1] For a description of the electrical equipment conspiracies, see Herling (1962) and Walton and Cleveland (1964).

[2] Section I forbids "every contract, combination . . . or conspiracy in restraint of trade or commerce among the several States." As interpreted by the courts, the section makes agreements to fix prices per se illegal (Scherer 1980, p. 497).

[3] See ch. III.

conduct. Available evidence indicates that conspiratorial meetings ended in 1959 and have not been resumed (Ohio Valley Electric et al v. General Electric et al, 1976, p. 3).

PURPOSE OF THE STUDY

A central purpose of this study is to examine the impacts of conspiracy and subsequent antitrust "conduct" remedies on performance in electrical-equipment markets.[1] We attempt to address the issues of whether price fixing caused measurable overcharges for electrical equipment and whether the remedies imposed were an effective response to the problem.

Despite the passage of more than 20 years since the conspiracies were exposed, the question of their effectiveness remains open. In the course of numerous damage suits,[2] utilities argued, and the courts generally agreed, that conspiratorial meetings had succeeded in raising equipment prices (Bane 1973). On the other side, manufacturers (U.S. Senate 1961) and Sultan (1974 and 1975) have asserted that because of uncontrollable cheating on agreements, the sessions failed to increase prices.[3]

From a theoretical point of view, conspiratorial meetings may or may not raise seller prices and profitability significantly

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[1] Conduct remedies, such as fines, jail terms, and damage payments, seek to influence industry performance by changing seller conduct but make no attempt to modify industry structure.

[2] See ch. III.

[3] Sultan's strongest evidence, however, supports a successful conspiracy. See ch. II.

above the levels otherwise achieved. Improved interfirm communication through these face-to-face gatherings could lead to stronger price agreements and higher profits than otherwise. The success of meetings may depend, however, on industry structure characteristics. For example, at least moderate levels of concentration are probably needed to allow effective policing of any price agreements worked out in meetings. Extremely high concentration levels, however, may allow maximum industry profits to be approached without explicit collusion--for example, through market signaling.[1] If industry profits are already about as high as possible, meetings may have no significant effect on participants' returns. In other instances, despite moderate to high concentration, high fixed costs and sharp cyclical demand fluctuations may prevent profit elevation by conspiracy, signaling, or any other form of seller conduct.[2]

The effectiveness of an antitrust policy aimed at ending explicit collusion depends on the impact of conspiratorial meetings relative to that of other pricing methods. If price-fixing sessions succeed in raising participants' returns compared to alternative pricing mechanisms, then by ending the gatherings, antitrust will eliminate the added monopoly profits. Where concentration is high enough to make signaling as effective as

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[1] Market signaling can be thought of as the attempt by rival sellers to increase prices through communication in the public media rather than by conspiratorial meetings.

[2] See ch. III.

meetings, however, antitrust directed at the meetings alone will have no observable impact on profit performance. Under other circumstances, where an unfavorable market structure thwarts both meetings and signaling so that neither method achieves higher profitability, antitrust will again have no effect.

In addition to being unsettled questions, the impacts of conspiracy and conduct remedies on electrical-equipment markets are important ones. Proper implementation of antitrust policy in the future requires information on the successes and failures of past applications. The electrical-equipment conspiracies represent one of the most widespread, dramatic violations of the Sherman Act's Section I. The conduct remedies imposed were among the strongest ever. Thus, these conspiracies and the policy response present an opportunity to examine the impacts of such actions in bold relief.

Along with the relationship of conspiracy and conduct remedies to profitability, we examine other important industrial-organization and antitrust policy issues. Among them are the importance of price-raising versus cost-reducing effects of concentration, the significance of strategic groups in producer goods markets, and the role of the third-largest firm in promoting competition. Our results provide additional useful information on these questions--in part because previous studies have rarely analyzed them using data as disaggregated as those of the present inquiry.

THE SAMPLE

Of the 20 product markets in which conspiracy was uncovered, this study examines 8.[1] The chosen markets account for just over 60 percent of total sales affected by the electrical-equipment conspiracies. All 8 are highly concentrated, with two-firm concentration ratios ranging from just under 50 to nearly 100 over the 1950-70 period. They vary substantially, however, in terms of such other structural characteristics as standardization of the product, foreign competition, and the ratio of fixed to variable costs in the production process.

The eight product markets included in our study can be described briefly as follows:

(1) Steam turbine generators are very large, multimillion-dollar machines, generally custom built to utility specifications and used to produce electricity;

(2) Steam surface condensers are large, custom-built tanks, employed in connection with steam turbine generators to recycle the steam that drives the turbine;

(3) Power transformers are big voltage-changing devices that permit more efficient transmission of electricity over long distances (while the largest sizes are custom built, smaller standardized units are sold from inventory);

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[1] Our selection was made primarily on the basis of market size and in an attempt to include some industry structure diversity in the sample. However, we omitted such large product groups as industrial controls and low-voltage distribution equipment, which include too great a variety of products for effective analysis as economic markets.

(4) Distribution transformers are small, standardized, voltage-changing devices that permit safe electricity distribution and use;

(5) Power circuit breakers are devices that interrupt the flow of electric current to prevent equipment damage in the event of an overload or short circuit (while the largest units are custom made, smaller breakers are standardized and sold from inventory);

(6) Power capacitors are devices that help overcome line voltage drops, permitting more efficient transmission of electricity (although sold off the shelf, these devices may vary in quality across sellers);[1]

(7) Insulators are porcelain objects used to hold transmission lines, while preventing the electric current from escaping through the supporting poles or towers into the ground (this standardized product is produced by the millions annually and sold from inventory);

(8) Demand and watt-hour meters are devices that measure the amount of power used by electric utilities' individual consumers (these meters are generally standardized and sold from inventory).

Data on these eight products were collected by a survey of 35 respondent firms. Merger and acquisition activity over the

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[1] Abel 1969, p. 62.

years gave these companies access to a number of other electrical-equipment manufacturers' records. As a result, the survey obtained data for about 70 firms that made one or more of our eight products during the 1950-70 period, which contains roughly equal years of conspiracy (1950-59) and nonconspiracy (1960-70). The resulting sample is unique in that it contains data on sales, assets, and profits at a highly disaggregated level for a 21-year period. With this sample, we can examine the sources of high seller profitability and evaluate the impacts of conspiracy and subsequent antitrust remedies, using observations that more closely approximate true economic markets than those usually available.[1]

A First Impression of Electrical-Equipment Profitability

Using our survey data, we can obtain a rough indication of of electrical-equipment profitability patterns over the 1950-70 study period. For this purpose, we estimated product-line equity, aggregated equity and net income across firms in each market, calculated industry-level after-tax rates of return on equity, and

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[1] Our data are generally less aggregated than those available from the Bureau of the Census or the Internal Revenue Service. (see appendix B). Our data are not without their limitations, however. At least four sources of error, inconsistency, or omission are present: (1) differences in accounting definitions and practices across companies and products, (2) changes in such conventions over time, (3) estimation errors where records are incomplete, and (4) missing observations where no basis for estimation exists. Where such data problems introduce predictable biases into the sample, we attempt to adjust our analysis to correct for them.

averaged these rates of return over the 1950's and over the 1960's.[1] To reflect (for comparison purposes) the profitability patterns of U.S. industry in general, we use data for all manufacturing from the same period.[2]

If we consider electrical-equipment industry profitability relative to that of all manufacturing, different pictures emerge for the 1950's, when conspiratorial meetings were held, and the 1960's, the posttrial or nonmeeting period. The all-manufacturing average is relatively stable over the entire 21-year period; all-manufacturing average after-tax returns on equity are approximately 11 percent for each of the two decades. By contrast, electrical-equipment industry returns are relatively volatile. During the 1950's, five of our eight product markets had rates of return greater than or equal to 20 percent. These highly profitable product markets are turbine generators, meters, power transformers, distribution transformers, and power circuit breakers. In general, from the 1950's to the 1960's, average industry profitability fell--in some cases substantially. During the 1960's, only three product markets had returns that equaled or exceeded 20 percent. These markets are turbine generators, meters, and distribution transformers. Examination of data for

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[1] Because most firms in our sample did not provide equity data by product line, we allocated total company equity to lines on the basis of product-line assets.

[2] Profit rates for all manufacturing are based on FTC Quarterly Financial Report data (see The Economic Report of the President, 1972, p. 282).

individual years indicates, moreover, that by the end of the 1960's, only the meter industry was able to earn returns well above the all-manufacturing average. By contrast, in the 1960's, power-circuit-breaker profitability fell approximately to the all-manufacturing level while rates of return in power transformers dropped below that average. Finally, the insulator, condenser, and power-capacitor industries were unable to earn average returns above the all-manufacturing level in either the 1950's or the 1960's.

How should these rough comparisons be interpreted? Clearly, one cannot draw strong conclusions from them about the effectiveness or ineffectiveness of conspiracy and antitrust in individual electrical-equipment markets. Any attempt to extract such conclusions would ignore the numerous other determinants of profitability that must be held constant to identify the impacts of conspiracy and antitrust.[1] These comparisons are, however, suggestive that a significant change in electrical-equipment-product market performance may have occurred at the time when antitrust prosecution brought the price-fixing meetings to an end. Through analysis of structure, conduct, and performance, the remainder of this study presents a more sharply focused look at the impacts of conspiracy and antitrust in electrical equipment.

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[1] For example, antitrust damage payments reduced postconspiracy profits, even absent a change in seller behavior. In our analysis below, we correct for this and other influences on profitability.

Chapter II

STRUCTURE-CONDUCT-PERFORMANCE THEORIES: ISSUES AND MODELS

In this chapter, we address three industrial-organization questions that have been debated in previous structure-conduct-performance analyses. We examine the impact of conspiracy on profitability: is price fixing a profitable activity for the conspirators? We also explore the concentration-profitability relationship to shed some additional light on its meaning: does concentration lead to higher prices or lower costs? In addition, a recently posed question that we consider is the importance in explaining profitability of firms following common strategies within industries.

For each of these issues, we survey the literature briefly, indicating the ways in which the present study will contribute to that literature. Then, we present, in general form, the regression model that we will use to derive our results in chapters III and IV.

DOES CONCENTRATION RAISE PRICE OR LOWER COST?

Structure-conduct-performance models consist of a set of relationships between industry-structure characteristics and economic performance, through the intermediary of seller conduct. Since Bain's (1951) pioneering study, a voluminous literature analyzing these models has accumulated.[1] Most of these analyses

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[1] For a survey of this literature, see Weiss 1974.

focus on the relationship between concentration and profitability. In general, the authors found evidence of a positive association between these two variables. Where a few sellers control a relatively large fraction of industry output, rates of return tend to be higher than the level that would prevail in a less concentrated but otherwise identical market.

Two possible explanations have been advanced for a positive profitability-concentration relationship: the price-elevation hypothesis and the cost-reduction hypothesis.[1] The price-elevation hypothesis states that forming and maintaining a collusive agreement is easier in a concentrated industry, because the number of participants is smaller (Scherer 1980, pp. 199-200). As a result, prices are likely to be higher, other things equal.[2] The collusion could be implemented using a variety of interseller communication techniques, ranging from market signaling to face-to-face meetings.

According to the cost-reduction hypothesis, concentrated industries are characterized by economies of large-scale operation. Such advantages of large firm size relative to the market

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[1] The discussion of these alternative explanations is based largely on Scherer (1980, pp. 280-85).

[2] Higher prices imply greater profitability, provided that sellers do not permit costs to rise as much as prices. Assumed away, then, is inefficiency in the absence of competitive pressures, i.e., Leibenstein's x-inefficiency (1966). Also ruled out is the seeking of such nonprofit management goals as costly workplace amenities (Williamson 1964, and Alchian 1965), or labor's sharing in monopoly profits where a powerful union exists. (See Scherer 1980, p. 463, for a discussion of the evidence on the latter relationship.)

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can arise where substantial fixed costs must be incurred in order to sell in that market. In a research-and-development-intensive industry, for example, it may be optimal to maintain costly test facilities, regardless of the output level produced. A large scale of production permits the costs of those facilities to be spread over more units of output, thus adding less to the cost of each unit than would be added at a smaller scale.

Only a few previous studies have attempted to discriminate between these two explanations, which can apply simultaneously to the same industry.[1] To some extent, price-raising and cost-reducing effects of concentrated market structure can be separated by including both an industry-concentration measure and a market-share variable in a structure-conduct-performance model (Scherer 1980, p. 283). Especially in homogeneous-product industries, where price variation across sellers is likely to be minimal, the profitability/market-share relationship probably captures cost differences between large and small rivals. In that event, the concentration variable should reflect primarily the price-raising effect of collusion. In differentiated product markets, this conclusion is somewhat weakened by the possibility that large sellers may also have advantages in convincing buyers, rightly or wrongly, that their products are better than those of smaller rivals or potential entrants. Such large-firm product

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[1] See, for example, Demsetz (1973), Ravenscraft (1980), and the studies done using the PIMS data set, which are cited in Scherer (1980, p. 283 n.).

differentiation advantages may translate into higher prices for their products than for smaller sellers' output. Although these large-seller price advantages may exist in some producer-goods industries (Lean 1979), they are probably more prevalent in consumer product markets. In addition, to the extent that monopoly power is related to market share (as would be true, for example under a dominant-firm model), the separation of price-raising from cost-reducing effects of concentration becomes more difficult to achieve.

As indicated in chapter I, our study examines eight markets in which utilities purchase producer goods. With the aid of their own engineering staffs and outside consultants, the buyers of these products are relatively well informed. As a result, any product differentiation is more likely to reflect real performance differences in these markets than it would in a set of consumer-goods markets.[1] Hence, the market-share profitability relationship that we estimate may reflect product quality and monopoly-power differences as well as cost differences between large and small sellers. Nevertheless, our study may be able to shed some additional light on the price-raising and cost-reducing effects of concentration.

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[1] For a discussion of product differentiation in the case of power capacitors, see Abel (1969, p. 62).

IS CONSPIRACY PROFITABLE?

Relatively few previous studies have attempted to estimate the impact of conspiracy on profitability for markets in which price fixing is known to have occurred (see Scherer 1980, pp. 276-77). In these analyses, mixed, zero, or even negative results were obtained. As explanations of their failure to observe a strong positive relationship, the authors suggest problems of simultaneity and measurement errors. In at least some instances, however, other possible explanations can be suggested.

Asch and Seneca (1980) examine a sample that includes 51 firms that were found guilty of or that pleaded nolo contendere to Sherman Act conspiracy charges during 1958-67. Also included in their sample were 50 apparently noncollusive firms chosen at random from Moody's Industrials. Although the authors expected to observe a positive conspiracy-profitability relationship, they found that the conspiring firms were less profitable than those in the control group, other things being equal. Recognizing that causality can run from profitability to conspiracy as well as in the opposite direction, the authors suggest by way of explanation that price-fixing attempts may be a response to poor profit performance, a negative relationship consistent with their findings. This explanation suggests the need to develop a multiequation model in which conspiracy is endogenous and (perhaps) a function

of previous-period profitability, while also being an explanator of present-period rates of return.[1]

Other Asch and Seneca findings indicate a relationship between concentration and conspiracy that could account (at least in part) for their observed negative conspiracy-profitability result. For producer goods, they found a negative relationship between concentration and conspiracy, which could reflect the use of explicit price-fixing when concentration is too low to permit effective tacit collusion or market signaling. In other words, conspirators' profits may be relatively low because concentration, in markets with explicit price-fixing, is also low.

In another study, Phillips (1972) makes both the propensity to attempt price fixing and price fixing's effectiveness endogenous variables, with each a function of profitability and the industry-structure characteristics: number of sellers and number of trade associations. The author measures the attempts to fix prices by the number of trade associations reported as attempting to fix prices in each industry of a sample drawn from the British economy. The effectiveness of price fixing is measured by a survey of buyers' judgments on the issue. The author hypothesizes

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[1] They do not, however, develop and estimate such a model.

that a highly effective conspiracy is associated with high profits--a positive relationship.[1] In addition, Phillips assumes that low profitability levels reflect recent profit decreases that tend to increase the attempts to fix prices--a negative relationship similar to that proposed by Asch and Seneca as an explanation for their findings. In ordinary-least-squares regressions, Phillips found, however, that neither of his conspiracy variables was significantly related to profitability--a result that he suggests may be attributed to reporting errors.

Phillips' two-stage-least-squares results are mixed. As expected, the effectiveness of price fixing has a positive coefficient that is greater than its standard error in the various specifications of the profitability equation. In equations that explain price-fixing effectiveness and price-fixing attempts, however, profitability has the signs predicted by Phillips, but its coefficients are smaller than their respective standard errors.

