AD-A167 124 EFFICIENCY IN THE MARKET SHARE AND PROFITABILITY RELATIONSHIP(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH A S HAGIN DEC 85 AFIT/GOR/OS/85D-8 1/2

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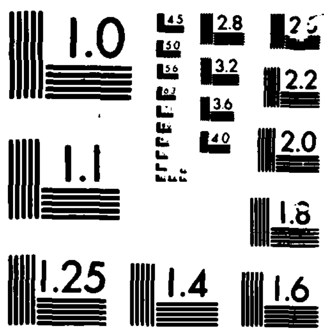

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AFIT/GOR/OS/85D-8

EFFICIENCY IN THE MARKET SHARE AND PROFITABILITY RELATIONSHIP

THESIS

Allan Scott Hagin
Captain, USAF

AFIT/GOR/OS/85D-8

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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GOR/OS/85D-8	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Engineering — 6b. OFFICE SYMBOL (If applicable) AFIT/ENS	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State and ZIP Code) Air Force Institute of Technology Wright-Patterson AFB, Ohio 45433	7b. ADDRESS (City, State and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION — 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State and ZIP Code)	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT NO.
11. TITLE (Include Security Classification) See Box 19	

12. PERSONAL AUTHOR(S)
Allan Scott Hagin, B.A., Capt, USAF

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Yr., Mo., Day)	15. PAGE COUNT
MS Thesis	FROM ____ TO ____	1985 December	159

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB. GR.	
05	03		Economics, Economic Analysis, Economic Models

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Title: EFFICIENCY IN THE MARKET SHARE AND PROFITABILITY RELATIONSHIP

Thesis Chairman: Dr. Robert F. Allen

Approved for public release: IAW AFR 190-1.
LYNN E. WOLAVER 19 Feb 86
Dean for Research and Professional Development
Air Force Institute of Technology (AFC)
Wright-Patterson AFB OH 45433

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Dr. Robert F. Allen	22b. TELEPHONE NUMBER (Include Area Code) (513) 255-3362 — 22c. OFFICE SYMBOL AFIT/ENS

DD FORM 1473, 83 APR — EDITION OF 1 JAN 73 IS OBSOLETE

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SECURITY CLASSIFICATION OF THIS PAGE

Abstract

This thesis determines whether market share serves as an efficiency or price raising measure in its positive relation with profitability for manufacturing firms in the U.S. This thesis also investigates whether or not public firm segment data and industry data available from Standard and Poor's Compustat Services and the Census Bureau, respectively, allow precise market shares to be defined for use in a market share-profitability study. Statistical estimation with linear regression is used to estimate both an additive and an interaction model to test the market share role. Return on assets and return on sales are used as profitability measures. Efficiency measures that market share is compared with include the firm cost to sales ratio, sales to employee ratio, and the industry cost advantage ratio. The impact on the results of using segments with a market share greater than seven percent is tested. Size, growth, and product differentiation measures are used as control variables to test their effect on the market share strength in the profitability relation. C4 is used as a measure of industry price raising ability and the advertising expense to sales ratio is used as a measure of firm price raising ability.

An average of 1977-1979 Compustat data as well as 1977 Census of Manufactures data are used for the analysis. Market share is measured as the Compustat firm segment's average net sales divided by census value of shipment for the industry identified with the segment's business activity. A small sample of such market shares that are tested (computed from Compustat 1984 data) are highly correlated with market shares obtained from the Trinet Establishment Database.

The analysis shows that efficiency does explain part of the positive market share relation to profitability, and efficiency is more significant in the large share portion of the market share distribution. However, the four firm concentration ratio and the advertising expense to sales ratio are more significantly related to market share than the efficiency measures. This indicates that price raising ability may outweigh efficiency as a determinant of market share. Regardless of their relative importance, the analysis shows that market share reflects both price raising and efficiency effects in its relation with profitability.

AFIT/GOR/OS/85D-8

EFFICIENCY IN THE MARKET SHARE AND PROFITABILITY RELATIONSHIP

THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Operations Research

Allan Scott Hagin, B.A.
Captain, USAF

December 1985

Approved for public release; distribution unlimited

Acknowledgements

I wish to thank two people without whom this project would not have been possible. I greatly appreciate the thoughtful suggestions and endless patience of my thesis advisor, Dr. Robert F Allen. I am also deeply indebted to my wife Peggy for her encouragement and unselfish contribution of administrative skills.

A. Scott Hagin

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Abstract

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I. Introduction

An understanding of industrial organization is important in forming sound public policies that address the interaction between buyers and sellers. "Industrial organization" refers to the relationships among market structure, behavior and performance (24:3). For example, knowledge about such market dynamics can help policy makers determine the extent of competition or monopoly in a given market where antitrust measures are being considered to improve competition. Other studies in the industrial organization field

> have a direct and continuing influence on the formulation and implementation of public policies in such areas as the choice between private and public enterprise, the regulation and coordination of transportation systems and public utilities, . . . the stimulation of technological progress through patent grants and subsidies, and the like (20:3).

A basic question industrial organization economists study and answer differently is how market structure affects profitability. "Profitability is the general degree of prosperity of the firm" (24:7) that results from a firm's decisions about price and cost. Market structure refers to a collection of market characteristics such as the number of customers and firms, the concentration of firms, barriers to a new firm entering the market, and firm market share (20:4). Two of the market structure characteristics such profitability studies focus on are market share and market concentration ratio. The market share of a firm is the firm's percentage of total product sales in a specific product market. The market concentration ratio is " the percentage of total industry sales contributed by the largest few firms ranked in order of market shares" (20:56). Empirical profitability studies show that firm profits increase with increases in market share and industry profits increase with increases in the concentration ratio (24:177-181). Unfortunately, the theoretical basis for the relation between profitability (price-cost margin) and concentration allows an interpretation that the increase in profitability can be caused by higher prices, lower costs or both (32:436). Therefore, the studies differ in how they explain this structure-performance statistical relationship. Some economists credit the decreased costs of large firm efficiency as the reason for high profits, large market shares and an industry with high concentration (2:933). Other economists argue that high market shares and high concentration ratios indicate a high level of market power which allows firms to raise prices above costs to increase profits (2:933; 20:284).

Shepherd called this tradeoff between the price raising and cost reducing potential of large firms the "antitrust dilemma" (23:178). The antitrust laws are an attempt to regulate the market to be competitive, so consumers can enjoy lower prices. If, for example, some merger is disallowed in the name of competition, yet the increase size of the new firm would allow lower production costs that could be passed on as lower prices to consumers--there exists a dilemma. Beside helping to solve antitrust problems, the resolution of this difference of interpretation should be of interest to the Department of Defense. The DOD influences the concentration in defense industries by deciding to award contracts to small or large firms (20:142). Evidence on whether or not a leading firm position is predominantly related to cost saving efficiency or price raising actions could provide support for DOD to emphasize business with large or small firms respectively.

Three recent empirical studies using firm level data attempt to clarify the role of market share in the structure-profitability relationship. Two of the studies add to the market power versus efficiency debate by estimating the relative importance of market share, concentration and efficiency on profitability. Gale and Branch (10:103) use market share as an efficiency measure. They show that the statistical relationship of market share to profitability is stronger than the relationship of concentration to profitability. The authors compare market share with relative price, "the ratio of the business' price level compared to those of its . . . competitors" (10:93), and relative cost "the estimated . . . costs of the business as a percectage of the costs of its competitors" (10:96). They conclude that efficiency (as measured by market share) is responsible for the association between market structure and profitability since market share does not relate to relative price and does relate to relative cost. Sturm (12:19,23) attempts to replicate the Gale and Branch study. He uses efficiency measures of market share and the sales to asset ratio in his study. The results from one of his three data sets also support the dominance of market share over concentration in the profitability relationship (24:270-272). In addition, Sturm's results demonstrate that market share is related more to concentration than his alternative efficiency variable. This finding gives weak support to the view that market share is related to market power more than to efficiency, if concentration is an acceptable variable for market power (1).

Shepherd supports the view that only a small part of market share's relation to profitability can be explained by scale economies in his 1983 study that estimates the relative economy of scale (efficiency) and market share impacts on profitability (23:166). He focuses his analysis on large market share firms. His economy of scale measure is a direct estimate of the scale economy cost savings to each firm. Shepherd's average estimate of cost savings is no more than 30% of profits, and when he tests this estimate with market share in a profitability relation the results show "that economies of scale provided little efficiency basis for market shares" (23:196) for the firms in his study.

These three studies do not resolve the question on whether market share serves as a cost savings efficiency variable, a measure of a firms ability to raise prices, or both, in its relation to profitability. The difference of interpretation may remain because the studies use different operational measures of efficiency and different portions of the firm size (market share) distribution (1). One reason the different efficiency measures (market share, sales to asset ratio, and scale economy cost savings) are used is because each author uses firm data that only supports specific measures. Another reason is that the authors are testing slightly different hypotheses in each study. Shepherd concentrates on scale economies while the other studies include any cost savings in their efficiency terms. In addition, the use of data from a different portion of the firm size distribution (Shepherd, Gale and Branch, and Sturm respectively used firms with average market shares of 34%, 20%, and 6%) is driven by the particular data available to the author as well as the hypothesis to be tested. For example, Gale and Branch use a data base comprised of business activity from large corporations (22:108), and Shepherd's hypothesis involves the test of large share firms.

The problem this study addresses is to resolve the different interpretations that exist concerning market share in structure-profitability studies. Is market share serving largely as an efficiency measure or a market power variable? Why do authors reach different conclusions based on their empirical work (1)? The interpretations appear to vary with the section of the firm size distribution selected for study and the operational measures of efficiency variables that are employed. Efficiency means any activities in the firm which reduce its costs of producing its output. Typical cost savings include scale economies and the elimination of excess management. This study of the problem will attempt to show whether or not using alternative efficiency measures and different portions of the firm size distribution can provide statistical evidence of either a price raising or cost reducing role for market share. Another result of this study will be a determination of how useful publicly available firm data is for studying market structure trends in the manufacturing sector of U. S. industrial markets.

One major limitation of this study may, in fact, be the cause of the problem being studied--nonavailability of adequate data. In order to measure the nature of the structure-profitability relationship existing in the market place, detailed information is required about many firms' operating activities in specific markets. Company differences in accounting procedures (20:272-273) and the desire not to release 'intelligence' to competitors both contribute to the lack of specific firm performance and structure data for studies of this type. One economist attributes the lack of needed data to the mutual unwillingness of firms and government agencies to provide information (25:87).

> These agencies collect little or no data on many key facts about market position, financial ties, and performance, and what data they do collect are kept secret, permanently (25:88).

Specific problems that result from inadequate data will be discussed as the data used in this study are applied.

The purpose of this study is reflected in the following research question: How does using different size distributions of firms and operational concepts of efficiency influence the estimated market structure-profitability relationship and its interpretation?

In attempting to answer the research question a two step approach is taken. First, a detailed analysis of the available firm data is conducted. This analysis establishes criteria for data selection and provides the best possible data set for analysis. The second step applies the selected data set with statistical techniques to estimate equations between various firm profitability and market structure variables. The form of the resulting equations are then used as a basis for the answers to the research question.

The remainder of this thesis effort is reported in the following four chapters. Chapter two will review the theoretical basis for structure-performance empirical studies. The chapter also provides a review of the recent empirical studies related to the research question, including the three studies highlighted in this introduction. Chapter three will discuss the methodology. It will describe the additive and interaction models that are applied, the Compustat and census data sources, the operational measures, and explain the analysis to obtain a good data set. Chapter four will display the results of applying the models to the best data set. The results of this data analysis will be used to answer the research question. The final portion of this thesis, chapter five, will summarize the results and offer recommendations for future work with the structure-performance model.

II. Empirical Study Review

This chapter is a review of eight studies on the industrial market structure relationship to profitability, as well as a review of the theoretical basis for empirical studies of the type described. Each study provides a unique perspective on how one might empirically define a relationship between specific elements of structure and profitability in the market. This chapter will identify those unique aspects as well as the common definitions applied in the empirical studies. In addition, to some extent, each study addresses the market share role in the structure-profitability relationship. As indicated in chapter one, some results point to a predominant price raising role for market share while others indicate that market share has a strong efficiency link. This chapter compares the empirical evidence provided in support of each interpretation given for the market share variable.

After initially presenting the eight study objectives, the early sections of the chapter will discuss the models, data, and operational measures applied in each study. The following sections will then review the analysis methodology and the results reported from the empirical work. Finally, the chapter will show how the authors' conclusions are used as a starting point for the analysis in this thesis.

Study Objectives

The variety of objectives supported by these studies reflect the authors' desires to emphasize a specific part of the market structure-profitability relation or to extend the empirical understanding of the relation by using improved data. The first two studies reviewed are examples of the first structure-profitability empirical work done with firm (in contrast to industry) data. Shepherd, in his 1972 study, focused on six characteristics of a firm's market position (market share, leading-firm group, entry barriers, firm size, advertising intensity and growth rate) to determine their "relative importance and interrelations . . . as determinants of profitability" (26:25). Gale, in his study (11:412), also considered several variables in the profitability relation to market structure, but he focused on the market share interaction with concentration, growth, and firm size (13:1Ø1). His intent was to "develop and test a theory of the effect of firm share on profitability under various competitive situations" (11:412).

The objectives in the next three studies were similar to each other. Kwoka (13:1Ø1), Gale and Branch (1Ø:85), and Sturm (29:2) all used the structure-profitability relation to study "the relative explanatory power of concentration, [sic] and market share" (1Ø:85). Kwoka's objective was to show that use of an industry's market share distribution can give empirical results that explain industry performance better than a single concentration ratio (13:101). Gale and Branch sought to demonstrate either that market share and concentration were equally related to profitability or that market share was more strongly related to profitability than concentration (10:85). Sturm's objective was to show whether or not the Gale and Branch results held true for a different data set and for the alternative concentration (market power) measures that Kwoka had studied (29:2).

The last three studies reviewed here include the latest empirical work published on the structure-profitability relation at the firm or line of business level. Shepherd provided a direct measure for the scale economy portion of the market share influence on profitability in his effort to answer the question "how much of the monopoly profits (that is, the extra rate of return) arising from high market shares can be credited to economies of scale?" (23:166). In the next study discussed, Ravenscraft attempted to refine the understanding of market structure elements in the profitability relationship by using the relatively new Federal Trade Commission line of business data source. The purpose of the final study reviewed in this chapter by Clarke, Davies, and Waterson was to empirically test whether market power or efficiency is responsible "for the [within industry] relation between market share and firm-level profitability" (7:435).

Models

All of the models used in the studies that are reviewed here are based on what Waterson calls "the central hypothesis: structure influencing profitability" (32:190). Waterson explains what is meant by "structure influencing profitability" in the context of "a simple model where there are N sellers of a standardised product with a single selling price in a market with no possibility of entry, inputs being purchased at given prices and outputs sold to price-takers" (32:18). He derives the model starting with:

$$\text{Profits}_i = p\, q_i - c(q_i)$$

to maximize profits:

$$d\text{Profits}_i/dq_i = p + q_i\, dp/dq_i - C_i = 0$$

note

$$dp/dq_i = (dp/dQ)(dQ/dq_i) \quad \text{and} \quad dQ = dq_i + dQ_i$$

so

$$dp/dq_i = dp/dQ\,[(dq_i + dQ_i)/dq_i]$$
$$= dp/dQ\,[1 + L_i]$$

then

$$d\text{Profits}_i/dq_i = p - C_i + q_i\, dp/dQ\,[1 + L_i]$$

since $d\text{Profits}_i/dq_i = 0$, $n = (p/Q)(dQ/dp)$, substituting and multiplying through by 1/p and Q/Q gives the model:

$$(p - C_i)/p = S_i\,(1 + L_i)/n \qquad (1)$$

where

p = price

Profits_i = firm i profits

$c(q_i)$ = firm i cost function

C_i = marginal cost of firm i

S_i = market share of firm i

L_i = dQ_i/dq_i

q_i = firm i output

Q_i = industry output without firm i

n = industry price elasticity of demand

Q = total industry output

L_i is called the conjectural variation term or what a firm thinks "about how the others [firms] will react to its output changes" (32:18). In the derivation he assumes profit maximization (32:18-19). Sawyer provides a similar derivation (19:19-20). From this equation, it can be seen how firm profitability (given by $(p - C_i)/p$, the price-cost margin) is determined by structure (S_i and n) "through firm-determined conduct (profit maximization and the belief about [L_i])" (32:19). In other words, "structure affects conduct, which in turn determines ultimate economic performance" (20:268).

The application of this basic structure-conduct-performance model in empirical studies contains several limiting assumptions; four of the assumptions discussed here concern the treatment of market dynamics, conduct and demand elasticity, and the functional form of the model. Sawyer states that "the major limitation is that the structure-performance relationships, based on a short-run static equilibrium approach, can provide at most only a snapshot picture of the forces at work" (19:147). Static empirical models will not allow conclusions concerning changes in the market over time (19:147). In two of the studies reviewed, the static model limitation is investigated by using a "change in market share" variable.