In a subsequent two-volume analysis of electrical equipment markets, Sultan estimates the impact of conspiracy on turbine-generator prices. Largely unconvinced that the conspirators succeeded in raising these prices, the author follows earlier writers by recognizing that reverse causality may also exist, so that

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[1] He also assumes that high profits reduce the incentive to cheat on collusive agreements (and thus increase the effectiveness of conspiracy). The latter assumption can be questioned, however, because high prices increase the return to the individual successful cheater and, by inducing more rapid entry, reduce the return to those who maintain the agreed-upon price. See Scherer (1980, pp. 172-73).

price levels may have determined whether meetings were held.[1] By contrast with the previous authors, who assumed that low or declining profits stimulate conspiracy, Sultan suggests that high prices, due (for example) to strong demand, cause conspirators to persist, under the apparently mistaken impression that their meetings are effective (1975, p. 111).[2] In other words, while Asch and Seneca as well as Phillips argue that low profits cause conspiracy (a negative relationship), Sultan suggests that high prices induce meetings (a positive association). Nevertheless, Sultan estimates a model based on the assumption that conspiracy raises prices and finds evidence of a positive but insignificant relationship between the two variables. In a subsequent simulation analysis, however, he observes a significant impact of conspiracy: predicted prices for a model that includes conspiracy effects are 8 or 9 percent higher than those for a model without conspiracy (1975, p. 348).

As indicated in the preceding discussion, recognition of simultaneity between conspiracy and profitability suggests the

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[1] Sultan, however, apparently did not test for the impact of price levels on conspiracy. His use of conspiracy variables similar to those of the present study (dummy variables representing 5- or 10-year conspiracy periods) probably precludes such a test. To test for this reverse causality would probably require that conspiracy be defined in terms of, say, number of meetings per year, or even analyzed on a meeting-by-meeting basis, using the individual transactions discussed at each meeting.

[2] During the downswing, Sultan argues, when weak demand causes falling prices, conspirators recognize their ineffectiveness and stop meeting.

development and estimation of a multiequation model in which both variables are determined endogenously. To the best of our knowledge, only Phillips has developed and estimated such a model. Other authors, however, have analyzed multiequation structure-conduct-performance models, which (although they do not include a conspiracy variable) nevertheless provide useful insights. In previous studies by Strickland and Weiss (1976), Martin (1979), and Pagoulatos and Sorenson (1981), three-equation structure-conduct-performance models were estimated, in which profitability, concentration, and advertising intensity are treated as endogenous variables. These models represent an econometric advance over single-equation ones in that simultaneous-equation bias is avoided. From comparison of their results to those from single-equation estimation, however, the authors suggest that such bias may be unimportant (Strickland and Weiss, p. 1109), or no more important than the bias due to the omission of relevant explanatory variables (Martin, p. 646).

With regard to the problem of omitted variables, Maddala (1977, p. 231) suggests that the ordinary-least-squares method, which is often used to estimate single-equation models, has been found, in general, to be more robust against specification errors than many simultaneous-equation methods. Lacking rigorous theoretical models to indicate the correct specification, structure-conduct-performance regression models almost certainly omit relevant explanatory variables and are subject to other

specification errors. Hence, the use of ordinary least squares to estimate these regression models may be the best technique available and certainly provides useful results, even though simultaneity is thereby ignored.

As a result of these considerations, the present study estimates single-equation models using ordinary least squares and generalized least squares to correct for the heteroskedasticity often found in structure-conduct-performance models. While profitability is assumed to be endogenous, industry-structure characteristics, seller conduct, and all other explanatory variables[1] are assumed to be determined exogenously. In particular, our models assume that seller conduct is a function of public policy. In other words, the choice between clearly illegal price-fixing conspiracy and other (possibly legal) forms of pricing, such as market signaling or tacit collusion, is assumed to depend on the probabilities of detection and punishment and on the cost of any resulting penalties (Becker 1968). These probabilities and penalties are assumed to depend, in turn, on exogenously determined antitrust policy.

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[1] See ch. III.

WHAT CAN WE LEARN FROM EXAMINING THE "STRUCTURE WITHIN INDUSTRIES"?

Recent work by Caves and Porter (1977) and Kwoka (1978) has extended the conventional structure-conduct-performance analysis to examine the "structure within industries" (Porter 1979). Caves and Porter hypothesize that markets are inhabited by firms with divergent profit-maximizing strategies. Firms that have the same general strategy can be placed in a "strategy group." For instance, in a consumer market, one group of firms may advertise intensively to differentiate their products and to sell on a national basis. In another group, firms may advertise less intensively and choose regional product distribution. Still a third group might aim for the private-label or the generic-market segment. In producer goods, while one strategic group might manufacture a high volume of standardized goods, another may produce low-volume specialty or odd-lot items.

Porter posits that industry-structure variables will have different effects on the profits of firms in each strategic group. For example, he suggests that leader firms will enjoy higher profits in highly concentrated industries than in less concentrated industries because mobility barriers between follower and leader groups and between outsiders and leaders are likely to

be higher in the high-concentration industries.[1] Follower firms may exhibit a similar concentration-profitability relationship due to an umbrella effect (a relatively broader sharing of higher industry profits in more highly concentrated markets). Nevertheless, Porter argues that follower firms in highly concentrated industries may face a greater threat from entry. In other words, weaker mobility barriers may erode a potential umbrella effect. For follower firms, Porter thus expects the concentration-profitability relationship " . . . to be less positive than for leaders (or even negative)" [1979, p. 221].

Using a sample of 38 industries, each divided into leader and follower groups, Porter estimates industry structure-profitability relationships for each group. Generally, Porter's results conform to his predictions. For instance, the relationship between profitability and concentration is positive but not significant for leader firms; it is significantly negative for followers.

Kwoka's work (1978) is consistent with a price-cutting role for the third-largest firm in an industry. He found that where a number-three firm has over 16 percent of the market, industry profit margins are 13 or 14 percentage points lower, other things being equal. The author (1978, p. 34) warns, however, that this

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[1] Porter (1979, p. 220) defines leaders as the largest firms in an industry, accounting as a group for approximately 30 percent of industry sales revenue. Followers are all other firms. He defends this division stating that a series of full-blown case studies would be required to develop a more refined division of firms into strategic groups.

finding, though statistically significant, is based on a limited number of observations. In only 5 of his 314 industries did the third-firm share exceed 16 percent.[1]

The present study subjects these previous analyses of the structure within industries to further testing. Our tests are carried out through the estimation of different structure-conduct-performance models in chapters III and IV. Before these analyses, however, we present a statement of a typical model of this type and then modify it for use in further examining the issues discussed above.

STRUCTURE-CONDUCT-PERFORMANCE REGRESSION MODELS

A typical structure-conduct-performance model assumes that industry profitability is a function of industry structure and some nonstructure variables that correct for other influences on rates of return, such as market disequilibrium or measurement problems.[2] In cases where data are available by company or by product line, firm characteristics are sometimes included as additional explanatory variables.[3] Algebraically, a regression

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1 Ravenscraft (1980, p. 71) suggests that Kwoka's findings may be due to multicollinearity.

2 See Scherer (1980, pp. 268-76) for a detailed discussion of structure-conduct-performance models.

3 See, for example, Hall and Weiss (1968), FTC (1969), Imel and Helmberger (1971), Shepherd (1972), and Gale (1972), studies that made total firm profit a function of a weighted average of characteristics of industries in which the firm participates. See also the studies carried out using the PIMS data set, which is collected by product line (discussed in Scherer 1980, p. 283n.).

model used to estimate structure-conduct-performance relationships with product line data can be written as follows:

$$R_{ij} = a_0 + a_1 I_{j1} + \ldots + a_m I_{jm} + b_1 X_{j1} + \ldots + b_n X_{jn} + c_1 Z_{ij1} + \ldots + c_p Z_{ijp} + e_{ij} \quad (1)$$

where R_{ij} = rate of return of the i^{th} firm in the j^{th} industry,

a_0 = constant term,

$I_{j1}, \ldots, I_{jm}$ = industry-structure variables,

$X_{j1}, \ldots, X_{jn}$ = other industry characteristics that influence profitability,

$Z_{ij1}, \ldots, Z_{ijp}$ = product-line characteristics,

and e_{ij} = random-error term.

Because the present study focuses on the impact of conspiracy, we modify the structure-conduct-performance model described in equation (1). In addition to the explanators indicated there, we include seller-conduct variables. With these changes, the structure-conduct-performance models that we estimate can be written in general algebraic form as follows:

$$R_{ijt} = a_0 + a_1 I_{jt1} + \ldots + a_m I_{jtm} + b_1 X_{jt1} + \ldots + b_n X_{jtn} + c_1 Z_{ijt1} + \ldots + c_p Z_{ijtp} + d_1 C_{t1} + \ldots + d_q C_{tq} + e_{ijt}, \quad (2)$$

where $C_{t1}, \ldots, C_{tq}$ = seller conduct variables representing the presence of price fixing or other forms of collusion in year t. All other variables are defined as in equation (1), except that

each now varies over time as well as across firms and product lines.[1] Having thus presented our model in general form, we turn to the definition of the variables included in the various specifications of the model and to the presentation of our estimation results.[2]

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[1] In other words, our data set is a pooled cross section time series. Previous studies that used pooled samples are Hall and Weiss (1967) and Kessel (1971).

[2] Our basic model will be extended in chapter IV, to permit variation in some of the coefficients over time and across companies and industries.

Chapter III

COLLUSION AND PROFITABILITY IN ELECTRICAL-EQUIPMENT MARKETS

In this chapter we present variable definitions and estimation results for some structure-conduct-performance models. The main focus of each is the relationship between collusion and profitability. Model estimation is carried out using a sample of data collected from electrical-equipment-manufacturing companies in the following eight industries: insulators, steam condensers, steam turbine generators, demand and watt-hour meters, distribution transformers, power transformers, circuit breakers, and power capacitors. Annual product-line data were obtained for the period 1950 to 1970. During this period antitrust prosecution ended price fixing in these eight industries, but market signaling may subsequently have arisen in at least one of them. Our sample is relatively complete for the years starting in 1957, and thus most of our analysis uses this part of the total data set. As a test of the robustness of our results, however, we reestimate our models using the full 21-year period, making appropriate allowance for possible biases introduced by the changing composition of our sample of product lines over time.[1]

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[1] In this report, we adopt the following descriptive terminology with respect to the aggregation levels of our data: "company" 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; and "product line" will be used to describe the data of a single company that relate to its operations in a single industry.

THE VARIABLES

The performance variable to be explained is a ratio of accounting profit to sales. The variable, OPSALE, is the ratio of before-tax operating income to net sales, defined by product line by year.

Of major interest among the explanatory variables in our analysis are the conduct variables, which represent different periods of price-fixing conspiracy during the 1950's. Information from indictments and congressional hearings indicates that electrical equipment executives met to discuss prices beginning at least as early as 1950 and continuing into 1959 [U.S. Senate 1961]. These meetings covered prices in all eight industries in our sample. Available evidence suggests that such meetings were not held during the 1960's [Ohio Valley Electric et al. v. General Electric et al. 1965, p. 925, and U.S. v. General Electric et al. 1976, p. 3].

In January 1955, sharp price reductions occurred in electrical equipment markets, accompanied by a cessation of meetings in at least some instances [Sultan 1974, pp. 40, 46, and 63]. Sultan [1974, pp. 54 and 64-65] argues that this "white sale" divides the 1950's into two conspiracy periods: a 1950-54 period of occasional unstructured sessions and a 1955-59 period of frequent organized meetings. Of the approximately 70 turbine-generator meetings that Sultan included in a rough tally, the majority occurred between 1955 and 1959 [1974, p. 64]. The

evidence in support of Sultan's interpretation is not overwhelming, however, and in the Ohio Valley Electric decision, Judge Feinberg took an opposing view. There [1965, pp. 923-26], he concluded that a single continuous conspiracy existed for many years before and after 1954, starting as early as 1939 and ending in 1959. To explain the smaller volume of evidence supporting conspiracy in more distant years, he cited the deaths prior to deposition of three early participants and the faulty memory of one deponent [p. 926, n.]. Thus, Sultan's tally may reflect the pattern of information loss rather than the actual frequency of meetings.

Based on the historical evidence, we define several conspiracy-dummy variables. In some regressions using the full 1950-70 sample, we use CON5054 and CON5659 to represent the hypothesized effects of face-to-face meetings on profit/sales ratios during these respective conspiracy subperiods. To express the effects of the white sale, we define a third conspiracy dummy, CON55. In other regressions, we employ CON5059 to estimate conspiracy's average impact over the entire 1950's. These variables provide a test of the competing hypotheses concerning the conspiracy's effectiveness that were advanced by Sultan and Judge Feinberg. In regressions estimated with the 1957-70 sample, we use a single conspiracy-dummy variable, CON5759.

As suggested above, we assume that these variables are influenced by antitrust policy through its effect on the expected net

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returns to conspiracy. Our assumption is derived from Becker's [1968] analysis of the economics of crime. Using a similar analytical approach, Posner [1970, pp. 388-95] argued that the criminal penalties imposed under the antitrust laws have generally been too small, relative to the expected gains, to deter price-fixing conspiracies. At least prior to the electrical-equipment cases, fines were relatively small, and jail sentences were almost never given. Consistent with Posner's view, the electrical-equipment executives were not deterred in the 1950's.

The electrical-equipment prosecutions represented a break from the past; some company officials received jail sentences (some of which were suspended), and some executives were fired or demoted by their employers. Also, the conspiracy cases' decisions facilitated the large number of damage actions that were brought against the manufacturers.[1] As a result, it is reasonable to assert that the expected net gains to price-fixing conspiracy fell in relation to gains to price signaling or to other forms of tacit collusion, in the late 1960's. As indicated above, the available evidence, indicating no meetings but possible market signaling for that period, is consistent with this assertion.

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[1] Starting in 1961, nearly 2,000 damage suits were filed by utilities and governmental units [Bane 1973, pp. 73-83]. As a result of some of the settlements in these cases, General Electric incurred after-tax income reductions in 1963 and 1964 totaling $87 million [Bane 1973, p. 251], Westinghouse charged $55 million against 1964 income reinvested in business [Bane 1973, p. 254], and Allis Chalmers debited about $22 million from surplus in that same year [Moody's 1965, p. 1998].

The conspiracy variables, CON5054, CON55, CON5659, CON5759, and CON5059, take on the value of one for 1950-54, 1955, 1956-59, 1957-59, and 1950-59, respectively. For other observations, they assume the value of zero. We expect these variables' coefficients to be positive. Face-to-face meetings should lead to higher profit rates, other things equal.[1]

Another conduct variable that has important policy implications (SIG6470) is included to capture the effect of alleged price signaling in turbine generators during the 1960's. In 1963, GE announced major changes in its turbine-generator pricing policies, issuing a revised price book and eliminating price escalation on orders for delivery within 36 months [Electrical World, May 27, 1963, p. 27; Business Week, May 25, 1963, p. 30; Bureau of National Affairs, December 14, 1976, p. A-12; and Plaintiff's Memorandum, U.S. v. GE and Westinghouse 1976, p. 309]. In perhaps the biggest departure from previous pricing

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[1] These dummy variables reflect the average impact of conspiracy on profits during their respective time periods. Variation in the effectiveness of collusion undoubtedly occurred, for example, at the times of periodic breakdowns in the meetings. While more accurate measurement of times and frequency of meetings may be possible, it would probably require intensive research through court records in each of our eight industries [see Sultan 1974, pp. 37-38, for some information on actual dates of meetings in three industries: switchgear, transformers, and turbine generators]. The use of individual transaction data for some of the other variables, instead of annual aggregates, would probably also be needed. Early on, we decided that the resulting increased cost to the FTC and probable increased burden to individual companies outweighed any likely improvements that the use of such data would make in the study. Differences in conspiracy's effectiveness may also have existed across industries. Some interesting evidence on this point is presented below.

arrangements, GE instituted a "price protection" policy. Under it, a discount given to any buyer would be applied retroactively to all orders placed in the previous 6 months. GE's customers could assure themselves that all were paying the same price by requesting that the accounting firm of Peat, Marwick, Mitchell, and Company examine the seller's records.

In 1976, the Justice Department filed a memorandum alleging that GE's 1963 policy changes were part of a successful attempt to eliminate turbine-generator price competition [Business Week, January 8, 1972, p. 24 and Bureau of National Affairs, December 14, 1976, p. A-13]. Although Justice found no evidence of actual conspiracy, it interpreted GE initiatives and Westinghouse responses as devices to achieve adherence to the same quoted price via public communication [Plaintiff's Memorandum, U.S. v. GE and Westinghouse 1976, pp. 3-8].

According to Justice, the new pricing arrangements complemented each other in facilitating this aim. GE's new book greatly simplified price calculation for the complex, custom-built product. It also provided information on the size and type of machine that GE would propose in bidding on a given set of specifications. The use of a published percentage multiplier applied to book price facilitated price change computation. Justice saw the retroactive discount ("price protection") policy as a means whereby GE increased the cost to itself of selective deviation from quoted price. Giving customers the right to audit GE

quotations was viewed as a method of eliminating secrecy. Finally, GE published all orders and quotations outstanding at the time of its policy changes and repeated this practice when later price increases were announced. This was seen by Justice as a way to show that quotations were not discounts from the new, higher announced price. In sum, Justice argued, GE sought to assure Westinghouse that it would charge all buyers the same published price for any given machine and to facilitate Westinghouse's calculation and emulation of that price.