Sawyer emphasizes that the assumed conduct in the derivation of a theoretical model like Eq (1) is profit maximization (19:147). Sawyer cautions that the use of Eq (1) as the basic structure-performance model may be improper if, in fact, the firms in an industry are practicing other than profit maximizing conduct, for example sales revenue maximization or limit pricing (19:148). Sawyer (18:295-302) demonstrates that assuming the behavior of limit pricing by a firm would require a change to the basic theoretical model that should be used in a structure-performance study. He recommends a basic model for study of entry barrier effects on profitability:

$$(p - c)/c = 1/eS$$

where
- p = price
- c = average cost
- $e = (p/q)(dq/dp)$
- S = reciprocal of the minimum efficient scale of production relative to total output

Most empirical studies that have estimated a structure-performance relation do not include a measure for demand elasticity in their empirical models. That practice is clearly contrary to the relation described in the theoretical model, Eq (1). Waterson explains that estimates of elasticities of demand for industrial goods are difficult to obtain. For this reason it is common to leave the variable out of estimating equations. Thereby, economists assume implicitly that elasticity is random across industry (32:191). Sawyer implies that controlling for factors such as "the degree of product differentiation, advertising intensity, consumer or producer goods" (18:297), which are related to changes in the demand elasticity, would be appropriate. The statistical problem that occurs when demand elasticity (or any other variable) is left out of estimated models is a potential for biased estimates (12:169).

The final limiting assumption discussed here is the functional form of the estimated model. The theory does not give a functional form for the empirical structure-performance model (32:190). This is especially true when variables are included to control for different trends in the data, in demand elasticities, as an example. Sawyer feels that any measurable model derived from Eq (1) "is likely to be highly non-linear" because the basic relationship between profitability and demand elasticity is not linear (18:297). The only way to adjust for this limitation is to experiment with different model forms (32:191).

All of the studies reviewed use the following functional relation in a linear form as their basic model:

Profitability = f(market structure elements)

where in all cases the independent variables include some measure of firm size distribution. The remainder of this section will define each of the basic models the authors' use to support their objectives. Important derivatives of the models will also be discussed. The operational measures for key variables will be discussed after the data sources are examined in the next section.

Shepherd's (26:27) basic model is:

$$RR = a + bM + cG + dS + eA + fE + u \qquad (2)$$

where

RR = rate of return
M = market share
G = industry leading-firm group
S = firm size
A = advertising intensity
E = firm growth
a,b,c,d,e,f = coefficients to be estimated
u = error term

He includes firm size and advertising intensity as measures for barriers to entry. He deviates from the basic linear model in two ways. First he adds M squared and log M terms separately to "test for curvilinearity in the role of" market share (26:27). Second, he substitutes a concentration and concentration squared term together for M. Finally, Shepherd steps away from the basic model completely to investigate how changes in M over time relate to profitability:

$$(M_n - M_1) = a + bRR_1 + cM_1 + dS_1 + e(A_n - A_1) + f(RR_n - RR2) + u \qquad (3)$$

where all the variables are defined the same as Eq (2) and the suffixes 1,2 and n refer to the first, second and last year of data, respectively, for the period under study.

Gale (11:415-417) uses the following interaction model as the basis for his analysis:

$$P = b_1 + b_2 D_2 + b_3 D_3 + b_4 D_1 SH + b_5 D_2 SH + b_6 D_3 SH + u \qquad (4)$$

where

P = profitability SH = market share

D_1, D_2, D_3 = binary variables

b_i = coefficients to be estimated

D_1, D_2, and D_3 are used to indicate when the interacting variable under study is a low, medium, or high value. For a given interacting variable, if the estimates show a statistically significant difference between b_4 and b_6, the conclusion would be that there is a significant difference in the market share-profitability relation caused by different levels of the specific interacting variable (11:415). He uses five different interacting variables in turn. They are concentration, industry growth, sales, market share, and a "complex" term. Share is used as an interacting variable with itself to test for curvilinearity in the relationship. The complex variable includes concentration, sales and growth rate in one interaction term. Finally, Gale adds sales, industry growth, leverage, and firm growth as control variables in his basic model to test their effect on the concentration interacting variable.

Kwoka (13:102) relies strictly on the following linear model:

$$PCM = f(FSD, KO, DISP, GROW, CDUM, MID \text{ or } MCDR) \quad (5)$$

where

PCM = industry price cost margin
FSD = firm size distribution
KO = capital to output ratio
DISP = geographical dispersion index
GROW = percent change in growth
CDUM = binary variable for advertising
MID, MCDR = scale economy

The alternative firm size distribution variables that Kwoka includes in his model are the first, second, ... tenth largest market share in the industry (S1, S2, ... S10); the two, three, and four firm concentration ratios (C2, C3, C4); and the Herfindahl index, "defined as the sum of squared market shares in an industry" (13:103). MID and MCDR are used alternately in the model.

Gale and Branch (10:90) started with a simple model:

$$P = k_1 + k_2 MS + k_3 C + u \quad (6)$$

where

P = profitability MS = market share
C = concentration u = error term
k_i = coefficients to be estimated

They next define a market share index (MSI) and a relative quality (Q) variable and use both in relations with relative price (RP) and relative cost (RC):

$$RC \text{ or } RP = k_1 + k_2 Q + k_3 MSI + u \quad (7)$$

They then test the change in market share index (ΔMSI) "the difference between the share index's value during the first two years and the second two years of the four-year period of analysis" (10:101) with the basic profitability relation:

$$P = k_1 + k_2 MSI + k_3 \Delta MSI + u \qquad (8)$$

Sturm's basic model is similar to the Gale and Branch model (Eq 6), with the exception that Sturm adds a firm sales to asset ratio variable (29:17). Sturm also uses Kwoka's alternative firm size distributions (S1, S2, S3, C2, C3) in place of concentration.

Shepherd (23:188) returns to his basic model given in Eq (2) for his 1983 study. He adds a scale economies term. He also uses one additional model to regress minimum efficient scale firms (MES) and cost gradients (C) with net rate of return (RR):

$$RR = k_1 + k_2 MES + k_3 C + u$$

As already mentioned, Ravenscraft's (17:26) basic model contains twenty-three independent variables in a linear relationship with profitability:

$$P = f(23 \text{ variables}) \qquad (9)$$

Eleven of the variables are similar to those discussed in the previous models, but the following twelve are unique to Ravenscraft's model: distance shipped, exports, imports, industry and line of business (LB) capacity utilization, industry and LB diversification, industry and LB vertical integration, buyer and suppliers' concentration ratios, and suppliers' dispersion index. His only modification to the model is the addition of five interaction terms: market share and assets, market share and R & D, market share and advertising, market share and minimum efficient scale, market share and concentration.

Clarke, Davies and Waterson (7:445) include a quadratic market share term in their model:

$$PCM = a + b S + c S^2 + u \qquad (10)$$

where

PCM = firm price cost margin
S = market share
a,b,c = coefficients to be estimated
u = error term

Table I summarizes which of six main structure variables are used as independent variables in the eight studies' basic empirical models. Every model includes a profitability term as the dependent variable and market share as one of the independent variables. Five of the models use growth as a control variable and use some measure of entry barrier.

Data Sources

The objective in selecting data to test hypotheses of the structure-performance model is to find information that accurately describes business activities in specific homogeneous product markets. Data about business activity

Table I

Empirical Model Summary

Study (Eq #)	Market Share	Concentration	Growth	Scale Economies	Size	Advertising Intensity
		Entry Barrier Measures				
Shepherd 1972 (2)	X		X		X	X
Gale (4)	X	(X)	(X)		(X)	
Kwoka (5)	X	X	X	X		(X)
Gale & Branch (6)	X	X				
Sturm (6)	X	X				
Shepherd 1982 (2)	X		X	X	X	X
Ravenscraft (9)	X	X	X	X	X	X
Clarke (10)	X					

Note: The symbol (X) denotes that the particular variable was not regressed in the model directly (ie. it enters as a binary or interaction variable).

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has been gathered and classified in line-of-business, establishment, firm or industry units of analysis. The line-of-business unit describes business activity that occurs in a very specific product category. The line-of-business data reflects the most homogeneous product market.

Establishment, firm and industry product categories each could contain more than one line-of-business product category. Sources for line-of-business data include the Project Impact of Market Strategies (PIMS) data base (22:109) and the Federal Trade Commission's (FTC) Line of Business Survey (17:22).

An establishment is defined as "a single physical location engaged in one of the industry categories of the [standard industrial classification] SIC" (3:X). This is the unit of business activity used by the U.S. Department of Commerce, Bureau of the Census when data is collected for the Census of Manufactures every five years. While establishment data could give a degree of product homogeneity equivalent to the line-of-business data, companies sometimes report different production activities that occur at the same establishment, in the same industry category (3:XII). This causes some contamination of the data. In addition, due to confidentiality laws, the establishment data is not available for analysis, rather, most census data is reported by product and industry categories (3:XXIX). Within the categories, the establishment information is aggregated. There are 452 4-digit SIC industries available in the 1977 census (3:X). So, even though the census establishment data provides homogeneous product market information, the reporting of aggregates restricts its use to industry comparisons.