From Westinghouse's responses, Justice inferred that an understanding had been reached. Within days of GE's price-policy announcement, Justice alleged, Westinghouse began using its rival's new book. In March 1964, Westinghouse published a new price book that was "similar in many significant respects to GE's" [Plaintiff's Memorandum, U.S. v. GE and Westinghouse 1976, p. 8]. Westinghouse also followed GE's lead by adopting a price-protection policy and publishing outstanding orders and quotations in that same year. Citing internal company documents, Justice interpreted Westinghouse's responses as acceptance of a perceived GE invitation to stabilize prices and as insurance that the rivals' mutual understanding would not be intentionally or accidentally disrupted [Plaintiff's Memorandum, U.S. v. GE and Westinghouse 1976, p. 9].

Based on the Justice Department's allegations, the signaling variable (SIG6470) has a value of one for turbine-generator observations in the years 1964-70. For all other observations, its value is zero. We expect SIG6470 to have a positive coefficient. With such allegedly facilitating practices as price protection and price auditing in place by 1964 and continuing at least through 1970, turbine-generator profitability should be increased, other things equal, during that period.

In sum, over our 1950-70 study period, the turbine-generator market is assumed to be unaffected by either conspiracy or signaling from 1960 to 1963. The other seven product lines are assumed to be collusion-free from 1960 through 1970.

Perhaps the main industry-structure variable included in our model is seller concentration. The relationship of this explanatory variable to profitability has been central to most previous structure-conduct-performance models. In the present analysis, a somewhat unusual concentration measure is considered. CONC2 is the largest two sellers' combined share of annual industry sales. This ratio was chosen over the more traditional four-firm--due, in part, to the small variability of the four-firm ratio across the industries in our sample. Also, it has been asserted that the two-firm ratio is a better summary measure of the ability to raise price [Kwoka 1978, pp. 35-37]. (See, however, Ravenscraft 1980, pp. 69-70.) As to the theory relating these two variables, it is argued that high concentration lowers the cost of reaching price

agreements and policing them against cheating [Scherer 1980, pp. 199-200].[1] To the extent that concentration reflects the ability of firms to act collusively or simply to recognize interdependence, we predict that CONC2 will have a regression coefficient significantly greater than zero.

In his illuminating decomposition of the four-firm concentration ratio, Kwoka [1978] observed a negative relationship between the third-largest seller's market share and industry profitability. He interpreted this result as an indication that the third firm tends to be a price cutter, seeking to enlarge its own market share and profits but causing industry profitability to be lower, other things equal. To express the possible influence of third-firm price cutting in electrical-equipment industries, we include among the explanatory variables in our model, SELLER3, the third leading seller's market share. This variable is defined by industry, by year. The expected sign of its regression coefficient is negative.

A number of other industry-structure characteristics affect the ability of sellers, whether through conspiracy, signaling, or other conduct, to achieve higher prices. In our analysis, we include variables to express the influence of the following such characteristics: excess demand, fixed/variable cost ratios, custom-building, and import competition.

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[1] Investor-owned utilities purchase at least some equipment through secret negotiations, creating the opportunity for such cheating.

Our excess demand measure (GROWDEV) is the deviation in year t of industry sales about an exponential sales growth trend estimated over all available years for the given industry. Industry sales are deflated using the GNP deflator. The resulting excess-demand measure is sensitive to changes in relative prices, which can be affected by industry demand shifts but is uninfluenced by changes in the absolute price level.

GROWDEV implies a particular assumption about electrical-equipment manufacturers' capacity-expansion decisions. Specifically, we assume that electrical-equipment suppliers expand capacity at the exponential sales growth rate estimated for each industry. Under this assumption, positive deviations about trend represent years of excess demand, while negative deviations indicate idle plant and equipment. We expect profit/sales ratios to be positively related to excess demand, as measured by GROWDEV.[1]

Electrical-equipment-product markets are subject to cyclical demand fluctuations. Where production in such markets is characterized by high fixed/variable cost ratios, there may be

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[1] Preliminary discussions with representatives of electrical-equipment manufacturers indicated that a requirement to supply capacity data would pose serious conceptual and practical problems for those companies. Hence, such a requirement was not included in our questionnaire. The exponential-capacity-growth assumption serves as an alternative to these data and is reasonable in the light of the similar long-term growth pattern of electricity demand and the relatively slowly changing technology of electricity generation and distribution. Although backlog or inventory data were requested for each of the eight industries in our sample, an inadequate response precluded the use of these data to measure excess demand.

greater incentive to cut price during periods of weak demand than in markets with low fixed/variable cost ratios [Scherer 1980, pp. 205-12]. This result follows because profits decline more than in industries characterized by low fixed/variable cost ratios. Moreover, the relatively low level of variable costs (in high fixed/variable cost industries) means that price can fall further before exit is induced. Similar effects could result from shifts in the demand for individual sellers' output. According to this view, we would expect profit/sales ratios to be lower in industries in which average fixed/variable cost ratios are high.

From another viewpoint, a positive relationship between fixed/variable cost ratios and profit/sales ratios has been suggested [Telser 1972, p. 199; Marvel 1978, p. 19; and Scherer 1980, p. 209]. Where the fixed/variable cost ratio is high and disruption of collusive understandings causes relatively greater losses, sellers will be particularly careful to avoid such breakdowns, and to the extent that they succeed, profit/sales ratios will be higher.

For each industry, annual ratios of total assets to sales (ASALIND) are used to capture the effect of average fixed/variable cost ratios on profit/sales ratios. Depending on which of the two tendencies described above is stronger, ASALIND's regression coefficient can be either positive or negative.

Some electrical equipment is custom built to individual-buyer specification, with input from manufacturers and engineering

consultants. Other products are standardized and purchased off the shelf by utilities. When a product is built to order, cheating on any collusive price agreement is possible through design modification to provide more or better features at the same price. Standardization, on the other hand, reduces the number of dimensions that collusive agreements must cover and thus the cost of policing cheaters [see Scherer 1980, pp. 201-2]. Given this difference, we predict that custom-built-product industries will have lower product-line profit/sales ratios than those making standardized goods, other things equal. In order to estimate this relationship, we include a variable (CUSTOM) with value one for the steam-condenser, steam-turbine-generator, power-transformer, and power-circuit-breaker industries--the products of which are custom built. CUSTOM takes on the value zero for the industries that make standardized products: insulators, demand and watt-hour meters, distribution transformers, and power capacitors.

A dummy variable (IMPORTS) is included to capture the effect of competition from foreign manufacturers. Based on information from various public sources, we identified a year for each industry in which import sales first appear to become a significant presence in the U.S. market.[1] These judgments are

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[1] The sources consulted are both governmental [U.S. Bureau of the Census, various issues] and industry publications [Electrical World, various issues]. Neither gave sufficiently complete disaggregated data to allow construction of a continuous import variable for our electrical-equipment industries.

necessarily crude, but, in the absence of sufficiently disaggregated import data, the best we could make. We assume that once foreign suppliers enter a market, their potential competition continues to influence profits, even if import sales fall to zero in a subsequent year.[1] On the basis of the available information, and following this assumption, foreign competition was judged to be insignificant in the following four industries throughout the study period: steam condensers, demand and watt-hour meters, distribution transformers, and power capacitors. Evidence of potentially significant import penetration into the U.S. market first appears for power transformers in 1955, for steam turbine generators in 1959, in 1963 for power circuit breakers, and in 1964 for insulators. We expect the coefficient of the IMPORTS variable to be negative. Foreign competition should lower domestic sellers' product-line profitability, others things being equal.

Given industry structure, profitability varies with size of company, in an absolute sense, and with size of operation relative to industry size. COMSIZE (annual company net sales/GNP deflator) expresses the effect of absolute company size on profit/sales ratios for all that company's product lines. This variable

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[1] More basically, we postulate that imports are determined primarily by influences exogenous to our model (for example, international factor-price differences) and that foreign entry reflects a change in these influences. With continuous import data, a more fully developed model would make the imports variable endogenous and, in part, a function of electrical-equipment prices.

corrects primarily for influences other than the ability to raise price in individual electrical equipment markets. For example, previous studies have found that large firms are able to borrow at lower interest rates than smaller ones [Scherer in Goldschmid, Mann, and Weston 1974, pp. 41-42]. To the extent that such advantages exist and are not captured by the market-share variable, we expect COMSIZE to have a positive coefficient.

The variable expressing the effect of seller size relative to a product market is SHARE, the product-line market share by year. In general, a market-share variable is included in structure-conduct-performance models to express large suppliers' cost or price advantages over their small, fringe competitors.[1] Because electrical-equipment products are producer goods sold to relatively well-informed buyers, SHARE probably captures cost advantages and any real advantages in producing high-quality goods that are related to product-line sales, in addition to the possibly greater monopoly power of relatively large sellers. In at least some electrical-equipment markets, it is likely that small producers operate at suboptimal output levels. If large sellers have been able to raise price sufficiently above their own costs to cover these less efficient suppliers' higher costs, then the firms with large market shares will earn relatively high product-line profits, while the fringe producers earn only normal

[1] For a sample drawn from several industries, SHARE captures the average advantage of relative size across those industries.

returns [Weiss in Goldschmid, Mann, and Weston 1974, pp. 226-27]. In addition, it is possible that large sellers, in at least some electrical-equipment markets, make better products [see Abel 1969, p. 62]. Thus, to the extent that such large-seller advantages exist, we expect a positive relationship between SHARE and profit/sales ratios.

As explained by Weiss [in Goldschmid, Mann, and Weston 1974, pp. 198-99], in a structure-conduct-performance analysis, the use of accounting profits/sales as the dependent variable requires the inclusion of a capital/sales ratio as an explanatory variable. In brief, accounting profits contain the returns needed to retain capital in its current use, the cost of capital. Ideally, we would like to subtract these normal returns from accounting profits to obtain a closer approximation to monopoly profits.[1] However, we generally lack the information necessary for this subtraction and are thus forced to use an alternative correction.[2]

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[1] The use of accounting rates of return raises additional problems, because theory calls for a different concept: the economic rate of return. The economic rate of return is the discount rate that equates the present value of the income obtained from a company's investments to the present value of its investment outlays. As Solomon [1970] and Stauffer [1971] have shown, the economic rate of return equals the firm's accounting rate of return only in special cases. Unfortunately, correction for this divergence is at present an only partially solved problem. Moreover, the data requirements for even partial correction (e.g., depreciation rates for the firm's individual investment projects) are well beyond the scope of this study and would impose enormous burdens on the respondent companies.

[2] The finance literature has, to the best of our knowledge, not developed a method of determining the cost of capital at the product line level. See Gordon and Halpern [1974] for an attempt to deal with the problem.

Assuming that the magnitude of these normal returns is a positive linear function of the size of capital itself, we can include the capital/sales ratio on the right-hand side of our regression equation as an explanator of profit/sales.

Because our profit/sales measure (OPSALE) includes interest income, the capital/sales ratio should encompass both debt and equity capital. This variable (ASALPRLN) is thus equal to total assets over net sales, defined by product line by year. The expected relationship between ASALPRLN and OPSALE is positive.

A brief summary of all variable definitions is listed below:[1]

Variable to be Explained

OPSALE	Before-tax operating income divided by net sales, times 100, by product line by year.

Explanatory Variables

CONC2	The combined market share of the two leading sellers by industry by year.
GROWDEV	The deviation of industry sales in year t (deflated by the GNP deflator) about an exponential sales growth trend estimated for that industry.
ASALIND	The asset-to-sales ratio by industry by year.
ASALPRLN	The asset-to-sales ratio by product line by year.

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[1] For more detailed definitions of the financial concepts used here, see the reference list in appendix B.

CUSTOM	A dummy variable equal to 1 if the industry's product is made to order; 0 otherwise.
IMPORTS	A dummy variable equal to 1 for years and industries in which imports appear to have a competitive impact; 0 otherwise.
CON5054	A conspiracy dummy variable equal to 1 in years 1950 to 1954; 0 otherwise.
CON55	A conspiracy dummy variable equal to 1 in 1955; 0 otherwise.
CON5659	A conspiracy dummy variable equal to 1 in years 1956 to 1959; 0 otherwise.
CON5759	A conspiracy dummy variable equal to 1 in years 1957 to 1959; 0 otherwise.
CON5059	A conspiracy dummy variable equal to 1 in years 1950 to 1959; 0 otherwise.
SIG6470	A signaling dummy variable equal to 1 in years 1964 to 1970 for the turbine-generator industry; 0 otherwise.
COMSIZE	Net sales (deflated by the GNP deflator), divided by 10 million, by company by year.
SHARE	Market share, by product line by year.
SELLER3	Market share of the third-largest seller, by industry by year.

THE DATA

Using the information supplied by respondents to our questionnaire (see appendix B) and public information, we were able to develop complete annual observations for 553 product lines during the 1950-70 period. These data points span 21 years for 19 companies in the eight industries named above.[1] Due to the passage of time, company organizational change, and differing data-retention policies across companies, many more observations are available from 1957 on than for the earlier years. For example, between 1950 and 1956, we have an average of 12 product-line observations per year, which were reported by 10 companies in four industries. By contrast, from 1957 on, we have an average of 34 product-line observations per year, provided by the full sample of 19 companies in eight industries.

The changing composition of companies and industries over time in our sample introduces the possibility of bias. For example, if the companies for which we have data starting in 1950 happen to be more efficiently managed, then they will earn higher profits than the companies for which data become available in 1957. Such a difference in profitability would bias the coefficients of our conspiracy variables in the positive direction. In order to correct for this potential bias, we introduce

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[1] If company A entered one of the eight industries by acquiring company B, the product lines involved are treated as belonging to a single company in this tally.

four dummy variables that reflect each product line's initial year of data availability.

These variables are defined as follows:

DATA50 = 1 if product-line data first became available in 1950,
= 0 otherwise;

DATA53 = 1 if product-line data first became available in 1953,
= 0 otherwise;

DATA55 = 1 if product-line data first became available in 1955,
= 0 otherwise;

and DATA56 = 1 if product-line data first became available in 1956,
= 0 otherwise.

Another source of bias is the accounting treatment of antitrust damage payments in the early 1960's. If these payments reduced product-line profitability during that postconspiracy period, they would bias our conspiracy variables' coefficients in the positive direction. Available information on the accounting treatment of these payments by companies in our sample indicates that most subtracted them (net of taxes) from retained earnings.[1]

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[1] This treatment followed the American Institute of Certified Public Accountants' recommendations at that time [Schattke 1965, p. 807].

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As a result of this treatment, income-statement items such as net sales and operating income are unaffected, and no bias is introduced. Other companies, however, substracted damage payments from total company net sales and/or added them to cost of operations.[1] Depending on whether or not these adjustments were allocated to the product-line level, the profitability data for these product lines may be too low and the above-mentioned bias may exist. In order to correct for this potential bias, we deleted the 23 product-line observations that might be so affected from our sample.

Three other product-line observations were deleted to eliminate the impact of entry or exit on our analysis. Upon entering or exiting an industry, a firm's profit/sales ratios are likely to depart from equilibrium levels. Startup costs may reduce entrants' initial returns below those ultimately earned. Exiters may leave a market because of low profits but may earn extraordinary revenues upon shutdown when assets are liquidated. These varying effects appear difficult to model, and numerous observations would be required to estimate their impacts. Among the electrical-equipment sellers included in our study, only seven instances of entry or exit occurred during 1950-70. Moreover, due to missing information, only three of these observations are

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[1] In 1977--over a decade after the payments in question--Financial Accounting Standards Board Standard #16 required any legal damage payments to be shown on the income statement in the year paid [telephone interview with technical standards staff of the American Institute of Certified Public Accountants].

complete. As a result of this paucity of information, we decided to drop these firms' entry and exit years from the data used in our regression analysis. The resulting data set consists of 527 observations from 1950-70 and 446 observations from 1957-70.

ESTIMATION RESULTS

Table III-1 presents ordinary-least-squares (OLS) and generalized-least-squares (GLS) regression results for a structure-conduct-performance model that includes conduct variables.[1] The sample consists of 446 annual product-line observations from the period 1957-70. Most of the independent variables have significant coefficients of the expected sign. The overall explanatory power of the model (which explains more than 30 percent of the total variation in profit/sales ratios) is consistent

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[1] Because structure-conduct-performance models often have heteroskedastic errors, the OLS t-statistics may be misleading. To deal with this potential problem in a simple and inexpensive way, we used a testing and correction procedure described in Maddala [1977, pp. 263-64]. First, application of a likelihood-ratio test to the OLS residuals (divided into 10 groups according to the predicted value of OPSALE) indicated that heteroskedasticity was probably present. Next, dividing the standard deviation of the residuals for each group by the standard deviation for the entire sample, we constructed weights for the data and reestimated the model. This procedure resulted in a substantial reduction in the variation of residual standard deviations across groups. It did not, however, totally eliminate this variation.

Table III-1.--Regression results for the basic structure-conduct-performance model, 1957-70*

Dependent variable = OPSALE

Independent variables	Equation	
	(OLS)	(GLS)
Intercept	-5.00 (-0.83)	-12.09 (-3.04)
GROWDEV	4.72** (6.03)	5.42** (9.26)
CONC2	8.00 (1.07)	13.09** (2.33)
SELLER3	116.02 (7.16)	127.99 (12.51)
COMSIZE	0.45 (1.03)	0.20 (0.81)
SHARE	30.34** (6.47)	32.59** (9.07)
ASALIND	-23.60** (-4.70)	-18.59** (-4.51)
ASALPRLN	-1.03 (-1.29)	-1.96 (-1.67)
IMPORTS	-0.17 (-0.13)	0.47 (0.50)
CUSTOM	-8.50** (-5.36)	-8.74** (-6.47)
CON5759	2.65** (1.91)	2.02** (2.28)
SIG6470	10.64** (3.15)	7.00** (2.69)
$\bar{R}^2$	0.39	0.32
F	27.13	20.45
Observations	446	446

* t-statistics are in parentheses.

** Coefficient has the predicted sign and is significantly different from zero at the 5-percent level or higher.

with the findings of recent structure-conduct-performance studies.[1]

Of primary interest is the impact of conspiracy on profitability. Our results are consistent with the existence of a successful conspiracy during the latter part of the 1950's. Allowing for such other influences on rates of return as excess demand and asset/sales ratios, we observe before-tax profit/sales ratios at least 2 percentage points higher during 1957-59 than otherwise. This result suggests that after antitrust prosecution ended the meetings, electrical-equipment sellers were not able to maintain prices as much above costs by other pricing methods.

With regard to turbine-generator price signaling, our results suggest that this effort also succeeded in raising prices relative to costs. The OLS regression analysis suggests that signaling caused more than a 10-percentage-point increase in turbine-generator profitability, while the GLS results indicate a 7-percentage point rise in profit/sales ratios.

As found in most previous structure-conduct-performance studies using the four-firm concentration ratio, our two-firm ratio is positively related to the rate of return on sales.

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[1] Several goodness-of-fit measures exist for GLS regressions. [See, for example, Judge, Griffiths, Carter, and Lee, 1980, pp. 251-257.] In this study, we use the following measure: first we calculate the F-statistic that tests the hypothesis that all coefficients (except the one of the weight correcting for heteroskedasticity) are equal to zero. Then we calculate the R^2 that corresponds to that F value. The resulting goodness-of-fit measure is bounded by zero and one and gives the percentage of dependent-variable variation explained by the independent variables.

Although not significant in the OLS regression, CONC2's coefficient becomes significant after we correct for heteroskedasticity. This result suggests that even in the highly concentrated markets under consideration and with allowances made for the advantages of large seller size, differences in industry concentration affect the ability of sellers to raise price relative to cost.

Contrary to Kwoka's findings [1978, p. 33], the third-largest firms' shares are positively related to profit/sales ratios. Moreover, this relationship is highly significant in both the OLS and GLS equations. Rather than playing a price-cutting role, the third-largest seller in electrical-equipment markets appears to have assisted its larger rivals in maintaining price above the level to which it would otherwise have gravitated.

Of the four other independent variables hypothesized to affect the ability of sellers to achieve higher prices, three have coefficients that have the expected sign and are significantly different from zero at conventional levels. The excess-demand variable's coefficient is positive, while those of custom-building and the asset/sales ratio are negative.

Profitability is significantly related to excess demand, as measured by deviations about the industry sales trend (GROWDEV). As expected, GROWDEV has a positive coefficient in both equations. In other words, profit/sales ratios are higher in years when industry sales grow faster than their long-term growth rate and lower when sales lie below trend, other things equal.

The ASALIND variable's coefficient is negative and significant in both the OLS and GLS equations. In other words, profitability tends to be lower in product markets with high asset/sales ratios. These results lend some support to the claim that where fixed costs are important in the production process, price agreements are destabilized.

The CUSTOM variable's coefficient is negative and significant in both equations. In other words, as expected, products that are made to order have lower returns than products that are sold from inventory. This result is consistent with the greater difficulty of achieving a stable price agreement in the markets for the former products than in those for the latter.

Market share, too, has a significant, positive relationship to the profit/sales ratio. Thus, firms with large market shares tend to have higher product-line profitability. As suggested above, this finding is consistent with large sellers' cost or price advantages over their smaller rivals, where "large" and "small" are defined in relation to product-market size.[1]

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[1] By contrast, the absolute-company-size variable's coefficient is insignificant. Earlier studies [FTC 1969, and Imel and Helmberger 1971] also found profitability to be related to relative, but not absolute, size. IMPORTS and ASALPRLN also have insignificant coefficients, and in three of four instances, these coefficients have the wrong signs. These results may indicate that our model is misspecified. For example, our model assumes that the normal return to capital is constant across industries and over time and thus ignores risk differences that may exist.

To test the robustness of the conspiracy-profitability relationship in the late 1950's and to examine this relationship during the early part of that decade, we reestimate our model for the full 1950-70 sample. Additional variables (DATA50, DATA53, DATA55, and DATA56) are included to control for a possible bias introduced by the changing composition of our sample over time. The results obtained with the 1957-70 data set are largely reproduced, and some additional insights into the 1950-56 period are obtained.

The results of OLS and GLS regressions for 1950-70 are presented in table III-2. Equation (1) suggests that conspiracy raised electrical-equipment rates of return by over 4 percentage points, considering the 1950-59 period as a whole. If we break the decade into subperiods (as suggested by Sultan), further insights into conspiracy's effectiveness emerge. Between 1950 and 1954, price fixing appears to have raised profit/sales ratios by nearly 7 percentage points. Then during the white-sale year (1955), there was no significant increase in profitability. Still later in the decade (1956-59), meetings were associated with about a 4-percentage-point increase in rates of return on sales. At this point it is interesting to recall Sultan's assertion that more frequent and better organized meetings occurred after the white sale than before. Although (as we saw above) this assertion may or may not be correct, we find no evidence that the

Table III-2.--Regression results for the basic model, with bias correction, 1950-70*

Dependent variable: OPSALE

Independent variables	Equation (1) (OLS)	(1) (GLS)	(2) (OLS)	(2) (GLS)
Intercept	14.26 (1.98)	12.25 (1.78)	14.90 (2.07)	13.00 (1.89)
GROWDEV	4.98** (5.91)	4.56** (5.67)	4.92** (5.83)	4.47** (5.56)
CONC2	-15.91 (-2.06)	-10.83 (-1.50)	-16.56 (-2.18)	-11.88 (-1.64)
SELLER3	22.50 (1.09)	15.93 (0.80)	20.36 (0.99)	13.53 (0.68)
COMSIZE	-0.01 (-0.03)	-0.02 (-0.05)	0.02 (0.05)	0.02 (0.06)
SHARE	28.31** (6.10)	26.60** (6.11)	28.09** (6.06)	26.30** (6.06)
ASALIND	-14.22** (-3.98)	-12.44** (-3.79)	-13.76** (-3.84)	-11.96** (-3.64)
ASALPRLN	-1.29 (-1.65)	-1.58 (-1.96)	-1.26 (-1.62)	-1.55 (-1.91)
IMPORTS	0.10 (0.07)	0.66 (0.49)	0.35 (0.25)	1.00 (0.74)
CUSTOM	-3.87** (-2.42)	-3.81** (-2.52)	-3.95** (-2.47)	-3.92** (-2.60)
CON5054			6.77** (3.45)	6.71** (3.72)
CON55			2.78 (0.88)	2.84 (0.98)
CON5659			3.98** (2.89)	3.66** (2.77)
CON5059	4.46** (3.41)	4.23** (3.35)		

Table III-2.--Regression results for the basic model, with bias correction, 1950-70*--Continued

Dependent variable: OPSALE

Independent variables	Equation (1)		Equation (2)	
	(OLS)	(GLS)	(OLS)	(GLS)
SIG6470	3.05 (0.92)	0.41 (0.13)	3.03 (0.91)	0.41 (0.13)
DATA50	4.46** (3.64)	3.77** (3.23)	4.02** (3.15)	3.15** (2.58)
DATA53	14.74** (4.77)	13.94** (4.80)	14.75** (4.78)	13.84** (4.77)
DATA55	12.26** (3.19)	11.22** (3.03)	12.54** (3.26)	11.48** (3.11)
DATA56	1.18 (0.34)	-0.59 (-0.17)	1.23 (0.35)	-0.54 (-0.16)
$\overline{R}^2$	0.39	0.26	0.39	0.26
F	23.17	13.26	20.64	11.78
Observations	527	527	527	527

* t-statistics are in parentheses.

** Coefficient has the predicted sign and is significantly different from zero at the 5-percent level or higher.

post-white-sale meetings increased profitability more than the presale sessions. On the contrary: the coefficient of CON5054 is larger than that of CON5659.

The remaining results are generally consistent with those of the model estimated for 1957-70. Profitability varies positively with excess demand, market share, and the third sellers' share, and negatively with the ratio of fixed to variable costs and custom-building. Two differences from the earlier results are notable, however. The concentration variable's coefficient has a negative sign, and that of the price-signaling variable is not significantly different from zero.

In sum, the results with our basic model suggest that price-fixing meetings succeeded in raising average product-line profitability in eight electrical-equipment industries during the 1950's, with the possible exception of the white-sale year (1955). In chapter IV, we will extend our basic model in several ways, both to test the robustness of our basic model's results and to derive further insights into the impact of collusion and into some other important industrial-organization issues.

Chapter IV

SOME EXTENSIONS OF THE BASIC MODEL

In chapter III, our basic model contains several simplifying assumptions. As a result, we consider only the average effect of conspiracy on profitability and thus rule out any variation in impact across industries or companies. In this chapter, we relax some of these assumptions. We examine the impact of conspiracy on seller's rates of return individually in each of our eight electrical-equipment industries. We explore the question of whether firms that participated in the meetings had larger or smaller increases in profitability than those that did not participate. Grouping companies according to common business strategies, we consider whether structure-profitability and conspiracy-profitability relationships differ across these groups.[1]

To carry out these tests, we define the following new variables (all other variables are defined in chapter III):

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[1] In chapter III we also assume that the relationship between industry structure and profit/sales ratios is unaffected by the presence of conspiracy. For example, the concentration-profitability relationship is assumed not to change when sellers are meeting to set prices. In chapter IV, we test whether structure-profitability relationships change when sellers engage in price fixing.

INSULCON	A conspiracy dummy variable equal to 1 for insulators in years 1957 to 1959; 0 otherwise.
CDSRCON	A conspiracy dummy variable equal to 1 for steam condensers in years 1957 to 1959; 0 otherwise.
TURBNCON	A conspiracy dummy variable equal to 1 for steam turbine generators in years 1957 to 1959; 0 otherwise.
METERCON	A conspiracy dummy variable equal to 1 for demand and watt-hour meters in years 1957 to 1959; 0 otherwise.
DISTCON	A conspiracy dummy variable equal to 1 for distribution transformers in years 1957 to 1959; 0 otherwise.
PTRANCON	A conspiracy dummy variable equal to 1 for power transformers in years 1957 to 1959; 0 otherwise.
BREAKCON	A conspiracy dummy variable equal to 1 for circuit breakers in years 1957 to 1959; 0 otherwise
CAPCON	A conspiracy dummy variable equal to 1 for power capacitors in years 1957 to 1959; 0 otherwise.

PART5759	A conspiracy dummy variable equal to 1 for participants in an electrical-equipment conspiracy in 1957 to 1959; 0 otherwise.
NON5759	A conspiracy dummy variable equal to 1 for nonparticipants in an electrical-equipment conspiracy in 1957 to 1959; 0 otherwise.
PART6470	A signaling dummy variable equal to 1 for participants in turbine-generator price signaling in 1964 to 1970; 0 otherwise.
NON6470	A signaling dummy variable equal to 1 for nonparticipants in turbine-generator price signaling in 1964 to 1970; 0 otherwise.
LEADCO	A dummy variable equal to 1 for leading sellers; 0 otherwise.
NONLEAD	A dummy variable equal to 1 for nonleading sellers; 0 otherwise.[1]

[1] The distinction between leading and nonleading sellers is discussed below.

DID THE CONSPIRACY VARY IN ORGANIZATION AND EFFECTIVENESS ACROSS INDUSTRIES?

While we have little specific evidence concerning the organization of conspiracies in our eight electrical-equipment industries, we do have a good idea of the number of participants in each. As shown in table IV-1, the number of sellers named in indictments varies from three in the meter industry to nine in the insulator industry. Such variation may be associated with differences in the organization of price fixing across our industries, a relationship that is suggested by the findings of Comanor and Schankerman [1976]. Those authors observed that in sealed-bid markets,[1] the collusive pricing scheme varies with the number of conspirators. In industries with relatively many firms (the authors used nine sellers as their breakpoint), conspirators tend to set identical prices without attempting to allocate market shares. By contrast, in industries with few sellers, conspirators are more likely to allocate market shares by rotating low bid status and charging different prices. Given the existence of at least this interindustry difference in conspiracy organization, it is of interest to test whether the effectiveness of conspiracy also varies across industries. To carry out this test, we define eight conspiracy variables, one for each of the eight industries in our sample. A priori, we expect that the coefficient of each will be positive.

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[1] The Government-utility portion of electrical-equipment markets uses sealed bidding.

Table IV-1.--Participants in electrical-equipment conspiracies

Industry	Company
Insulators	A. B. Chance
	General Electric
	H. K. Porter
	Lapp
	I-T-E
	Victor
	Porcelain Insulator
	McGraw-Edison
	Ohio Brass
Condensers	Allis-Chalmers
	Carrier
	Elliott
	Foster Wheeler
	C. H. Wheeler
	Ingersoll-Rand
	Worthington
	Westinghouse
Turbine generators	Allis-Chalmers
	Carrier
	Elliott
	General Electric
	Worthington
	DeLaval
	Westinghouse
Meters	General Electric
	Sangamo
	Westinghouse
Distribution transformers	Allis-Chalmers
	Moloney
	General Electric
	Kuhlman
	McGraw-Edison
	Wagner
	Westinghouse

Table IV-1.--Participants in electrical equipment conspiracies (continued)

Industry	Company
Power transformers	Allis-Chalmers
	Moloney
	General Electric
	McGraw-Edison
	Wagner
	Westinghouse
Circuit breakers	Allis-Chalmers
	General Electric
	I-T-E
	Federal Pacific
	Westinghouse
Capacitors	General Electric
	McGraw-Edison
	Ohio Brass
	Sangamo
	Cornell-Dubilier
	Westinghouse

Sources: Herling [1962], Indictments, and U.S. Senate [1961].

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Table IV-2 presents the results of OLS and GLS regressions for a model with industry-specific conspiracy variables. The results for the industry-structure and market-share variables are essentially the same as those obtained with the basic models. Profitability is positively related to demand growth, two-firm concentration, third seller's share, and own-market share, and negatively related to the asset/sales ratio and custom building. With the extended model, however, there emerge some interesting interindustry differences in the effectiveness of price fixing. It appears, from these results, that only the insulator and circuit-breaker meetings succeeded in raising profit/sales ratios above their levels, absent conspiracy. With the exception of the turbine-generator conspiracy, all others have positive coefficients (the expected sign), but none is significantly different from zero at conventional levels.[1]

DO NONPARTICIPANTS GAIN MORE FROM CONSPIRACY THAN PARTICIPANTS?

Although the electrical-equipment conspiracies included a majority of sellers in most industries, there remained some

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[1] The TURBNCON variable coefficient's sign is the opposite of that predicted by theory, and may reflect an error in model specification.

Table IV-2.--Regression results for an industry-specific conspiracy model, 1957-70*

Dependent variable: OPSALE

Independent variables

	Equation	
	(OLS)	(GLS)
Intercept	-6.02 (-0.86)	-17.39 (-3.62)
GROWDEV	5.00** (5.32)	6.21** (8.53)
CONC2	9.75 (1.13)	22.44** (3.33)
SELLER3	114.46 (6.42)	136.67 (12.06)
COMSIZE	0.05 (1.05)	0.02 (0.61)
SHARE	30.31** (6.42)	34.24** (9.66)
ASALIND	-23.24** (-4.00)	-21.70** (-4.68)
ASALPRLN	-1.03 (-1.27)	-1.99 (-1.69)
IMPORTS	0.06 (0.05)	0.26 (0.26)
CUSTOM	-9.23** (-5.01)	-9.83** (-6.02)
SIG6470	9.83** (2.69)	4.73 (1.62)
INSULCON	3.08 (1.24)	3.78** (2.54)
CDSRCON	3.31 (0.67)	.70 (0.16)

Table IV-2.--Regression results for an industry-specific conspiracy model, 1957-70*--(continued)

Dependent variable: OPSALE

Independent variables

	Equation	
	(OLS)	(GLS)
TURBNCON	0.56 (0.13)	-4.39 (-1.72)
METERCON	4.57 (0.88)	0.28 (0.11)
DISTCON	1.21 (0.43)	0.10 (0.06)
PTRANCON	2.59 (0.77)	2.44 (1.13)
BREAKCON	8.62** (1.86)	10.49** (3.45)
CAPCON	1.22 (0.29)	2.28 (0.54)
$\bar{R}^2$	0.39	0.32
F	16.56	12.58
Observations	446	446

* t-statistics are in parentheses.