One private information service has attempted to use

Census data to disagreggate the establishment information in the Census data for computing an estimate of establishment market shares. Control Data Corporation's Trinet Market Share Report Service (formerly EIS-Economic Information Systems, Inc.) uses the Bureau of Census County Business Patterns and its own private survey (13:109) to obtain establishment data, including market share, for analysis.

Data from most firm's (or company's) total business activity will obviously contain information for more than one line-of-business and in more than one industry. Therefore, total firm data should not be used to reflect a homogeneous product market unless it is divided into segments by line-of-business or industry product categories. Several sources used by the studies reviewed in this chapter contain business information about firms that are segmented into product or industry categories to varying degrees: Fortune Plant and Product Directory, Standard and Poor's Compustat, and Dun and Bradstreet's Dun's Market Identifiers.

Table II summarizes the data sets used by each of the eight studies. Note that the Clarke, Davies, and Waterson study uses census data for United Kingdom Industries. In addition to the basic data sets developed from the sources listed in Table II, four of the studies use data subgroups to control for a specific effect or variable. These subgroups together with the unique characteristics of the

Table II

Data Source Summary

	Census Data	Other Data Sources	Year of Coverage
Shepherd[a] 1972	No	Fortune Directories. Company, Industry, and Financial Sources. Fortune Directories.	1960-1969
Gale[b]	Yes	Compustat Dun's Market Identifiers	1963-1967
Kwoka[c]	Yes	EIS	1972
Gale & Branch[d]	No	PIMS	1970-1979
Sturm[e]	Yes	Compustat	1977-1979
Shepherd[f] 1982	Yes	Same as Shepherd 1972	1960-1969
Ravens-craft[g]	Yes	FTC	1975
Clarke[h]	Yes	United Kingdom Census Data	1971-1977

(compiled from 6:27-29[a]; 2:420[b]; 3:109[c]; 1:87[d]; ST:3-4[e]; 5:197-200[f]; 4:22[g]; cdw:445[h])

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basic data sets are outlined next.

Shepherd (26:27-28) starts with a basic data set of 231 manufacturing firms. All but 14 firms are in the Fortune 500 largest and those 14 are in the second 500 largest firms. Shepherd excludes some of the largest 500 firms to form his basic data based on the following factors:

(1) a high degree of internal diversification, (2) a major merger during the period, (3) high

> sales to the military ..., (4) absence from the largest-500 for more than one year of the 1960-1969 period, and (5) major disequilibrium in the firm's primary industry or in its own condition (26:28).

He splits up the basic 231 firms into the five subgroups of consumer goods (113 firms), producer goods (118 firms), old slow growing (50 firms), firms with entry barrier estimates (177), and a group of 210 firms which eliminate 21 "special doubts" (26:28) firms. Slow growing firms are defined as those in the "steel, meatpacking, glass, rubber, oil and copper [industries which had] . . . yearly growth rates below 5 percent since 1958" (26:28).

Gale uses a sample of 106 firms. Firm selection is based on compatibility of industry definitions among the data sources. Additionally, firms are rejected if the "weighted average variables did not represent at least fifty percent of firm's employees" (11:420) and if the employee data available for the firm also includes overseas employees.

Kwoka's (13:109) data base comprises 314 4 digit SIC industries. He uses market share data from Economic Information Systems (EIS). He excludes the 70 "miscellaneous" and "not elsewhere classified" industries from his sample. 67 additional industries are left out because they are not compatible with the EIS defined industries (EIS used an old SIC system).

Gale and Branch (10:87) develop a basic sample that includes four year averages of 1486 lines of business in the period 1970-1979. Their data is from the PIMS program which has "a data base reflecting the business-strategic experiences of about 600 individual businesses operated by 50-plus major corporations" (22:108). Their data subgroups are formed by applying two criteria. The first two subgroups are formed based on product differentiation. Businesses with relative prices within 1% of their competitors' average price are deemed homogeneous (976 lines) and the rest are considered differentiated. The next two subgroups are based on market share ranking. One subgroup is defined as businesses that have market shares ranked one or two in their industry (953 lines) and all other market share ranks are in another data subgroup.

Sturm (29:22-23) uses Compustat to develop a basic data set with 495 firms and two data subsets with 188 and 299 firms respectively. The first subset includes only firms for which he has complete data. The second subset includes only firms which could be corrected for foreign sales. The Compustat data Sturm uses is for the largest segment (based on sales) of each firm in his data sets (29:62).

Shepherd's data for his 1983 study defines 85 industrial firms whose market share is "clearly above 20%" (23:183) during 1960-1969. In selecting the 85 firms he uses discriminants similar to those in his 1972 study.

> Data were drawn from many sources, including monographs, industry reports and data, market

> surveys, form 10k from the firms, antitrust case records, the Fortune Plant and Product Directory, . . . census reports . . . Advertising Age [and], Printers Ink (23:197-200).

He uses two subgroups of data. The first subgroup includes 49 firms which has good measures of scale economies. The second group consists of 53 consumer firms.

Ravenscraft (17:22) uses FTC data that covers 3,186 lines of business for 1975. His sample contains 258 4 digit FTC manufacturing categories and the businesses comprise 47.5% of industry sales in 1975. Additional sources for his data include the 1975 Annual Survey of Manufactures (value of shipment data) and unpublished FTC adjusted census concentration ratios (17:30).

Clarke, Davies, and Waterson (7:445) use data from 104 of the 122 manufacturing industries for which the United Kingdom collects census data (19:33). They do not say why they exclude some industries.

Operational Measures

The purpose of this section is to compare the operational measures each study uses in their analysis. With Ravenscraft's study to contend with it is beyond the scope of this chapter to operationally define every variable used in all eight studies. Instead, this section will define the key variables used in most of the models. The key variables include profitability, market share, concentration, growth, size, advertising, and scale economies.

Profitability measures include return on equity (ROE), price cost margin (PCM), return on investment (ROI), operating income divided by sales, return on sales (ROS) and return on assets (ROA). The use of a profit to revenue ratio like ROS assumes that "marginal cost could be approximated by average cost" (32:191). Profit indices such as ROS and ROA are used instead of the ideal PCM because they are "reasonable approximations" (20:269) to PCM and they are easier to measure with data. Like PCM, such indices tend toward zero as competion increases and increase in size as monopoly profits increase (20:269). Shepherd uses ROE in both of his studies. ROE is computed as after tax net income divided by the sum of book value equity and retained earnings (26:28). Gale computes his ROE as the average of earnings available for "common equity" divided by "common equity" (11:420). Gale and Branch use ROI computed as the ratio of before tax profits to invested capital. Sturm computes ROS and ROA as profit/sales and profit/assets respectively (29:18). Kwoka and Ravenscraft each use the PCM, (value added minus payroll)/value of shipments, for their industry analyses. Ravenscraft adjusts his PCM to make it more compatible with the line of business profits measure he uses, ratio of operating income to sales. Operating income is defined as "sales minus materials, payroll, advertising, other selling expenses, general and administrative expenses . . . and depreciation" (17:22).

Clarke, Davies and Waterson use a PCM for their firm profitability measure (7:445).

Market share appears to be the most difficult variable to measure. Shepherd uses a weighted average market share for the firm in both his studies. He estimates market share in the primary markets for each firm "based on information in the Fortune Plant and Product Directory and a large variety of official, company, industry and financial sources" (26:28-29) and then weights the firm's shares by employment and sales to obtain the weighted average market share. Gale uses a "weighted average employee share . . . in the four-digit industries in which the firm competed" (11:420) for a measure of firm market share. Kwoka uses the EIS estimate for market shares in each of his industries. EIS multiplies individual plant employment estimates by the census bureau value of shipments per employee to obtain plant value of shipments which are compiled to obtain firm shares (13:109). Gale and Branch use the PIMS data to compute market share as the sales (or lease) revenue of the business as a percentage of the participating company's estimate of the industry's sales" (10:89). They also compute a market share index "as the sum of normalized market share and the normalized log of relative market share" (10:94). Use of the share index allows the appropriate treatment of those firms with low absolute share and high relative share; such a firm probably has scale economies relative to its competitors which are captured by the relative share component of the index, yet at the same time the scale economies are modest which is captured by the absolute share component (10:94). They claim their index gives results similar to relative or absolute market share. Sturm computes his market share measure as the ratio of segment net sales to industry value of shipments. His data source, Computstat, identifies the four digit industries each firm operates in and segments the net sales (and other firm data) based on the firm's business activity in each industry. Ravenscraft uses "adjusted LB [line of business] sales divided by an adjusted Census value of shipments" (17:31) for his market share. Clarke, Davies and Waterson appear to use an aggregated market share variable. While they do not define market share, "the data employed were taken from [U.K.] census size class distributions" (7:445).