** Coefficient has the predicted sign and is significantly different from zero at the 5-percent level or higher.

companies that did not take part in the meetings. If these nonparticipants were more prone to undercut the collusive prices set at these meetings, then we might expect these firms to gain relatively more from the conspiracy than the participants did. By this undercutting (and if the conspirators adhered to the collusive price) the nonparticipants could gain market share (perhaps lowering unit costs) and increase profitability more than the participants did (who might suffer a cost increase due to their lost collective market share). To test for differences in the impact of conspiracy on participants and nonparticipants, we estimate a model with different conspiracy variables for each group of firms.

The results of estimating our participant/nonparticipant model are presented in table IV-3. As with the previous models, profitability is positively related to industry excess demand, two-firm concentration, third seller's market share, and own market share. It is negatively related to industry asset/sales ratios and custom-building. Both participants and nonparticipants earn higher returns during the conspiracy than otherwise. Although the nonparticipant conspiracy variable's coefficient is larger, the difference is not significant. By contrast, the nonparticipant signaling variable's coefficient is significant and larger than that of the participant signaling variable.[1]

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[1] The t-statistic to test the hypotheses of a difference in cofficients is 11.75.

Table IV-3.--Regression results for a participant/nonparticipant model, 1957-70

Dependent variable: OPSALE

Independent variables

	Equation	
	(OLS)	(GLS)
Intercept	-4.52 (-0.74)	-11.32 (-2.78)
GROWDEV	4.69** (5.97)	5.23** (8.70)
CONC2	7.36 (0.98)	13.26** (2.30)
SELLER3	114.83 (7.07)	126.32 (11.98)
COMSIZE	0.45 (1.05)	0.25 (0.94)
SHARE	32.02** (6.59)	32.67** (8.71)
ASALIND	-23.92** (-4.74)	-19.45** (-4.60)
ASALPRLN	-1.02 (-1.27)	-2.43 (-1.99)
IMPORTS	-0.11 (-0.08)	0.14 (0.15)
CUSTOM	-8.48** (-5.28)	-8.26** (-6.12)
PART5759	2.28 (1.49)	2.04** (2.06)

Table IV-3.--Regression results for a participant/nonparticipant model, 1957-70--(continued)

Dependent Variable: OPSALE

Independent variables

	Equation	
	(OLS)	(GLS)
NON5759	3.89 (1.49)	3.40** (1.92)
NON6470	15.12** (3.04)	12.07** (2.05)
PART6470	8.23** (2.13)	6.05** (2.04)
$\overline{R}^2$	0.39	0.32
F	23.08	16.82
Observations	446	446

* t-statistics are in parentheses.

** Coefficient has the predicted sign and is significantly different from zero at the 5-percent level or higher.

STRATEGIC GROUPS

Recent empirical work in industrial organization has focused on the "structure within industries" and analyzed differences in structure-conduct-performance relationships for different firms that are grouped by business strategy. To examine the significance of such groups, we divided firms into leaders and nonleaders for each of our eight industries. The classification was made judgmentally, taking into account such firm characteristics as diversification across markets, fullness of line offered within each market, and general reputation.[1] A dummy variable (LEADCO) is defined to equal one for each leading firm and zero for all other firms, while a second dummy variable (NONLEAD) is defined to equal one for the nonleaders and zero for the leaders. A basic assumption underlying this division is that there are substantial costs associated with movement from one group to another by a change of business strategy. In many industries, the size and diversification requirements of a leader strategy make mobility into that group more difficult than entry as a nonleader [Porter 1978, p. 215]. Also, leader strategy groups are generally more concentrated than nonleading groups. These characteristics tend (other things equal) to raise leader profit/sales ratios above those of nonleaders. On the other hand, opportunities for specialization and the display of individual technological

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[1] Our leading-firm definition takes into account elements of strategy discussed by Porter [1979, p. 215].

virtuosity in nonleader firms may make this group more profitable in some industries [Porter 1979, p. 220]. Using the two strategic-group variables, we attempt to discriminate between these opposing tendencies.

The LEADCO and NONLEAD variables also permit us to examine whether the relationship between other explanators (for example, concentration) and profitability is different for leaders from that for nonleaders. Such analysis is of interest because Porter [1979] has presented some evidence that industry-structure characteristics affect profitability differently in different strategic groups. The notion that entry as a nonleader is generally easier than entry as a leader has clear implications for the signs of several independent variables' coefficients. In particular, explanators that affect the ability to raise price above cost should have a greater absolute impact on leading firms' profit/sales ratios than on those of nonleaders. For example, conspiracy, concentration, and market signaling will tend to raise price above cost for both groups of firms. Easier entry into the nonleader group, however, should moderate the increase in members' profits. As a result, we expect to observe a stronger positive relationship between profitability and these independent variables for leaders than for nonleaders.

As in the nonstrategic-group model, overall company size corrects primarily for influences other than the ability to raise price. For example, if large firms are able to borrow at lower interest rates than small firms, then COMSIZE is expected to be

positively related to profit/sales ratios of both leaders and nonleader firms. A priori, it is not clear whether this relationship is stronger for leading firms or for nonleaders.

The SHARE variable measures the extent to which firms have achieved the advantages of large size in a given industry. Assuming the usual L-shaped cost curve (and that other size-related advantages also display diminishing returns), market-share differences (or changes) have greater effect on profit/sales ratios in the downward-sloping part of the cost curve than in the relatively flat portion. To the extent that nonleader firms are more likely than leaders to be in the downward-sloping region (other things equal), nonleaders' profit/sales ratios will be more responsive to share differences than those of leading firms. Based on this reasoning, the SHARE-profitability relationship should be positive for nonleading firms. This relationship may be weaker for leading sellers and may even be zero if leaders have achieved all significant advantages of size relative to the industry.

Although the third firm may be a price cutter in some industries, our results suggest it is not in electrical-equipment markets. To see whether the positive relationship between SELLER3 and OPSALE (that we observed with our preceding models) is also observable for leading firms and for nonleaders, we include SELLER3 in our leader/nonleader model.

In the case of IMPORTS, we predict that import competition will tend to reduce both leaders and nonleader firms' profit/sales

ratios. The relative strengths of the relationship for the different strategic groups will depend on the strategy choice of the foreign entrants.

Custom-building may make oligopolistic agreements less stable. Thus, we predict that firms' profit/sales ratios will be lower in custom markets than in markets where products are not made to order. Because, other things equal, stable agreements are more likely in the relatively concentrated leader groups, breakdowns may affect leading firm profits more than those of nonleaders.

The greater likelihood of oligopolistic agreements among leaders also implies that the relationship of ASTSALE to profitability will probably be stronger (in an absolute sense) for leaders than for nonleaders. As suggested in chapter II, this relationship may be either positive or negative.

Table IV-4 presents regression results for our leader/nonleader model. Consistent with the findings of our preceding models, profit/sales ratios are positively related to excess demand, two-firm concentration, the third-largest-seller's market share and own market share, for both leaders and nonleaders. With the exception of leading-firm own market share, these variables' coefficients are significantly different from zero at conventional levels. As with previous models, profitability is negatively related to the industry asset/sales ratio and custom-building for both groups of firms. These coefficients are significantly

Table IV-4.--Regression results for a leader/nonleader Model, 1957-70*

Dependent variable: OPSALE

Independent variables

	Equation			
	(OLS)		(GLS)	
	Leader	Nonleader	Leader	Nonleader
Intercept	-1.77 (-0.17)	-1.05 (-0.12)	-4.62 (-0.76)	-10.53 (-1.57)
GROWDEV	5.51** (3.71)	4.03** (4.00)	5.32** (6.22)	3.82** (4.18)
CONC2	21.73 (1.49)	1.64 (0.16)	18.24** (2.07)	17.88** (1.99)
SELLER3	105.39 (3.57)	104.07 (4.18)	105.50 (6.12)	95.61 (4.45)
COMSIZE	-0.38 (-0.57)	1.72 (0.42)	-0.24 (-0.60)	-5.87 (1.72)
SHARE	10.02 (0.60)	28.41 (1.47)	15.01 (1.48)	71.17** (4.39)
ASALIND	-14.80 (-1.33)	-21.48** (-3.23)	-10.98 (-1.54)	-19.94** (-3.04)
ASALPRLN	-12.28 (-1.59)	-0.61 (-0.74)	-11.35 (-2.33)	-1.32 (-1.00)
IMPORTS	-0.75 (-0.34)	-0.07 (-0.04)	-0.64 (-0.50)	1.02 (0.63)
CUSTOM	-6.78** (-2.74)	-9.36** (-4.28)	-5.94** (-3.60)	-10.90** (-4.69)

Table IV-4.--Regression results for a leader/nonleader Model, 1957-70*--(continued)

Dependent variable: OPSALE

Independent variables

	Equation			
	(OLS)		(GLS)	
	Leader	Nonleader	Leader	Nonleader
CON5759	1.67 (0.75)	3.00** (1.63)	1.94 (1.57)	2.27** (1.65)
SIG6470	5.73 (1.16)	16.04** (3.00)	4.76 (1.46)	12.43** (1.97)
$\bar{R}^2$	0.44		0.27	
F	15.41		8.28	
Observations	446		446	

* t-statistics are in parentheses.

** Coefficient has the predicted sign and is significantly different from zero at the 5-percent level or higher.

different from zero at conventional levels, with the exception of the leading-seller ASALIND coefficient.

The relationship between conspiracy and profitability has the expected positive sign for both leaders and nonleaders. Its significance is reduced for both groups, however, and it fails conventional tests for leaders. The behavior of the signaling/profitability relationship is similar.

Of primary interest in the leader/nonleader model are tests for differences between the leading-firm coefficients and those of nonleaders. The only variable that has coefficients of the predicted sign for both groups and a significant difference between group coefficients is SHARE.[1] Thus, while a larger market-share is associated with higher profitability for nonleading firms, market-share differences have no significant impact on leading firms' rates of return. This finding suggests that any advantages of size (e.g., lower costs, better products, and/or greater monopoly power) do not extend beyond the smallest seller in the leader group.

In sum, the results obtained with our extended models have generally been consistent with those of our basic model.[2] Our

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[1] The t-statistic is -2.94 for a test of the hypothesis that the difference between leader and nonleader coefficients is different from zero.

[2] One additional model was estimated, namely, a model that permits the slope coefficients of all industry structure variables and own market share to change when price fixing is present. No significant changes were observed.

extended models have found (as did the basic model) that conspiracy is positively related to profitability. Separate consideration of participants and nonparticipants appears to shed little extra light on the relationship, while looking at strategic groups in isolation weakens it. Examining the impact of conspiracy on an industry-by-industry basis shows that it is significant only in the insulator and circuit-breaker industries. With regard to the relationships of other explanatory variables to profitability, the extended models generally support the basic model's finding that profitability is positively related to concentration, excess demand, third seller's market share, and own-market share, and negatively related to industry asset/sales ratios and custom-building. The separate consideration of strategic groups appears to make a difference only in the case of own-market share, which has a significant relationship for nonleaders but not for leaders.

Chapter V

SUMMARY AND CONCLUSIONS

This study attempts to shed some additional light on three sets of questions that previous analyses have posed. First (and most important), is collusion profitable? Second, does concentration raise price or lower cost? Finally, what can we learn from examining the "structure within industries"? We present new evidence obtained from estimation of structure-conduct-performance models using data on eight electrical-equipment markets for the 1950's and 1960's. In this chapter, we summarize our results and draw conclusions for public policy.

IS COLLUSION PROFITABLE?

By contrast with the findings of some earlier studies, our analysis suggests that collusion raises rates of return. With every model estimated we observe a significant effect on profitability of meetings between electrical-equipment sellers. As shown in table V-1, the size of these impacts varies from an average increase for all eight industries of about 2 percentage points to an increase of about 10.5 percentage points for circuit breakers. In most instances, we also observe significant coefficients for the variable reflecting price signaling in the turbine-generator market.

How should our results be interpreted? Recalling the crude profitability comparisons made in the introductory chapter, what additional insight have we gained from the regressions? What can

Table V-1.--Estimated increase in electrical equipment profit/sales ratios due to collusion (in percentage points)

Model	Type of Collusion	
	Meetings*	Signaling**
Basic	2.02	7.00
Basic with bias correction		0***
(1950-54)	6.71	
(1956-59)	3.66	
(1950-59)	4.23	
Industry-specific conspiracy		0***
Insulators	3.78	
Circuit breakers	10.49	
Other products	0***	
Participant/Nonparticipant		
Participant	2.04	6.05
Nonparticipant	3.40	12.07
Leader/Nonleader		
Leader	0***	0***
Nonleader	2.27	12.43

* Estimates are for meetings between 1957 and 1959, unless otherwise indicated.

** Estimates are for signaling in turbine generators between 1964 and 1970.

*** Not significantly different from zero at conventional levels.

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we say about the level of electrical equipment returns compared to normal profits during the 1950's? or the 1960's?[1]

In chapter I, our crude rate-of-return comparisons suggest that from the 1950's to the 1960's electrical-equipment profitability fell. Our regression results are added evidence that profitability fell after 1959, at least for insulator and circuit-breaker manufacturers. There is also some evidence that profitability rose for turbine-generator makers, starting in 1964.[2]

With respect to normal profits, we can say very little. Lacking a good measure of the cost of capital for product lines, we cannot compare actual electrical-equipment profitability to that level. Thus, supranormal profits may have been earned by insulator and circuit-breaker sellers during the 1950's and by turbine-generator makers during the 1960's. To provide the analytical basis for a test of this hypothesis, a synthesis of financial theory and industrial-organization analysis will be needed.[3]

DOES CONCENTRATION RAISE PRICE OR LOWER COST?

Our results suggest a price-raising effect of industry concentration. In the presence of a market-share variable to reflect

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[1] Normal profits are the minimum sufficient to retain capital in its current use, i.e., the cost of capital.

[2] We also obtained tentative evidence from one of our regressions that profit/sales ratios dropped during the white-sale year (1955).

[3] For an initial effort to achieve this synthesis, see Sullivan [1978].

cost and product-quality advantages of large size (as well as monopoly power, to some extent), both the two-firm concentration ratio and the third-firm share have significant positive coefficients in almost every instance. This finding is the more striking because the markets under examination have two-firm concentration ratios ranging from just under 50 percent to almost 100 percent. In other words, the least concentrated of our electrical-equipment industries are highly concentrated indeed. Nevertheless, variation in concentration appears to reflect monopoly-power variation and makes a difference as far as profitability is concerned.

WHAT DO WE LEARN FROM EXAMINING THE STRUCTURE WITHIN INDUSTRIES?

In our examination of the structure within industries, we observed only one structure-conduct-performance relationship that is different for leader and nonleader firms. As discussed above, the relationship between profitability and market share varies from one strategic group to the other. Our results are consistent with the hypothesis that there are no further cost or price advantages of large size beyond that of the smallest leading firm.

POLICY IMPLICATIONS

The conspiracy involved firms both large and small, and both leader and nonleader; and, as indicated above, our regression results suggest that the meetings raised at least some sellers' profits during the 1950-59 period. The industry's long history of collusion [see Walton and Cleveland 1954, ch. 1] and the existence of a structure perhaps conducive to it suggest that agreements might have continued and been effective in the posttrial 1960's, had the cases not been brought. On the basis of available evidence, the price-fixing prosecutions did stop meetings between competitors [U.S. v. General Electric et al. 1976].

Price signaling may have raised turbine-generator rates of return during the 1964-70 period. This activity appears to have ended in response to a challenge by the Department of Justice. In December 1976, General Electric, Westinghouse, and the Justice Department agreed on modifications of the 1962 turbine-generator consent decree [Bureau of National Affairs, December 14, 1976, p. A-12]. The new decree prohibits public statements of pricing policy intended to signal an invitation to eliminate competition, the price-protection policy (see ch. III), publication of outstanding quotations or information from which a pricing policy could be inferred, and examination by one seller of documents from which a rival's pricing policy could be inferred (Plaintiff's Memorandum, U.S. v. GE and Westinghouse 1976, p. 12). According to a Justice Department official, the new agreement went into effect about spring 1978. Because the present study's results

indicate that the banned pricing arrangements may have succeeded in raising turbine-generator profitability, one task of future research could be evaluation of the modifications' effectiveness in promoting price competition, compared to the original 1962 decree.

Under section 1 of the Sherman Act, price-fixing attempts are illegal per se. The impact of collusive conduct becomes relevant, however, in damage actions brought by buyers under Section 4 of the Clayton Act [Scherer 1980, p. 494]. These cases include a determination of the magnitude of damages to buyers caused by conspiracy's effect on prices.

Several different methods of damage estimation have been used by the courts [Harrison 1980]. Many have employed relatively simple empirical techniques and have ignored the impact of a higher conspiratorial price level on the quantity of the good sold. Harrison [1980, pp. 781-87] has explored the use of multiple-regression analysis to estimate the reduction in buyers' profits due to the purchase of a good subject to price fixing. The regression analysis in our study evaluates conspiracy's impact from the sellers' side of the market. Whether an analysis similar to ours could complement such buyers'-side damage estimations is an interesting subject for future inquiry. Such improved estimates may represent a superior alternative to the relatively simple methods used in the electrical-equipment cases [Bane 1972, chs. IV and V; and Sultan 1974, ch. III].

By contrast with the legal emphasis on damages to buyers, economic analysis generally focuses on inefficient use of society's scarce resources [see Scherer 1980, pp. 459-71]. Conspiracy can lead to several types of inefficiency--for example, (a) deadweight monopoly loss; (b) rent seeking, the use of resources to seek and maintain monopoly power at the sacrifice of goods and services that buyers prefer, given the choice; and (c) the use of excess resources in production, or X-inefficiency.

If the conspiracy succeeds in raising prices and profitability, the gains to the conspirators will in general be less than the loss to buyers by the deadweight monopoly loss. When antitrust puts an end to price-fixing meetings, it restores to society this difference (which the conspirators were unable to capture), in the form of a gain to buyers.

Whether or not price fixing succeeds in raising returns, the resources involved in seeking and maintaining monopoly power--for example, valuable executive time and energy to run the meetings--are misused, from society's point of view. There is no benefit to society from conspiracy to achieve or maintain monopoly power in a particular market [Buchanan, Tollison, and Tullock, 1980]. By ending the conspiracy, antitrust may induce a redirection of these resources to additional efforts that confer real social benefits, such as product improvement and production-cost reduction.

There is some evidence that the weakening of competitive pressures, as during a successful conspiracy, reduces cost-cutting

efforts and leads to X-inefficiency [Leibenstein 1966]. In other words, too many of society's scarce resources (land, labor, and capital) are used to produce the product subject to price fixing.

To the extent that X-inefficiency or rent seeking exists, any relationship between conspiracy and profitability will be weakened. While meetings may reduce competitive pressures and thus raise prices, cost increases may offset the impact on profits wholly or in part.

One can only speculate as to whether X-inefficiency is likely to be more significant in large or small firms. To the extent that cost-control problems increase with enterprise size, however,[1] the conspiracy/profitability relationship may be weaker for large firms than for small ones. This effect could account for our finding that conspiracy raised nonleader firms' profit rates but failed to increase those of leading firms.[2]

Employing structure-conduct-performance models, this study illustrates uses of individual-firm product-line data to evaluate collusion and antitrust remedies. The results suggest that inquiries employing improved models and data might be fruitful in analyzing business conduct and governmental policies in other

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[1] For a discussion of this question, see Scherer 1980, pp. 84-88.

[2] On the other hand, it should be noted that large-company middle managers testified to the extreme pressure to increase profits to which top-level management subjected them during the conspiracy period [U.S. Senate 1961]. This pressure could, however, indicate the magnitude of the cost-control problem that the companies faced.

markets. Clearly, we need to learn more about seller interaction in concentrated markets and its effects upon industry performance. For those who undertake further research of this kind, the study reveals kinds of information that can be obtained from companies and possible uses to which that information might be put. It is hoped that additional analytical efforts will be stimulated by this study and that further research will be carried out to increase our understanding of market processes and of the impact of collusive conduct and antitrust remedies.

REFERENCES

Abel, Derek F. (1969). "Pricing in Oligopoly: An Empirical Analysis of Competition in the Utility Market for Power Capacitors." DBA dissertation, Harvard University.

Alchian, A. A. (1965). "The Basis of Some Recent Advances in the Theory of Management of the Firm." Journal of Industrial Economics, Vol. 14 (November), pp. 30-41.

Asch, P., and J. J. Seneca (1980). "Is Collusion Profitable?" Journal of Reprints for Antitrust Law and Economics: Predatory Conduct and Empirical Studies in Collusion. New York: Federal Legal Publications.

Bain, J. S. (1951). "Relation of Profit Rate to Industry Concentration, American Manufacturing, 1936-1940." Quarterly Journal of Economics, Vol. 65 (August), pp. 293-324.

Bane, Charles A. (1973). The Electric Equipment Conspiracies: The Treble-Damage Actions. New York: Federal Legal Publications.

Becker, G. S. (1968). "Crime and Punishment: An Economic Approach." Journal of Political Economy, Vol. 76 (March/April), pp. 169-217.

Bureau of National Affairs (1976). "GE, Westinghouse Agree to Stimulate Competitive Prices for Turbine Generators," (December 14), pp. A-12--A-14.

Business Week. Various issues.

Buchanan, J. M., R. D. Tollison, and G. Tullock (1980). Toward a Theory of the Rent-Seeking Society. Texas A. & M. University.

Caves, R. E., and M. E. Porter (1977). "From Entry Barriers to Mobility Barriers: Conjectural Decisions and Contrived Deterrence to New Competition," Quarterly Journal of Economics, Vol. 91, pp. 241-61.

Comanor, W. S., and M. A. Shankerman (1976). "Identical Bids and Cartel Behavior." Bell Journal (Spring), pp. 281-86.

Demsetz, Harold (1973). "Industry Structure, Market Rivalry, and Public Policy." Journal of Law and Economics, Vol. 16 (April), pp. 1-10.

Economic Report of the President, 1972.

Electrical World. Various issues.

Federal Trade Commission (1969). Economic Report on the Influence of Market Structure on the Profit Performance of Food Manufacturing Industries. Washington, D.C.: U.S. Government Printing Office.

Gale, B. (1972). "Market Share and Rate of Return." Review of Economics and Statistics, Vol. 54 (November), pp. 412-23.

Goldschmid, Harvey J., H. Michael Mann, and J. Fred Weston (1974). Industrial Concentration: The New Learning. Boston: Little, Brown and Co.

Gordon, Myron J., and P. Halpern (1974). "Cost of Capital for a Division of a Firm." Journal of Finance, Vol. 29 (September), pp. 1153-63.

Hall, M., and L. Weiss (1967). "Firm Size and Profitability." Review of Economics and Statistics, Vol. 49 (August), pp. 319-31.

Harrison, J. L. (1980). "The Lost Profits Measure of Damages in Price-Enhancement Cases." Minnesota Law Review, Vol. 64 (April), pp. 751-88.

Herling, J. (1962). The Great Price Conspiracy. Washington, D.C.: Luce.

Imel, B., and P. Helmberger (1971). "Estimation of Structure-Profits Relationships With Application to the Food Processing Sector." American Economic Review, Vol. 61 (September), pp. 617-27.

Kessel, R. (1971). "A Study of the Effects of Competition in the Tax-Exempt Bond Market." Journal of Political Economy, Vol. 69 (July), pp. 706-38.

Kwoka, J. (1978). Market Share Concentration and Competition in Manufacturing Industries. Washington, D.C.: Federal Trade Commission.

Lean, D. F. (1979). "Structural Change and Product Differentiation in the Heavy-Truck Manufacturing Industry, 1947-71." Industrial Organization Review, Vol. 6 (No. 3), pp. 180-92.

Leibenstein, H. (1966). "Allocative Efficiency vs. X-Efficiency." American Economic Review, Vol. 56 (June), pp. 392-415.

Mann, M. (1966). "Seller Concentration, Barriers to Entry and Rates of Return in 30 Industries, 1950-1960." Review of Economics and Statistics, Vol. 48 (August), pp. 296-307.

Martin, S. (1979). "Advertising, Concentration, and Profitability: The Simultaneity Problem." Bell Journal (Autumn), pp. 639-47.

Marvel, H. P. (1978). "The Locus of Collusion in U.S. Manufacturing." Unpublished paper.

Maddala, G. S. (1977). Econometrics. New York: McGraw-Hill.

Moody's Industrials (1965).

Ohio Valley Electric et al. v. General Electric et al. (1965). 244 F. Supp. 914.

Pagoulatos, E., and R. Sorenson (1981). "A Simultaneous-Equations Analysis of Advertising, Concentration, and Profitability." Southern Economic Journal, Vol. 47 (January), pp. 728-41.

Phillips, A. (1972). "An Econometric Study of Price-Fixing, Market Structure, and Performance in British Industry in the Early 1950's." In Marketing Structure and Corporate Behavior. Edited by K. Cowling. London: Gray Mills.

Porter, M. E. (1979). "The Structure Within Industries and Companies' Performance." Review of Economics and Statistics, Vol. 61 (May), pp. 214-27.

Posner, R. A. (1970). "A Statistical Study of Antitrust Enforcement." Journal of Law and Economics, Vol. 13 (October), pp. 365-419.

Ravenscraft, David (1980). "Price-Raising and Cost-Reducing Effects in Profit-Concentration Studies: A Monte Carlo Simulation Analysis." Ph. D. dissertation, Northwestern University.

Schattke, R. W. (1965). "Financial Reporting of Antitrust Actions." The Accounting Review (October), pp. 805-11.

Scherer, F. M. (1980). Industrial Market Structure and Economic Performance. 2d edition. Chicago: Rand McNally and Co.

Shepherd, W. (1972). "The Elements of Market Structure." Review of Economics and Statistics, Vol. 54 (February), pp. 25-38.

Solomon, E. (1970). "Alternative Rate-of-Return Concepts and Their Implications for Utility Regulation." Bell Journal of Economics and Management Science, Vol. 1, No. 1 (Spring), pp. 65-81.

Stauffer, T. R. (1971). "The Measurement of Corporate Rates of Return: A Generalized Formulation." Bell Journal, Vol. 2 (Autumn), pp. 434-69.

Strickland, A. D., and L. W. Weiss (1976). "Advertising, Concentration, and Price/Cost Margins." Journal of Political Economy, Vol. 84 (October), pp. 1109-21.

Sullivan, Timothy G. (1978). "The Cost of Capital and the Market Power of Firms." Review of Economics and Statistics, Vol. 60 (May), pp. 209-17.

Sultan, R. G. M. (1974 and 1975). Pricing in the Electrical Oligopoly, Vols. I and II. Harvard University.

Telser, L. (1972). Competition, Collusion, and Game Theory. Chicago: Aldine.

U.S. Bureau of the Census. U.S. Imports for Consumption and General Imports. Various issues.

U.S. v. G.E. and Westinghouse (1976). Plaintiff's Memorandum, Civil No. 28228.

U.S. Senate Subcommittee on Antitrust and Monopoly (1961). Administered Prices. Washington: U.S. Government Printing Office.

Walton, C., and F. Cleveland (1964), Corporations on Trial: The Electric Cases. California: Wadsworth Publishing Co.

Weiss, L. W. (1974). "The Concentration-Profit Relationship and Antitrust." In Industrial Concentration: The New Learning. Edited by Harvey J. Goldschmid, H. Michael Mann, and J. Fred Weston. Boston: Little, Brown and Co.

Williamson, O. E. (1964). The Economics of Discretionary Behavior: Managerial Objectives in a Theory of the Firm. Englewood Cliffs, N.J: Prentice-Hall.

APPENDIX A

THE SURVEY AND THE DATA

To obtain data for the electrical equipment study, Bureau staff developed a test questionnaire which was sent to six companies in July 1973. The six were chosen to represent different company size classes and all product lines to be studied. The test was designed to uncover data collection problems and provide information to aid in the redesign of the questionnaire.

While four companies completed the test questionnaire, two others filed legal motions with the Commission to suppress the test. These motions were granted by the Commission in October 1974. Subsequently, Bureau staff was instructed to develop a revised questionnaire. In July 1975, after review by the General Accounting Office and further revisions, a final questionnaire, Form EEM, was sent to 42 companies, not including the four that had completed the pretest form. Of the 42 Form EEM respondents, 31 satisfactorily completed the questionnaire. Ten other companies were eliminated from the study after reporting either that they did not manufacture any of the product lines during 1950-70, or that they no longer maintained records for such manufacturing. One company reported that it was more than 50 percent owned by another respondent company which then supplied data for both.

Four other companies, Emerson Electric, General Electric, Ingersoll-Rand, and Westinghouse Electric, filed motions to quash Form EEM with the Commission. After these motions were denied in October 1975, the companies filed preenforcement suits against the Commission in U.S. District Courts in Missouri, New York, and Ohio during November and December 1975. In January 1976, the Commission filed an enforcement suit in the U.S. District Court for the District of Columbia. The company suits were subsequently transferred to the District of Columbia District Court and were dismissed in favor of the Commission's enforcement action. The companies appealed this dismissal, but their appeal was stayed pending the Dictrict Court's decision in the enforcement proceeding. At the District Court's request, the Commission and the four companies negotiated an agreement under which sufficient data would be provided to permit the EEM Report's completion. The enforcement suit was dismissed in February 1978, and by December 1978 all data needed to carry out the EEM Study were provided.

The EEM Survey was designed to obtain data from companies that manufactured any of the following products during the 1950-70 period: insulators, condensers, large turbine generators, demand and watt-hour meters, distribution transformers, small power transformers, large power transformers, small power circuit breakers, large power circuit breakers, and power capacitors. Companies were selected if any of the following sources listed them as domestic manufacturers:

Association of Edison Illuminating Companies, Design Details of Steam Turbine-Generators, Steam Generators, Surface Condensers, and Boiler Feed Pumps Placed in Commercial Operation, various issues, 1950-70.

Association of Edison Illuminating Companies, Design Details of Steam Turbine-Generators and Associated Steam Generators, Surface Condensers, and Boiler Feed Pumps Ordered by Electric Utilities, various issues, 1950-70.

Electrical World, various issues, 1950-70.

National Electrical Manufacturers Association, Product Statistical Bulletins, 1950-70.

Tennessee Valley Authority, Qualified Bidder Lists, 1972.

The respondent firms that provided data are listed in the left-hand column of table A-1; the right-hand column contains the formerly independent firms for which the respondents also submitted data. These ex-independents are named beside the firms that due to merger or acquisition were able to provide their data. Altogether, there were 35 respondent companies and 32 previously independent firms.

Table A-1

Companies Included in the EEM Study

Respondents	Companies for which Data were provided by the Respondents
Allis-Chalmers Corporation	
Carrier Corporation	Elliott Company
Coleman Cable & Wire Company	The Porcelain Products Company
Colt Industries, Inc.	Central Transformer Corporation
	Moloney Electric Company
	Central Moloney, Inc.
Duncan Electric Company, Inc.	
Emerson Electric Company	A.B. Chance Company
	Cortran Manufacturing Company
Esco Manufacturing Company	
Foster Wheeler Corporation	
Fruehauf Corporation	Maryland Shipbuilding and Drydock Company
General Electric Company	Locke Insulators, Inc.
The Greyhound Corporation	C.H. Wheeler Manufacturing Co.
	Baldwin-Lima-Hamilton Corp.
	Armour and Company
H.K. Porter, Co., Inc.	
Ingersoll-Rand Company	
Interpace Corp.	Lapp Insulator Company
I-T-E Imperial Corporation	Victor Insulators, Inc.
	Bulldog Electric Products Company
	Kelman Electric and Manufacturing Company
	The Chase Shawmut Company
	The Rowan Controller Company
	Electrical Fittings Corporation
Joslyn Mfg. and Supply Co.	Porcelain Insulator Corporation of Lima, New York
Katy Industries, Inc.	Standard Transformer Co.
Knox Porcelain Corporation	
Kuhlman Corporation	
McGraw Edison Company	
Niagara Transformer Corp.	
The Ohio Brass Company	
R.E. Uptegraff Mfg. Company	

Table A-1

Companies Included in the EEM Study
(continued)

Respondents	Companies for which Data were provided by the Respondents
RTE Corporation	
Sangamo Electric Company	
Sierra Transformer Company	
Sola Basic Industries, Inc.	
Spokane Transformer Company	
Sprague Electric Company	
Square D Company	Sorgel Electric Company
Studebaker-Worthington, Inc.	Worthington Corporation
	Turbodyne Corporation
	Wagner Electric Corporation
Transamerica Corporation	De Laval Turbine, Inc.
Tyler Corporation	Southwestern Engineering Company
U.V. Industries, Inc.	Federal Pacific Electric Company
	Cornell-Dubilier Electric Corporation
	Roller-Smith Corporation
	Gardner Electric Mfg. Co.
	Pacific Electric Manufacturing Corporation
Westinghouse Electric Corporation	

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Form EEM sought consistently defined data from the respondent firms for 10 electrical equipment product lines over the 21 year period 1950-70. Data items requested included net sales, operating income, net income after taxes, and total assets for each EEM product line and for the company as a whole and stockholders' equity for the company. The survey form also requested orders, and either backlog or inventory figures for each product line. Backlog data were sought for condensers, large turbine generators, large and small power transformers, and large and small power circuit breakers. Inventory information was requested for insulators, demand and watt-hour meters, distribution transformers, and power capacitors.

After the completed questionnaires were processed, it was determined that usable data were available for eight product lines, with the number of years varying both by firm and by product. On these returned forms, the data items included net sales, operating income, net income after taxes, and total assets for product lines and for companies, and stockholders' equity for companies.

As often occurs in empirical analysis with historical information, the numbers received differed from those requested in several ways. First, accounting practices varied across firms and within firms over time. Second, some firms defined products differently from others, and some firms altered their product classifications over time. Third, some firms' records were missing.