The almost unanimous measure used for concentration ratio is the census four firm concentration ratio. Shepherd uses a leading-group variable instead of C4 in both of his studies. It is computed for each firm as C4 minus the firm's market share (26:26). Gale uses an adjusted C4 "to correct for local and regional markets and broad and narrow industry definitions" (11:420). He weights the C4 for each firm based on the firm's employee distribution (from a Dun and Bradstreet Data file) in the census 4 digit industries. In addition to C4, Kwoka uses the sum of his 4 largest market share estimates, C2, C3, and the Herfindahl index as alternate concentration ratios. Gale and Branch do not specify their concentration measure. Sturm uses C4 as his main concentration measure and also replaces C4 with C2 and C3 (29:38).

Growth variables are defined by Shepherd and Gale as the percentage change in total revenues over the period of interest. The growth variable controls for the "changes in demand or changes in cost that result in movements along the demand curve" (11:417). It should relate positively to profitability. Gale uses separate industry and firm growth variables and he adjusts his firm growth variable by the growth in industry value of shipments (11:417). Kwoka and Ravenscraft use the percentage change in industry shipments as their growth variables.

Only two size measures are used, assets and sales. Shepherd uses the natural logarithm of assets in both of his studies. Ravenscraft uses line of business (LB) and industry assets directly. Gale uses firm sales "expressed in money capital terms" (11:417) for his relative size interaction variable. Size acts as a possible entry barrier and according to Gale should be a positive influence on profitability (11:415). Shepherd maintains size can also exert a negative influence on profitability due to the possibility of size causing increased average costs (26:26).

Shepherd claims his choice of advertising expenditure to sales revenue ratio for an advertising intensity measure is the convention. Kwoka uses a binary variable (CDUM) to distinguish between consumer goods and producer goods industries. The classification is based on the industry advertising spending to sales ratio. Ravenscraft uses a direct measure of media advertising expenses for his LB and industry variable. These measures are an attempt to control for the effects of product differentiation. Such effects may represent another barrier to entry (26:26).

Only three studies employ scale economies variables. Scale economies decrease costs at both the industry and firm level. They can serve as barriers to entry and should relate positively to the profitability indices. Kwoka uses two measures. His first is the average market share of the largest establishments having 50% of sales in the industry (MID). His second measure (MCDR) uses a combination of MID and the cost disadvantage ratio (CDR). The CDR is the ratio of value added per worker for the smallest establishments having 50% of sales to value added per worker for the largest establishments with 50% of sales. Kwoka sets MCDR equal to MID when CDR < 0.75 and MCDR equal to zero when CDR ≥ 0.75. Ravenscraft uses a measure similar to MID for minimum efficient scale (MES) plant. He uses the "ratio of average plant size to industry size for the top 50% of the plant size distribution" (17:31).

Shepherd attempts a direct estimate of the scale economy cost savings to each firm for his economies of scale measure. He shows that the cost savings attributed to scale economies in a firm should be the difference between the costs at MES output for a given firm and the costs at a competitive output level in the industry. Any cost savings given by a market share greater than the MES output level are assumed not to be attributed to scale economies. Shepherd also assumes the maximum output level that can exist during competition--the competitive output level--will be less than MES and be at a higher point on the average cost curve (23:177-179). He computes his cost savings estimate by using a competitive market share for each firm of 10% (he also uses 6% and 8% for sensitivity), the best estimates for MES plant and firm he can obtain from the literature, and average cost curve gradients from estimates of "added cost at 1/3 of MES" (23:185). He determines the competitive average cost based on the 10% (6% and 8% also) market share output levels and cost gradient estimates. The difference between competitive average cost and actual average cost, multiplied by the output at MES, gives an estimate for the absolute cost savings. He uses this cost savings as a percentage of profits for the scale economies measure.

Methodology and Results

The technique used in each study is statistical estimation of the models' parameters by multiple linear regression. This section will describe the results each author obtains when the models are applied to the data sets. Table III gives a sample estimate of the basic model for each study. Note that a range of values (for their 29 industry estimates) is given for the Clarke, Davies and Waterson study.

Shepherd's main result for his static profitability model, Eq (2) page 16, is that "market share appears to be the primary element, with the group and barriers in secondary roles" (26:31). Market Share has the second largest (growth is largest) coefficient for all regressions on the basic static model. However, it is larger than the growth variable for the subgroup of "50 old industry firms." The group variable is positive and asset size is negative for all data sets except the 118 producer-goods firms. Shepherd states that the negative asset size variable is due to X-inefficiency (26:35). The major result with Shepherd's dynamic model, Eq (3) page 16, is that the profitability coefficient is large and positive. He claims the result is some support for the view that profits rise with increasing market share.

Gale expects to find the following results with his interaction model, Eq (4) page 17: market share would impact profitability more in high concentration industries than in low concentration industries, more in moderate growth industries than in rapid growth industries, more with

Table III

Sample Results of Studies

Study/Model	Estimate of Basic Model
Shepherd[a] (1972) Eq (2) pg 16	$RR = 6.67 + 0.24M + 0.03G - 0.30S + 0.25A$ (4.72) (11.53) (1.56) (1.54) (4.88) $R^2 = 0.504$
Gale[b] Eq (4) pg 17	$P = 0.06 + 0.04D_2 + 0.05D_3 + 0.32D_1SH$ (.03) (.03) (.16) $+ 0.17D_2SH - 0.05D_3SH$ $R^2 = 0.102$ (.09) (.10) Di = level of complex interaction variable
Kwoka[c] Eq (5) pg 18	$PCM = 0.05C4 + 0.08KO - 0.04DISP + 0.05GROW$ (1.76) (4.32) (3.01) (2.80) $+ 0.04CDUM + 0.06MID + 0.21$ (3.68) (2.42) $adjR^2 = 0.168$
Gale and Branch[d] Eq (6) pg 18	$P = 11.5 + 0.499MS - 0.02C$ (9.58) (18.48) (-1.05) $R^2 = 0.199$
Sturm[e] Eq (6) pg 18	$ROA = 0.201MS - 0.083C$ (2.00) (-2.49) $R^2 = 0.08$
Shepherd[f] (1982) Eq (2) pg 16	$ROE = 0.255M + 0.09G - 0.92S + 0.26A + 0.07E$ (6.78) (3.71) (3.73) (1.80) (0.23) + 0.21 Scale Economies (0.68) $R^2 = 0.48$
Ravenscraft[g] Eq (9) pg 19	$P = 0.18Mktshr - 0.02C4 + 0.214MES$ + others (4.90) (-1.34) (1.94) $R^2 = 0.208$
Clarke[h] Eq (10) pg 20	PCM = 0.149 (25.55) to 0.438 (31.22) + 0.28 (1.74) to 6.02 (3.41) S

(compiled from 26:30[a]; 11:416[b]; 13:103[c]; 10:90[d]; 29:31[e]; 23:190[f]; 17:26[g]; 7:446[h])

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relatively large firms than with relatively small firms, and more with firms that had a combination of high concentration, moderate growth and relatively large size (his complex interaction variable) than all other firms (11:415). In all his interaction regressions Gale shows the above stated expectations to hold true. He points out that the growth interaction with the market share impact on profitability is an effect that does not show up in an additive model; as he notes, Shepherd (26) concludes from his additive model that growth has no effect on structural variables (11:421). When Gale adds control variables to the concentration interaction model no surprising results occur.

Kwoka uses alternate firm size distribution variables in his model, Eq (5) page 18, to test their relative strengths. He tests the largest market share for each industry, then he adds the second largest share to his model, then adds the third largest . . . and he continues until he has the ten largest shares as firm size distribution variables in his model. His regression results show statistically significant positive coefficients for only the largest two market shares in all regressions. Starting with the third largest market share, the coefficients for the remaining share terms are negative. When he compares three concentration ratios in his model, the sum of the four largest market shares show a slightly larger coefficient and R^2 than the standard census C4, but the Herfindahl index is slightly larger than the other two. Kwoka's results show the MID scale economies term is more correlated with the firm size distribution variables than MCDR. MID's coefficient is consistently less than MCDR's parameter.