In response to a Form EEM request, firms identified changes in the accounting treatment of taxes, and depreciation and inventory valuation. For example several respondents switched from first in first out (FIFO) to last in first out (LIFO) inventory valuation and some adopted accelerated depreciation. When asked to estimate the impact of these changes, most respondents stated that there was no significant impact on their data. Some claimed that the impact while significant could not be estimated. Consequently, the data were not adjusted for these changes and the direction of any resulting error is unknown.

Product definitions differed in part because various companies maintained records at different levels of aggregation. In addition, different firms organized reporting units around different mixes of products and reorganized over time. Products with similar supply characteristics, but different demand attributes, were built in the same plant, and the record keeping systems combined them. For instance, instrument transformers were sometimes built in the same factory as distribution transformers. Because of these record keeping practices, some distribution transformer data were contaminated by instrument transformers, a product that was not under study.

In some cases, respondents indicated that the extent of such contamination was small. In others, where it was believed to be large, companies were unable to estimate the resulting errors. Consequently, no data adjustments were made.

In the case of two product groups, power transformers and circuit breakers, the difference between the requested and the available levels of aggregation made product line redefinitions necessary to permit further analysis. Separate large and small power transformer data and large and small power circuit breaker numbers were not available for a significant number of firms. By contrast, data on all power transformers and all circuit breakers were generally maintained. Consequently, these product line definitions were modified, and the analysis treated power transformers and power circuit breakers as single markets.

Finally, in the case of several other product lines, individual firm observations for some variables in certain years are missing. For some products and years, so many firms' data were missing that the years were deleted from the samples used to estimate our models, namely, the years 1950-52 for meters and 1950-57 for distribution transformers, power transformers, and power circuit-breakers.

Appendix B

EEM Survey Documents

The following documents were used to collect the Electrical Equipment Manufacturing Industry Study data:

Federal Trade Commission, Resolution Authorizing and Directing the Collection of Economic Reports, July 24, 1973.

Federal Trade Commission, Order to File Special Report, October 7, 1974.

Federal Trade Commission, Bureau of Economics, Washington, D.C. 20580, FTC Form EEM, Economic Report on the Electrical Equipment Manufacturing Industry, January 2, 1975.

Federal Trade Commission, Bureau of Economics, Reference List for Use in Completing the Federal Trade Commission's Report on the Electrical Equipment Manufacturing Industry, January 2, 1975.

Copies of these documents follow.

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Dear Sir/Madam:

The Federal Trade Commission has authorized a study of the heavy electrical equipment industry by the Bureau of Economics staff (see attached Resolution). This study will be carried out by a survey of approximately 50 electrical equipment manufacturers.

The attached Form EEM is designed to obtain data related to various elements of industry and firm performance, including profit performance, market shares, resource allocation, cost conditions, demand conditions, and research and development activities. Such data are sought for 10 electrical equipment product lines for the period 1950-70. As indicated in the attached Resolution and Order, completion of Form EEM is required by law.

The staff of the Bureau of Economics has carefully defined the data requirements of the study. Form EEM has been pretested both to insure clarity and to minimize compliance cost. We are confident that reliable and comparable data will be obtained through the cooperative efforts of your company and our staff. If you have any questions regarding Form EEM or the attached Reference list, please direct written inquiries to Chief, Division of Industry Analysis, Bureau of Economics, Federal Trade Commission, Washington, D.C. 20580. Telephone inquiries may be made to Jonathan Ogur, Economist, at (202) 254-7757 or to Robert Rogers, Economist, at (202) 254-7753.

Sincerely yours,

Director

Enclosures

UNITED STATES OF AMERICA
BEFORE THE FEDERAL TRADE COMMISSION

COMMISSIONERS:

Lewis A. Engman, Chairman
Paul Rand Dixon
Mary Gardiner Jones
David S. Dennison Jr.
Mayo J. Thompson

RESOLUTION AUTHORIZING AND DIRECTING
THE COLLECTION OF ECONOMIC REPORTS

WHEREAS, the Federal Trade Commission is authorized by Section 6 of the Federal Trade Commission Act to gather and compile information concerning, and to investigate from time to time the organization, business, conduct, practices and management of corporations (as specified in the Federal Trade Commission Act) engaged in commerce, and their relation to other corporations and to individuals, associations, and partnerships; and

WHEREAS, the Federal Trade Commission may require that such corporations file annual or special reports, or both, furnishing to the Commission such information as may be needed as to organization, business, conduct, practices, management, and their relation to other corporations, partnerships and individuals; and

WHEREAS, it is deemed necessary in the public interest for the Federal Trade Commission to gather information about corporations engaged in the manufacture, sale and distribution of electrical equipment, including, among other things, information as to the nature of business and relation of such corporations to other corporations, individuals, associations, or partnerships, as to the value of sales, assets, operating income, profit, and other financial items for units of such products produced or sold by such corporations, and as to price policies, terms of sale, patents and licensing agreements relating to such products of such corporations for the purpose of making the reports authorized under Section 6(f) of the Federal Trade Commission Act and aiding in the enforcement and administration of statutes committed to the Commission.

NOW, THEREFORE, IT IS HEREBY RESOLVED that the Federal Trade Commission, in the exercise of the powers vested in it by Section 6 of the Federal Trade Commission Act, and with the aid of any and all powers conferred upon it by law and any and all compulsory processes available to it, do forthwith proceed to investigate and collect information, including information in the form of reports, of the nature and for the purpose hereinabove stated, from such corporations engaged in commerce as may be designated by the Commission pursuant to general or special orders.

By direction of the Commission.

Date: July 24, 1973

Secretary

UNITED STATES OF AMERICA
BEFORE THE FEDERAL TRADE COMMISSION

In reply refer to
Division of Industry
Analysis, Bureau of
Economics

COMMISSIONERS:

Lewis A. Engman, Chairman
Paul Rand Dixon
Mayo J. Thompson
M. Elizabeth Hanford
Stephen Nye

ORDER TO FILE SPECIAL REPORT

To:

The Federal Trade Commission, in the exercise of the powers vested in it by Section 6 of the Federal Trade Commission Act, has adopted and entered of record a resolution (copy attached) authorizing and directing the collection of reports from corporations (as defined in Section 4 of the Federal Trade Commission Act) engaged in commerce as to their business and relation to other corporations, partnerships, proprietorships, and associations.

Pursuant to the powers conferred upon it by law, the Commission hereby requires you to file with it, on or before September 15, 1975, a completed copy of the attached FTC form, "Economic Report on the Electrical Equipment Manufacturing Industry."

The certification must be subscribed and sworn to by an official, partner or owner who has prepared or supervised the preparation of the Special Report. The subject is to state his full name and business address and his official capacity.

You are advised that penalties may be imposed under applicable provisions of Federal Law for failure to file special reports or for the filing of false reports.

Dated at Washington, D.C.

By direction of the Commission

Secretary

Dated: October 7, 1974

Date this report due:_____

THIS REPORT IS REQUIRED BY LAW:
It is mandatory under the authority
of the Federal Trade Commission Act
(15 U.S.C. 46)

FEDERAL TRADE COMMISSION
BUREAU OF ECONOMICS
WASHINGTON, D. C. 20580

FTC Form EEM
(1/2/75)
Approved by G.A.O. B - 180229 (S75028)
Expires 12/31/75

ECONOMIC REPORT ON THE

Electrical Equipment Manufacturing Industry

FTC Company File Identification
Name and address (please correct any errors)

Please complete and return one notarized copy of this report on or before September 15, 1975, to Chief, Division of Industry Analysis, Bureau of Economics, Federal Trade Commission, Washington, D.C. 20580. Telephone inquiries relating to this report may be made to Dr. Jonathan Ogur at (202) 254-7757 or Mr. Robert Rogers at (202) 254-7753. Written inquiries should be addressed to Chief, Division of Industry Analysis.

General Instructions and Definitions:

a. This survey seeks to reconstruct various electrical equipment product lines and their independent participants and to obtain data reflecting various elements of industry and firm performance, including profit performance, market shares, resource allocation, cost conditions, demand conditions, and research and development activities for each year during the period 1950 to 1970.

b. The answer to each question should be completed on these forms or on clearly numbered and identified continuation sheets. Identification should include company name and question number and part. Copies of continuation sheets have been included in the forms package mailed to your company. Additional copies of these forms, if needed for a complete response, may be reproduced by your company or may be obtained by writing to the Federal Trade Commission, Bureau of Economics, Washington, D.C. 20580. Before answering this questionnaire, please read carefully the accompanying "Reference List for Use in Completing the Federal Trade Commission's Report on the Electrical Equipment Manufacturing Industry," which contains instructions, definitions, and product classification information. Thank you for your cooperation.

c. All financial items, such as net sales, operating income, income after taxes, total assets and stockholders' equity should be reported in thousands of dollars.

d. If books and records which provide answers are not available, enter estimates and indicate the sources and bases of your estimates. Estimated data should be followed by the notation "est." If you are unable to answer any question fully, give such information as is available to you and explain why your answer is incomplete.

e. The reporting company for purposes of this report includes the addressee company and any domestic corporations in which it owns, directly or indirectly, a majority of the outstanding voting stock.

f. Please do not leave blank spaces. Enter "N.A." for "not applicable" and " " for "zero."

REPORT ITEMS

1a. Name and address of company. (Type or print exact corporate name, street addres, city, state, and zip code.)

_____

1b. Is the company named in Item 1a more than 50 percent owned by another domestic company?

[ ] Yes. Please list name and address of owning company: _____
Name

_____
Address

(If "Yes," skip to Certification at the end of this form and return within 10 days.)

1c. List the names of domestic companies which manufacture electrical equipment, a majority of whose voting stock is owned directly by the addressee company.

2. Shareholders of record in your company as of March 15, 1973 with a 5 percent or more voting interest. List below shareholders of record, including corporations, pension funds, brokers, foundations, mutual funds, trust departments of banks, or other owners of the voting stock of the reporting company with a 5 percent or more voting interest. Indicate the number of shares of voting stock owned or held by each, and the percent of voting stock held by each as of March 15, 1973 or date of record nearest March 15, 1973. If your company had more than one class of voting stock, combine data for all classes. Date of record: _____ (Month) (Day) (Year)

Name and mailing address of shareholder (a)	No. of shares of voting stock (all classes) owned or held (b)	Percent of voting stock (all classes) (c)

3a. Financial and output data by product: For each year from 1950 to 1970, report consolidated* net sales, operating income, income after taxes, total assets, and stockholders' equity for the reporting company. Report domestic** net sales, operating income, income after taxes, total assets, and number of units sold for each of the following product lines: insulators, condensers, large turbine generators, demand and watt hour meters, distribution transformers, small power transformers, large power transformers, small power circuit breakers, large power cricuit breakers, and power capacitors. Inventories should be reported for insulators, demand and watt hour meters, distribution transformers, and power capacitors. Backlogs should be reported for condensers, large turbine generators, small power transformers, large power transformers, small power circuit breakers, and large power circuit breakers. Total equipment capacity, returns and allowances, labor costs, cost of materials, and other allocable costs should be reported for large turbine generators. See "Reference List" for definitions of product lines and reporting items.

*3b. If consolidated data are not maintained for the reporting company, consolidated data may be submitted on the basis customarily used by the addressee company. In that case, separate data should be submitted for the individual unconsolidated units of the reporting company. Transfers at market price between the consolidated reporting company units and the individual unconsolidated reporting company units should also be submitted.

**3c. If the reporting company does not maintain information which excludes exports, information may be reported including exports. A brief explanatory footnote should be included.

3d. If the reporting company does not maintain information which corresponds to a given definition in the Reference List, this information may be presented in terms of the reporting company's own definition. A brief description of each such difference should be provided.

3e. If the reporting company does not maintain separate information on insulators, condensers, demand and watt hour meters, distribution transformers, small power transformers, large power transformers, small power circuit breakers, large power circuit breakers, or power capacitors, information may be presented following one of the two procedures outlined below. If the reporting company does not maintain separate information on large turbine generators, information should be presented following Procedure II.

Procedure I:

Step 1: Report estimates of the information requested, followed by the notation "est."
Step 2: Describe the sources and bases of these estimates.

Procedure II:

In following procedure II, use continuation sheets to report the value of shipments for product lines according to the following Bureau of the Census 7-digit product codes:

PRODUCT LINE	YEAR			
	1967	1963	1958	1954
Insulators	3264012 3264013 3264014 3264015 3264016 3264017 3264018	Same as 1967	3265011	Same as 1958
Condensers	3443151	same as 1967	same as 1967	not available
Large turbine-generators	3511113 3511119 3511121 3511124 3511135	3511117 3511121 3511124 3511135	3511116 3511118-39	3511235
Demand and Watt-hour Meters	3611110 3611112 3611113 3611114 3611115 3611133 3611141	Same as 1967	3611111 3611115 3611133 3611141	3613111 3613115 3613121 3613131 3613135 3613141
Distribution transformers	3612203 3612207 3612213 3612215	3612206 3612208 3612212 3612214	3612211 3612212 3612214	3615211 3615213 3615215
Small power transformers	3612225 3612227	3612216 3612217	same as 1963	3615216 3615217

PRODUCT LINE	YEAR			
	1967	1963	1958	1954
Large power transformers	3612231	3612221 3612223	3612219	3614219
Large and small power circuit breakers	3613243	same as 1967	3613211 3613241 3613245	3616131 3616141 3616145
Power capacitors	3629111	same as 1967	same as 1967	3619211

Step 1: List all company profit centers which produce any of the above named product lines.
Step 2: List all of the above named product lines covered by each of these centers.
Step 3: List all establishments in these profit centers which produce any of the above named product lines.
Step 4: List all of the above named product lines produced by each of these establishments.
Step 5: Report net sales, operating income, income after taxes, total assets, and backlog or inventory for each of the establishments listed in Step 3. If this information is not maintained, report net sales, operating income, income after taxes, total assets, and backlog or inventory for each profit center listed in Step 1. Report total equipment capacity, number of large turbine generator units sold, returns and allowances, labor costs, cost of matrials, and other allocable costs for establishments producing large turbine generators. If these data are not maintained, report total equipment capacity, number of large turbine generator units sold, returns and allowances, labor costs, cost of materials, and other allocable costs for profit centers producing large turbine generators.
Step 6: Report the value of shipments for each product line, establishment, and profit center listed in Steps 1 - 4, for the years 1954, 1958, 1963, and 1967 and for any other years for which this informaiton is maintained.

3f. The Electrical Equipment Survey seeks to reconstruct various electrical equipment product markets and their independent participants for each year during the period 1950 to 1970. Therefore, if the reporting company acquired an electrical equipment manufacturer during the period 1950 to 1970, data for the acquired company and companies which it or a predecessor in turn acquired should be reported separately for years prior to acquisition. Thus, if a company which later became part of the reporting company was an independent producer of electrical equipment in some year, that company's data for that year should be reported separately. For example, assume that on January 1, 1965, company A acquires company B, itself the product of a merger between companies C and D on January 1, 1960. Company A should report separately the following data:

1) data for itself for all years; 1950 to 1970, including data for company B from 1965 to 1970;
2) data for company B from 1960 to 1964;
3) data for company C from 1950 to 1959; and
4) data for company D from 1950 to 1959.

For a year in which an acquisition or divestiture took place, include data for the acquired or divested companies only for the portion of the year during which those companies were actually owned. Report separate data for the portion of the year prior to acquisition.

3g. If information is not maintained according to consistent accounting and/or depreciation rules, this information may be reported using the company's own accounting and depreciation rules in effect during the year reported. Describe each change in accounting and depreciation rules which, in your judgment, had a significant impact on the figures and estimate the percentage impact.

3h. Data reported should cover calendar years. If your books and records are not maintained by calendar year, you may report estimates or fiscal year data. For example, for 1970, data for fiscal years ending between July 1, 1970 and June 30, 1971 may be used in place of data for calendar year 1970.

3i. If allocation of all or a portion of reporting company costs to product lines would involve considerable expense, or if the basis upon which such allocation should be done is uncertain, report under the heading "unallocated costs" those reporting company costs which have not been allocated to any product line. Report labor costs and cost of materials for each product line and for the reporting company. For each product line, report under the heading "other allocable costs" those reporting company costs other than labor costs and cost of materials that have been allocated on some reasonable basis to that product line.

3j. If allocation of all or a portion of reporting company assets to product lines would involve considerable expense, or if the basis upon which such allocation should be done is uncertain, report under the heading "total unallocated assets" those reporting company assets which have not been allocated to any product line. Report labor costs and cost of materials for each product line and for the reporting company. For each product line, report under the heading "allocable asets," those reporting company assets that have been allocated on some reasonable basis to that product line.

If Procedure II of 3e is being followed, report labor costs, cost of materials, and allocable assets for each establishment listed in Step 3. If this information is not maintained, report labor costs, cost of materials, and allocable assets for each profit center listed in Step 1. Report total unallocated assets for the reporting company.