Gale and Branch demonstrate with their basic data set that concentration's relation to profitability is negative and small in comparison to market share when they are both included in the model, Eq (6) page 18. They state these results are "persuasive evidence of the relative importance of market share and concentration" (10:90) The authors apply their relative price model, Eq (7) page 18, to the differentiated products data set to test whether market share, together with a higher quality product, allows firms to charge higher prices (as a source for higher profits). Quality is defined as "the percentage of the business' total sales that comes from products it rates as superior to those of the competition, less the percentage derived from products it rates as inferior" (10:94). Their product quality variable has significantly more explanatory power than their market share index, and its coefficient is eleven times greater which indicates market share only has a weak influence on relative prices (10:96). When relative cost is used as the dependent variable in Eq (7) page 18, the share index has a negative coefficient that is three times the quality variable's coefficient. "Clearly relative direct costs tend to decline . . . as size relative to competitors increases" (10:96). The authors' "change in share index" variable in Eq (8) page 19, shows a positive coefficient when regressed with the share index against ROI. However, the simple share index coefficient is five times larger than the change in share index. Gale and Branch use the change in market share variable to determine whether or not effects other than price and cost are causing market share and profitability to change together. The results show "the 'third factor' effect exists but is only a small part of the explanation for the share/ROI relation" (10:101).

Sturm's analysis confirms the Gale and Branch result that market share has a greater impact on profitability than concentration. Sturm's market share is positive (though only statistically significant in one of his three data sets). Its coefficient is a factor of 2-6 larger in absolute value than the C4 coefficient, and the contribution to R^2 is more than C4's (29:30-32). Sturm's results also show market share is more correlated with C4 than with his efficiency variable (sales/assets) which he states "indicated that MKTSH is more a market power variable than an efficiency proxy" (29:27). This is different than the Gale and Branch conclusion. When Sturm analyzes the alternative concentration measures, the relative strength of the different measures in the profitability relation are similar to Kwoka's results. S1 (largest share in the industry) and C2 (two firm concentration ratio) are more correlated to market share than any of Kwoka's other measures (29:39).

In his 1983 study, Shepherd's most significant result is his estimate of scale economies' share of profits. This cost savings estimate (he called it cost effect) ranges from 3.9% to 59.1% depending on the assumption made for competitive market share (6, 8, or 10%) and the reliability he presumes for his MES and cost gradients. The high end of the cost savings range is obtained by using a 6% competitive market share and by raising his MES and cost gradient estimates by 50%. Shepherd concludes that "the true cost effect is almost certainly below 30 percent of monopoly profits" (23:186). When he uses his cost savings estimate as a scale economies measure in his profitability model, the variable has coefficients at least as large as market share for all data groups, but the R^2 contribution of scale economies is very small. When the scale economies variable is excluded from the model, the market share coefficient does not change much, indicating a small effect on market share's relation with profitability due to scale economies (23:187).

Ravenscraft's line of business results show no surprises in terms of the relative sizes of variable parameters. Market share, MES, line of business capacity utilization, industry advertising and industry R & D variables show the five largest coefficients (in increasing order). C4 has a negative coefficient. When the market share interaction terms are included, the pure market share variable turns negative. All five interaction terms have positive coefficients, but only the advertising-market share and assets-market share terms are statistically significant.

The Clarke, Davies and Waterson within industry analysis first uses a model, Eq (10) page 20, with a squared market share term to identify those industries that might have a "U"-shaped average cost curve. They eliminate those industries and use the remaining 29 industries that have a significant market share-profitability relation to determine whether or not market share plays an efficiency or market power role in the profitability relation. Their test centers on an estimate for "the degree of implicit collusion" (7:439) within an industry (call it k). k is related to the conjectural variation term ($L_i = dQ_i/dq_i$):

$$k = [(dQ_i/dq_i)/(Q_i/q_i)]$$

k is defined by Clarke and Davies (8:279) as firm i's conjectural variation (L_i) divided by the ratio of the sum of all the other firms output (Q_i) to firm i output (q_i). k is assumed constant for an industry. As k approaches zero, the industry is represented by firms who price as profit maximizers and assume competing firms will not react to their output changes--Cournot case (20:152; 8:279). k is estimated for each industry by a/(a + b) where a and b are the coefficient estimates for an industry in Eq (10) page 20, when c = o. For the 29 industries, the estimate of k ranges from 0.039 to 0.536 which shows for this set of industries there appears to be competition and collusion

(7:446-447). When the authors estimate the relation between concentration measures, alternately C5 and the Herfindahl index (H), and k for the 29 industries:

$$k = b_{\emptyset} + b_1 \text{ (C5 or H)}$$

they obtain a positive coefficient on both C5 and H. This shows "at least part of the reason why concentration and industry profitability are correlated is that more concentrated industries tend to be more collusive" (7:448).

Summary

This Chapter two summary presents the major conclusions from each study, summarizes the role of the market share relation as exhibited in the studies, and points out the areas for further work pursued in this thesis.

The Shepherd (26) and Gale (11) studies are among the early work that establishes profitability and elements of market structure have a significant relationship as estimated from data on manufacturing companies in the United States. Shepherd's main conclusion in his 1972 paper is that his results support the "neoclassical expectations" (26:35) that market share dominates the structure-profitability relation, with the leading firm group and entry barriers playing a small role (26:35). Gale's interaction results show that interactions between market share and other structure variables need to be considered in profitability studies. Specifically, the level of concentration, growth and the size of firms in an industry affect the strength of the market share and profitability relation. Neither study addresses the issue of whether the efficiency or price raising ability of a firm causes the relation.

Kwoka concludes that the largest two shares in an industry are the dominant firm size distribution variable in the industry profitability relationship. He feels his results show C2 to be a better measure for how firm size distribution affects industry margins (13:108) than the traditional C4. Another noteworthy result he mentions is that when the largest three shares are nearly equal, the effect on PCM is the same as an industry with all small shares. He infers that three dominant firms with equal shares allow competitive behavior in an industry.

The work of Gale and Branch (10) and Sturm (29) faces the question of whether the market position of large share firms reflects efficiency or price raising advantages. Gale and Branch conclude that market share accounts for the profitability of large scale business because of cost savings inherent in large business. Sturm concludes that market share does not reflect efficiencies of the firm.

In his study that measures scale economy cost savings directly for 85 large firms, Shepherd concludes that economies of scale does not explain the profitability market share relation for firms with market share above 20% (23:196).

Clarke, Davies and Waterson conclude "the evidence suggests some support for the view that both efficiency and market power are at work simultaneously" (7:435) in the between industry profitability-concentration relation. While the fact that some of their industries demonstrate a strong market share-profitability relation while at the same time showing little collusion (low k) indicates something other than market power influences are causing the relation, the authors admit their methodology is weak in trying to explain exactly what is that "something other."

Ravenscraft's major conclusion is "higher returns to advertising and assets for sellers with large market shares appear to underlie the positive profit-market share relation" (17:29). He comments that the returns could be due to high quality products and lower costs.

The market share-profitability relationship is found to result from firm cost savings by Gale and Branch and that conclusion is supported by Ravenscraft. The relation is found not to be influenced by a specific efficiency measure or scale economies in the Sturm and Shepherd studies, respectively. The apparent differences and conflicts in these conclusions could have resulted from each author using a different portion of the firm size distribution, the differences in methodology brought about partly from limitations in the available data, or from the simple fact that slightly different hypotheses are being tested in at least two of the studies.

Sturm's firm data has a relatively low average market share (6%) compared to the Gale and Branch data (20%). Perhaps cost savings are not apparent in a sample restricted to relatively smaller share markets (generally accepted) and therefore Sturm is not able to capture cost effects with his efficiency variable. However, that does not explain why Ravenscraft, with an average line of business market share of 6%, is able to obtain results with potential cost effects, or why Shepherd's scale economy variable (using data with an average market share of 21%) demonstrates no effect on market share.

Gale and Branch and Ravenscraft use very detailed firm or line of business data for their analysis. Their access to the PIMS data allows Gale and Branch to define relative cost and price variables. Similarly, the FTC data provides Ravenscraft with the potential to precisely estimate market share for lines of business. In contrast, Shepherd and Sturm rely on public data sources which do not allow them to evaluate market share with price and cost variables directly and which may not provide as accurate an estimate of other structure variables.

Shepherd limits his analysis to the effects of plant and firm scale economies on monopoly profits while Gale and Branch study cost effects and profitability in general. The attempt by Shepherd to focus his effort on scale economies may cause him to measure the effects of something less than that studied by Gale and Branch in their relative price and cost analysis. X-efficiency, pecuniary and other cost savings could be included in the Gale and Branch analysis.

This chapter has reviewed the relevant work that has been done in addressing the question of whether the positive market share-profitability relation is mainly due to the cost advantage of large share firms or due to their ability, through product differentiation or other market position advantages, to maintain prices that are higher than their competitors. In the following chapters an analysis is reported that uses the same data sources as Sturm with different efficiency measures and models in an attempt to answer the research question as well as minimize some of the reasons that may provide Sturm with results different than Gale and Branch.