Name of Company _____

Calendar Year 19__

or

Fiscal Year 19__

month day year to month day year

Reporting Items

Organizational Unit or Product Line	Net Sales	Labor Costs	Cost of Materials	Other Allocable Costs	Unallocated Costs	Operating Income	Income after taxes
Reporting Company				X			
Insulators					X		
Condensers					X		
Large turbine generators					X		
Demand and watt-hour meters					X		
Distribution transformers					X		
Small power transformers					X		
Large power transformers					X		
Small power circuit breakers					X		
Large power circuit breakers					X		
Power Capacitors					X		

Name of Company _____

Calendar Year 19__

or

Fiscal Year 19__

month day year to month day year

Reporting Items

Organizational Unit or Product Line	Total Assets	Total Unallocated Assets	Allocable Assets	Stockholders' Equity	Units Sold	Total Equipment Capacity of Units Sold
Reporting Company			X		X	X
Insulators		X		X		X
Condensers		X		X		X
Large turbine generators		X		X		
Demand and watt-hour meters		X		X		X
Distribution transformers		X		X		X
Small power transformers		X		X		X
Large power transformers		X		X		X
Small power circuit breakers		X		X		X
Large power circuit breakers		X		X		X
Power capacitors		X		X		X

Name of Company _____

Calendar Year 19__

or

Fiscal Year 19__

month day year to month day year

Organizational Unit or Product Line	Reporting Item: Backlog	Inventory	Returns and Allowances
Reporting company	X	X	X
Insulators	X		X
Condensers		X	X
Large turbine generators		X	
Demand and watt-hour meters	X		X
Distribution transformers	X		X
Small power transformers		X	X
Large power transformers		X	X
Small power circuit breakers		X	X
Large power circuit breakers		X	X
Power capacitors	X		X

4. For large turbine-generators and demand and watt-hour meters, submit summaries of quarterly and annual reports and memoranda from divisional, profit center, or product line levels to corporate headquarters or other higher levels, or in lieu thereof, copies of such reports and memoranda, on one or more of the following subjects: 1) the competitive position of the reporting company vis-a-vis those of its rivals in the product line in 1961, 1963, and 1967; 2) the state of demand for the product line in 1961, 1963, and 1967; 3) the cost conditions faced by the reporting company in the production of the product line in 1961, 1963, and 1967; and 4) research and development activities by the reporting company in the product line in 1961, 1963, and 1967.

5. For large turbine-generators, provide information on the costs of a) development; b) retooling; c) setting up; and d) production for the following unit sizes I) 400-750 megawatts; II) 750-1,050 megawatts; and III) greater than 1,050 megawatts.

389-306 O - 82 - 9

CERTIFICATION

This report was prepared under my supervision and is true and correct to the best of my knowledge.

_____ _____
(Signature and title of company official) (Date)

_____
(Typed name of above official)

Subscribed and sworn to before me at the City of _____, State of _____

this _____ day of _____, 19__. _____
(Notary Public)

My commission expires _____

Print or type the name, address, and telephone number of the person to contact regarding this report.

_____ _____
(Name) (Business Telphone Number)

_____
(Business Address)

FEDERAL TRADE COMMISSION
BUREAU OF ECONOMICS
WASHINGTON, D.C. 20580

CONTINUATION SHEET

for

ECONOMIC REPORT ON THE
ELECTRICAL EQUIPMENT MANUFACTURING INDUSTRY

Name of Company _____

Item number and part _____

1/2/75

REFERENCE LIST FOR USE IN COMPLETING THE FEDERAL TRADE COMMISSION'S REPORT ON THE ELECTRICAL EQUIPMENT MANUFACTURING INDUSTRY

Attached is a list of definitions in alphabetical order to assist you in preparing your company's report for the Electrical Equipment Manufacturing Survey. Please read all the definitions before completing the report form and refer to them as they apply to each of the questions.

Telephone inquiries relating to this report may be directed to Dr. Jonathan Ogur (202) 254-7757 or Mr. Robert Rogers at (202) 254-7753. Written inquiries should be directed to Chief, Division of Industry Analysis, Bureau of Economics, Federal Trade Commission, Washington, D.C. 20580.

DEFINITIONS

BACKLOG OF UNFILLED ORDERS

Backlog of unfilled orders is the dollar value of electrical equipment on order but not presently delivered and/or installed in working order as of the first day of your company's fiscal year.

If, however, the use of this definition would involve considerable additional costs, you may use the definition normally employed by your company. If the data reported are based upon a definition different from that shown above, all major differences must be explained in attachments to your reports.

CONDENSERS

For purposes of this report, condensers are defined as steam surface condensers and auxiliaries thereof, as are customarily sold with such devices, including but not limited to, circulating pumps, condensate pumps, and air ejectors.

COST OF MATERIALS

The term, cost of materials, refers to all direct charges actually paid or payable for items consumed or put into production during the year, including freight charges and other direct charges incurred in acquiring these materials. Include the cost of materials and fuel consumed regardless of whether these items were purchased from other companies, transferred from elsewhere in your own company, or withdrawn from inventory during the year.

COSTS OF RETOOLING

Cost of retooling are costs of purchase or lease of new equipment plus costs of installation of that equipment.

COSTS OF SETTING UP

Costs of setting up are costs of testing new equipment plus costs of preparation of that equipment for use in production.

DOMESTIC

Domestic includes the 50 states, the District of Columbia, Guam, and the Virgin Islands but excludes Puerto Rico.

DEMAND AND WATT-HOUR METERS

For purposes of this report, demand and watt-hour meters are defined as alternating current watt-hour meters, combined watt-hour and demand meters, combined watt-hour and time-switch meters, and demand meters sold separately, as well as renewal parts thereof, and such other devices as are used exclusively for the measurements of energy and/or demand. Included are the following products:

1. single-phase watt-hour meters;
2. single-phase mechanical watt-hour demand meters;
3. network watt-hour meters (single sector and two sector);
4. polyphase and network mechanical watt-hour demand meters;
5. all thermal watt-hour demand meters; and
6. separately sold mechanical registers.

Excluded are products included in the product scope of the Meter Mounting and Testing Equipment Group as defined by the National Electrical Manufacturers Association (N.E.M.A.).

DISTRIBUTION TRANSFORMERS

For purposes of this report, distribution transformers are defined as:

1. Single-phase transformers 500 KVA and smaller liquid-immersed (all voltages) and dry-type (601 volts and above) of the following types:

   a. overhead
   b. pad-mounted
   c. sub-surface

2. Three-phase transformers 500 KVA and smaller, liquid-immersed (all voltages) and dry-type (601 volts and above) of the following type:

   a. overhead
   b. pad-mounted
   c. sub-surface

Include repair and renewal parts, spare and accessories including bushings. Exclude the following products:

1. Secondary unit substation transformers, liquid-immersed and dry-type, all KVA's, all high-voltage ratings, low-voltage ratings 600 volts and below.

2. Network transformers, liquid-immersed and dry-type, all ratings, less network protectors.

3. Reactors and special purpose transformers, liquid-immersed and dry-type, single and three phase, all KVA's, all voltages, including: reactors, furnace transformers, rectifier transformers, locomotive transformers gounding transformers, ground fault neutralizers, mobile transformers, mobile unit substations, and integral single circuit unit substations.

4. Transformers for commercial, industrial and institutional applications, dry-type, single- and three-phase, 500 KVA and smaller, 15,001 volts and above.

ELECTRICAL EQUIPMENT

For the purposes of this report, electrical equipment refers to machines and devices used for the generation, transmission, distribution or measurement of electricity. This term includes the products being surveyed in this report: large turbine-generators, large and small power transformers, distribution transformers, condensers, insulators, demand and watt-hour meters, power capacitors, and large and small power circuit-breakers. Other products included under the term electrical equipment are switchgear assemblies, power plant boilers, specialty transformers, and lightning arresters.

ESTABLISHMENT

As establishment is an economic unit, generally at a single physical location, where manufacturing operations are performed. Central administrative office, auxiliary units and sales offices, which primarily wholesale or retail goods manufactured by the same firms, are not separate establishments.

A central administrative office is a unit primarily engaged in management and general administrative functions performed for other units of the same company.

An auxiliary unit is a unit primarily engaged in performing supporting services for other units of the same company rather than for the general public or for other business firms.

INCOME AFTER TAXES

Income after taxes equals operating income, plus non-operating income (dividends, interest, rent, royalties, etc.), minus non-operating expenses (interest, etc.), minus provision for current and deferred domestic income taxes.

INSULATORS

For purposes of this report, insulators are defined to include:

1. guy strain insulators and spools;
2. low voltage one piece pintype insulators and distribution line post insulators 27 KV and below;
3. high voltage pintype and line post insulators;
4. suspension type insulators;
5. switch and bus insulators; and
6. all porcelain only pieces.

INVENTORY

For purpose of this report, inventory is the dollar value of finished goods on hand but not designated for a particular buyer as of the first day of your company's fiscal year.

If, however, the use of this definition would involve considerable additional costs, you may use the definition normally employed by your company. If the data reported are based upon a definition different from that shown above, all major differences must be explained in attachments to your reports.

LABOR COSTS

Labor costs consist of the sum of (1) gross earnings paid to employees (prior to such deductions as employee's Social Security contributions, withholding taxes, group insurance premiums, union dues, and savings bonds) including dismissal pay, paid bonuses, vacation and sick leave pay, and the cash equivalent of compensation paid in kind, but excluding payments to members of Armed Forces and pensioners carried on your payrolls; (2) employer payments for all programs required under Federal or State legislation, such as Federal Old Age and Survivors' Insurance, unemployment compensation, workmen's compensation, and temporary disability payments; (3) employer payments for all other programs, whether initiated by the employer or established as the result of a collective bargaining contract, including insurance premiums on hospital and medical plans, life insurance premiums, and supplementary accident and sickness insurance (less any offsetting dividends, refunds, or other premium deductions), payments or allocations to all pension plans, supplemental unemployment compensation plans, welfare plans, stock purchase plans (where the employer payment is not subject to withholding tax), and deferred profit sharing plans. Exclude expenditures involving payments made directly to retired employees or their survivors which do not pass through a fund, losses on company operated cafeterias or snack bars, costs of in-plant medical services, free parking lots, discounts on employee purchases, uniforms and other work clothing supplied to employees and similar expenditures.

LARGE POWER CIRCUIT BREAKERS

For purposes of this report, large power circuit breakers include the following:

1. Oil Circuit Breakers:

   a. Oil circuit breakers, both indoor and outdoor, including all interrupting ratings and voltage ratings above 230,000 volts for alternating current services.

   b. Attachments for these circuit breakers such as bushing current transformers, bushing potential devices, interlocks, under voltage devices, shunt trips, over-current trips, etc. and auxiliaries sold with the breakers such as closing relays, structural steel supports, etc.

   c. Modernizing* parts for these circuit breakers and attachments.

2. Oilless and Low Oil Content Circuit Breakers:

   a. All oilless and low oil content circuit breakers, both indoor and outdoor, including all interrupting ratings and voltage ratings above 230,000 volts for alternating current services.

   b. Attachments for these circuit breakers such as bushing current transformers, bushing potential devices, interlocks, under voltage devices, shunt trips, over-current trips, etc., and air supply and storage equipment.

   c. Modernizing* parts for these circuit breakers and attachments.

LARGE POWER TRANSFORMERS

For purposes of this report, large power transformers are defined as liquid-immersed and dry-type, self-cooled equivalent

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* Do not include renewal and spare parts.

ratings, 10,001 KVA and larger, single and three-phase, all high- and low-voltage, conventional transformers and auto transformers with and without load tap-changing, primary unit substation transformers, and regulating transformers.

LARGE TURBINE GENERATORS

For the purposes of this report, large turbine-generators are defined as assemblies of a turbine and generator used in the production or generation of electricity on land by use of steam, together with gears, bases, couplings and other such accessories as are customarily sold with such machines as to form part of the unit with the generator having a capacity of over 10,000 kilowatts.

NET SALES

Net sales equals the value (measured f.o.b. plant) of products sold and services rendered (net of returns and allowances). Non-operating income and excise and sales taxes paid to Federal, State, local and other taxing agencies are not included. Intracompany transfers at market price should be included in the net sales of individual product lines, but not in the net sales of the reporting company.

OPERATING INCOME

Operating income equals net sales minus depreciation, depletion, and amortization of property, plant, and equipment, and all other operating costs and expenses (net of purchase discounts), including selling, general and administrative expenses.

OTHER ALLOCABLE COSTS

Costs other than labor costs or cost of materials that have been allocated on some reasonable basis to some product line.

POWER CAPACITORS.

For purposes of this report, power capacitors are defined as all power capacitor units and equipment of one-half KVAR and larger, all voltage ratings, used for power factor improvement and other frequency alternating-current applications, including distribution series capacitor installations.

The following products are excluded from the definition:

1. large direct-current filter capacitors (in power capacitor sizes);
2. large direct-current storage capacitors used for wind tunnels and atomic energy applications;
3. pulse forming network capacitors (both large and small);
4. direct-current electrolytic capacitors; and
5. large high frequency capacitors (either paper dielectric or parallel plate).

SMALL POWER CIRCUIT-BREAKERS

For purposes of this report, small power circuit breakers include the following:

1. Oil Circuit Breakers
    a. Oil circuit breakers, both indoor and outdoor, including all interrupting ratings and voltage ratings above 1,500 and below 230,000 volts for alternative current service.
    b. Attachments for these circuit breakers, such as bushing current transformers, bushing potential devices, interlocks, under voltage devices, shunt trips, over-current trips, etc., and auxiliaries

sold with the breakers such as closing relays, structural steel supports, etc.

c. Modernizing* parts for these circuit breakers and attachments.

2. Oilless and Low Oil Content Circuit Breakers

a. All oilless and low oil content circuit breakers, both indoor and outdoor, including all interrupting rating and voltage ratings above 1,500 and below 230,000 volts and alternating current service.

b. Attachments for these circuit breakers such as bushing current transformers, bushing potential devices, interlocks, under voltage devices, shunt trips, over-current trips, etc., and air supply and shortage equipment.

d. Modernizing* parts for these circuit breakers and attachments.

SMALL POWER TRANSFORMERS

For purposes of this report, small power transformers are defined as:

1. Liquid-immersed, self-cooled equivalent ratings of 501-2,500 KVA, single- or three phase, all high and low voltage, pad-mounted transformers, excluding conventional types.

2. Liquid-immersed, self-cooled equivalent ratings of 501-2,500 KVA, single- and three-phase, all high and low voltages, underground transformers, including conventional subway types.

3. Liquid-immersed and dry-type self-cooled equivalent ratings of 501-10,000 KVA single- and three-phase all high and low voltages of the following types:

a. liquid-immersed conventional transformers and autotransformers, with and without load-tap-changing; primary unit substation transformers and single-circuit unit substations.

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* Do not include renewal and spare parts.

b. dry-type conventional transfomers and autotransformers; coil and coil units.

4. Secondary unit substation transfomers; liquid-immersed and dry-type, sold with secondary switching equipment or sold without secondary switching equipment but with a secondary flange or throat for connection to such equipment; also single-and three-phase, all self-cooled equivalent KVA ratings, all high voltages, low voltages below 1,000 volts.

The following products are excluded from this definition:

1. All ratings of regulating transformers.

2. Network transformers, liquid-immersed and dry-type, all ratings, less network protectors.

3. Transmission and distribution voltage regulators, including induction voltage regulators of all KVA ratings 1,201 volts and above. Step voltage regulators 1,201 through 69,000 volts, single-phase 250 KVA and smaller, three-phase 2,500 KVA and smaller.

4. Reactors and special purpose transformers, liquid-immersed and dry-type, single- and three-phase, all KVA's, all voltages including reactors, furnace transformers, rectifier transformers, locomotive transformers, grounding transformers, ground fault neutralizers, mobile transformers and mobile unit substations.

STOCKHOLDERS' EQUITY

Stockholders' equity equals total assets minus total liabilities.

TOTAL ASSETS

This figure refers to the sum of:

1. cash

2. demand deposits in and outside the United States

3. time deposits in and outside the United States

4. Federal Agency securities

6. commercial and finance company paper (U.S. and foreign)

7. state and local government securities

8. foreign government securities

9. other short-term investments including bankers' acceptances

10. trade receivables from the U.S. Government

11. other trade receivables (less allowances for doubtful receivables)

12. inventories

13. current assets not elsewhere specified

14. depreciable and amortizable fixed assets including construction in progress and land and mineral rights, minus accumulated depreciation, depletion, and amortization.

15. non-current assets not elsewhere specified including investment in non-consolidated entities, other long-term investments, intangibles, etc.

TOTAL EQUIPMENT CAPACITY

Total equipment capacity for large turbine-generators is defined as total capacity in kilowatts of large turbine-generators sold by the reporting company.

VALUE OF SHIPMENTS

Net selling values, f.o.b. plant, of products shipped, after discounts and allowances and excluding freight charges and excise taxes. Include as products shipped not only the products made in the establishment but also those made elsewhere under contract form the materials owned by the establishment. Also, include all products sold, transferred to other parts of the reporting company, or shipped on consignment.

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