III. Methodology

This chapter describes the methodology used for testing whether market share, in the profitability relation, largely reflects cost reduction influences or price increasing forces. The basic methodology employed is multiple linear regression to estimate a specific model with a data set that represents firm business activity in 56 U.S. manufacturing industries. The first of five sections in this chapter will describe the linear statistical models that are used for analysis. The second section describes the data sources and the limitations of the data. The third section discusses the measurement of the model's variables. Section four outlines the criteria and procedures used for data set selection, and the final section of this chapter provides a rough calibration of the data set selected by comparing a sample of it with an independent data source.

Models

Two basic linear statistical models are used for the analysis, a linear additive model and a linear interaction model similar to the Gale (11:415) interaction model. The additive models are used for comparing different data sets, testing efficiency effects on market share and observing the effect of control variables. The interaction model is used to focus on the sensitivity of the market share-profitability relation to the different efficiency measures.

The basic linear additive model includes profitability (P) as the dependent variable, industry concentration, (C) market share (M) and a capital cost control variable (O):

$$P = a_1 + a_2C + a_3M + a_4O + u \qquad (11)$$

where

a_1, a_2, a_3, a_4, = coefficients to be estimated

u = error term

Concentration is included in the model to control for any industry price effects that lead to higher profitability. The capital cost control variable is used because the profit to revenue ratio and return on capital are used as profitability measures. Such a variable is needed to account for "the cost per unit of capital under competition" (20:269), or as Waterson calls it "the problem of subtracting from the dependent variable the cost of capital used up" (32:192). This model is used for initial data set screening to determine which data cuts fit the expected positive market share-profitability relation.

Alternate efficiency variables (E) are added to the basic model, Eq (11), to test directly the proposition that the market share variable is in part, an efficiency proxy:

$$P = a_1 + a_2C + a_3M + a_4O + a_5E + u \qquad (12)$$

If efficiency is at least part of the reason for a positive market share-profitability relation, then M and E should be correlated, and more importantly, a_3 should change significantly with E included in the model.

The last use of the additive linear model is to control for the effect of differences in firm growth (G), advertising intensity (A), and firm size (S) while examining the efficiency-market share-profitability relation:

$$P = a_1 + a_2 C + a_3 M + a_4 O + a_5 E + a_6 G + a_7 A + a_8 S + u \qquad (13)$$

Growth and firm size variables are added to control for the change in profitability that results from these two firm characteristics. The advertising intensity variable is included in an attempt to control for product differentiation among firms (20:285).

The interaction model tests for an efficiency effect on the profitability-market share relation without including the efficiency variable directly in the model:

$$P = b_1 + b_2D_2 + b_3D_3 + b_4D_1M + b_5D_2M + b_6D_3M + b_7O + u \qquad (14)$$

where

b_i = coefficients to be estimated

D_1, D_2, D_3 = binary variables

and the remaining variables are defined as above. Eq (14) is identical to the Gale model (11:415) with the exception of the capital cost control variable used here. D_1, D_2 or D_3 are set equal to one for each data case (segment) depending on whether the given segment belongs in the low, medium, or high efficiency group, respectively. For each efficiency measure, $(b_6 - b_4)$ will be significantly greater than zero if the high efficiency data reflects a market share-profitability relation significantly different than the low efficiency data. Gale's arbitrary rule of thumb (11:417) to divide the data so the middle efficiency group ($D_2 = 1$) contains about ten percent of the total data cases is followed in this study. For example, if the sales to employee ratio (SEMP) is the efficiency variable, all segments with SEMP $\geq$ ($SEMP_{avg}$ + 0.15 $SEMP_{sd}$) would be in the high efficiency group ($D_1 = 0$, $D_2 = 0$, $D_3 = 1$). All segments with SEMP $\leq$ ($SEMP_{avg}$ - 0.15 $SEMP_{sd}$) would be in the low efficiency group ($D_1 = 1$, $D_2 = 0$, $D_3 = 0$), and all remaining segments (roughly 10% of the data) would be in the middle group ($D_1 = 0$, $D_2 = 1$, $D_3 = 0$). $SEMP_{avg}$ and $SEMP_{sd}$ are the mean and standard deviation, respectively, for the sales to employee ratios of all segments.

Data Sources

There are two basic sources of the data used in the analysis: Standard & Poor's Compustat Services, Inc., Compustat II company information libraries; and the U.S. Department of Commerce, Bureau of the Census, Census's of Manufactures and Annual Surveys of Manufactures. One other source is used for comparisons: Trinet, Inc. Trinet Establishment Database. The main time period selected for analysis is 1977 through 1979, due to the availability of the Compustat data. The check on the Compustat data reported later in this chapter is done with 1984 data due to the limited availability of Trinet data.

The Compustat data is available in three formats, the annual Industrial file, the Business Information-Industry Segment file and the Business Information Geographic Segment file. The annual Industrial file contains 175 data items for each company, listed by year of activity. Each company is assigned a standard industrial classification (SIC) code which identifies the industry associated wit` the major business activity of the company. There are over twelve sources of information for annual file data including Security and Exhange Commission (SEC) 10-K reports, company reports, and a variety of trade and industry publications (28:2-5).

The Compustat "Industry Segment file provides financial information for up to ten industry segments per year for industrial companies" (27:2-2). The data for this file is obtained by Compustat from company reports that are required by the Financial Accounting Standards Board (FASB) and by the SEC under Regulation S - K (27:2-2). The FASB

> defines an Industry Segment as 'A component of an enterprise engaged in providing a product or service, or a group of related products or services primarily to unaffiliated customers . . . for a profit' (27:2-2).

Each firm segment is identified with an SIC code reflecting the primary business conducted by a firm's segment. Each segment contains up to twelve data items representing its business activity in a specific year.

The Compustat "Geographic Segment file provides key income statement and balance sheet items pertaining to a company's operations segregated by geographic areas" (27:3). The data contained in this file also comes from SEC and FASB reports. The information in the Geographic Segment file allow one to correct for the foreign business activity that is combined with U.S. business activity in the Industry Segment file data items. Three segment data items, net sales, profit, and assets, are corrected with the Geographic file data to obtain measures of U.S. business activity.

A major limitation of the Compustat data involves the classification of the firm segments into industries. Compustat classifies most of its firm segments by 4-digit SIC codes (some are 2 and 3 digit). While this approach is necessary for their data to be useful in various applications (including this thesis) it relies on the assumption that the segment data, reported by companies, can be categorized in one industry (4 digit SIC). The correctness of that assumption is dependent on each firm's interpretation of the FASB definition of "segment" when they report their business activity. Note that while the Segment file can contain up to ten segments per company, the actual number of segments reported is much smaller. For example, only about 16% of the firms in the 1978 Segment file report their business activities in more than three segments (27:5-D-4). Most firms either operate in a few industries or the business activity is lumped together in a few main segments. This source for noise in the data becomes a greater limitation when the Compustat data is combined with another data source, for example the census of manufactures, based on the common use of SIC codes. The Compustat use of the SIC codes may differ from the Census Bureau use because the company reported segment data that Compustat uses is probably more widely defined than the company reported establishment data the Census Bureau uses. This limitation is accounted for in the data selection procedure described in section four.

A second major limitation of the Compustat data is the non-availability of some business activity data at the segment level. When data is not available at the segment level, firm data has to be used. The assumption forced on the analyst by this limitation is that for those undefined items the segments' business activity is proportional to the level of segment net sales. Some data items not defined at the segment level are advertising expenses and cost of goods sold. In addition, the geographic file only contains data for the firm as a whole, so when segment data is adjusted for foreign business activity, the adjustment is based on the foreign activity of the firm.

The Census of Manufactures for 1977 and 1982 and the

Annual Survey of Manufactures (ASM) for 1978, 1979, and 1980 contain the Bureau of the Census data used in this analysis. The major differences between the census and the survey of manufactures are the method of data collection and the amount of information reported. The Census Bureau obtains information every five years from every manufacturing establishment to compile census of manufactures data. On the other hand, the ASM data is compiled in off-census years by surveying about 25 percent of the establishments with five or more employees and by using Internal Revenue Service and Social Security records for small establishments (4:VII). So, the ASM data is an estimate based on a partial sample, while the census is a population survey. The ASM information is formatted like the census, but the census provides more information. For example, the census contains industry concentration ratios and the ASM does not. The major limitation of the Census Bureau data is the reporting of establishment data in various aggregates to protect disclosure of companies' business operations. This limits the usefulness of the data in a firm or line of business analysis.

The Trinet Establishment Database, accessed through the Dialog Information Retrieval Service contains marketing information such as annual sales and market share on all U.S. establishments with twenty or more employees for 1984. "Data are generated from many sources such as annual reports, 10-K's, state and industrial directories, corporate financial reports, trade journals and clipping services " (31). Sales & Marketing Management reports Trinet estimates of U.S. Establishment and value of shipments totals by 4-digit SIC, State, and County (30:3). The major limitation of the Trinet establishment data is its cost. A Trinet market share report costs about $35 per industry.

Operational Measures

This section describes how each of the variables in the models are measured by using the data from the sources that were just described. The two profitability measures and their corresponding capital cost control variables are discussed first. Then market share and three alternate efficiency measures will be defined. Finally, concentration and measures for the remaining control variables are defined.

The two alternate profitability measures used are return on sales (ROS = profit/sales) and return on assets (ROA = profit/assets). Their respective capital cost control measures are the asset to sales ratio and its inverse the sales to asset ratio. Compustat segment net sales, profits, and assets data are used to compute all four measures. The Compustat net sales "consists of the industry segment's gross sales . . . reduced by cash discounts, trade discounts, and returned sales and allowances" (27:5-A-16). "Operating Profit (Loss) is sales of the identified industry segment minus its allocated share of . . . cost of goods sold; selling, general and administrative expenses; and depreciation, depletion and amortization" (27:5-A-17). Compustat assets are defined as "the tangible and intangible assets that are used by, or directly associable with each industry segment" (27:5-A-18).

Market share is measured by dividing the Compustat segment's net sales by the Census Bureau value of shipments. The value of shipments used is for the 4-digit SIC industry that Compustat has identified with the particular segment's business activity. The Census Bureau determines its value of shipments for industries by using establishment reported "net selling values, f. o. b. plant [free-on-board], after discounts and allowances and excluding freight charges and excise taxes" (3:XXII). The value of shipments is taken from the Census of Manufactures for 1977 and from the Annual Survey for 1978 and 1979.

The three efficiency measures are a value of input to value of output ratio for the firm and an output to input ratio for the firm, and a cost advantage ratio for the industry. The input value to output value ratio is measured as the ratio of cost of goods sold to net sales. Cost of goods sold is not one of the Compustat segment data items, so a firm ratio is used for this measure. "Cost of Goods Sold represents all costs directly allocated by the company to production, such as material, labor and overhead, etc." (28:9-27). As an efficiency measure, cost of goods sold "attempts to capture how well costs are managed for these factors of production which exclude capital expense" (21:1Ø6). The output to input ratio is measured as net sales to number of employees. Some firms report their employees by segments, so this efficiency variable is measured with a mix of firm and segment ratios. The Compustat employee data represents "the number of company workers as reported to shareholders" (28:9-41). A cost advantage ratio (CAR) for the industry is used to determine which industries contain lowest average cost for the four largest firms in the industry. CAR is

> a measure of the cost advantage of the four largest firms relative to the next largest four firms. It is calculated by dividing the average value added per employee for the largest four firms by the average value added per employee of the fifth through the eighth largest firms (2:935).

The data for CAR is obtained from the 1977 Census of Manufactures.

The concentration measure used is the four firm concentration ratio from the 1977 Census of Manufactures (3:9-12).

The final control variables in the models are firm growth, size, and product differentiation. Firm growth is measured as the percentage increase in sales between 1977 and 1979. The Compustat company net sales data are used to compute growth. Size is measured as the natural logarithm of assets for the segment. The product differentiation measure is the firm ratio of advertising expenses to net sales.

Data Set Selection

The focus in developing a good data set for the analysis is to define a reasonable measure of the market share variable. Reasonable here means a market share measure computed with a numerator (Compustat net sales) and a denominator (Census value of shipments) whose data come from the same industry. Reasonable also means a measure that is comparable to previous results and statistically significant when regressed in the profitability-structure relation given by the basic model, Eq (11). This section outlines the criteria used to decide which Compustat data subset is consistent with the census data. The regression results for the basic model using the selected data set will be compared to previous empirical work, and this section will present the summary statistics for all the variable measures using the selected data set. Appendix A details the methodology used and comparisons made during the data selection process.

Two criteria are used to test whether or not the Compustat use of the 4 digit SIC industry to classify its segment data is similar to the Census Bureau use of the 4 digit SIC industry to classify its industry data. The first criterion is the percentage of the census 1977 value of shipments for a 4-digit SIC industry accounted for by the sum of Compustat 1977 segment net sales attributed to the given industry. If this "total share" of the value of shipments for an industry is near 100 percent, then the

Compustat data very likely represents the same establishments contained in the census industry. If the total share is considerably less than 100 percent, either the Compustat Segment files are missing some of the firms in the industry, or some segments are incorrectly identified with other industries. If the total share is greater than 100 percent for an industry, then clearly the Compustat use of the SIC code is at odds with the Census Bureau use. The Compustat 1977 Segment file represents 373 manufacturing industries. 177 industries have total shares less than 25%. 23 industries have total shares greater than 120%. Of the remaining 173 industries, only 125 contain at least four segments (See Appendix A fig-1). These 125 industries are selected to be tested with the next criterion.

The second criterion for data selection uses the 1977 Census four firm concentration ratio (C4) and a four firm concentration ratio comprised of the four largest firm shares from the segment data for each of the 125 industries. The selected data set contains those industries whose segment share C4 was within ten percentage points of the census C4 (see Appendix A Table A-I for the list of industries). The 56 industries which meet that criterion have a simple correlation coefficient between the two C4's of 0.923. The average Census C4 was 37.13% and the average segment C-4 was 37.69% for the 56 industries. While both selection criteria definitely contain arbitrary aspects--

the 10% cutoff for C4 and the 25% < total share < 120% range --the intent in the data selection process is to minimize the noise in the market share measure while maintaining a representative sample of manufacturing firm segments for the analysis.

The selected data set contains 573 segments and represents firms from 56 industries. Each segment contains business activity data averaged over 1977-1979. The segments in the data set with a market share less than one percent are not used in the analysis so the results are not biased by the presence of a great number of very small segments. The remaining 345 segments form the basic data set for the analysis, designated SET31M. A subset of SET31M contains only those segments, 207 of them, that have been adjusted for foreign business activity with the Geographic Segment file data. This set is designated GEO31M.

In order to obtain reasonable market share measures, the segments in SET31M need to show a statistically significant and positive market share coefficient when regressed with the profitability measures. Ideally, the coefficient and explanatory power of the regression should be similar to those obtained by Gale and Branch or Sturm both of whom used the basic model, Eq (11). Table IV compares the regression results of set GEO31M with previously reported work.

It is clear from the comparison in Table IV that the selected data set gives statistical results similar to other

Table IV

Market Share Regression Comparison

Dependent Variable	Mktshr	C4	SA or AS	R^2
		GEO31M Mktshr ≥ 1% (Avg Mktshr = 8.53%)		
ROS	0.081 (1.67)**	0.012 (0.39)	0.032 (2.74)***	0.052
ROA	0.153 (1.92)**	0.007 (0.15)	0.070 (6.19)***	0.184
		GEO31M Mktshr ≥ 7% (Avg Mktshr = 16.71%)		
ROA	0.286 (2.60)***	-0.155 (-1.83)**	0.074 (4.31)***	0.257
		Gale and Branch (10:90) (Avg Mktshr = 20%)		
ROI	0.499 (18.48)***	-0.020 (-1.05)	--	0.199
		Shepherd (23:188) (Avg Mktshr = 34.4%)		
ROE	0.220 (3.91)***	Group 0.04 (0.88)	-- (+ other variables)	0.43
		Sturm (29:31) (Avg Mktshr = 4.69%)		
ROS	0.116 (2.11)**	-0.028 (-1.34)*	SA -0.031 (-5.89)***	0.078
ROA	0.201 (2.00)**	-0.083 (-2.49)***	0.046 (5.91)***	0.085

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05. * = 0.10

reported work. Market share is positive and significant for both GEO31M sets. Sturm uses Compustat segment data with a less rigorous data selection procedure than is employed here, however, the significance level of his market share coefficient is greater than results shown for GEO31M. For ROA though, the GEO31M data give more than double the R^2 reported for the Sturm data. It is interesting to note that the regression results for Sturm's data (29:30), which are corrected for foreign sales (not shown here), have a less significant and smaller market share coefficient and a smaller R^2 than his large data set results shown in Table IV. This is different than my results. GEO31M data shows a stronger profitability-market share relation than SET31M.

The summary statistics for all the variables are listed in Table V for the selected data corrected for foreign sales with a market share greater than one percent (GEO31M - 207 cases). Note that when ROA is used there are only 204 cases because three segments with excessively high ROA are deleted as outliers. Only 170 of the segments belong to firms for which Compustat reported non-zero advertising expenses.

Market Share Comparison

This section provides a rough test of the market share measures used in this study. The test is a comparison between the study market share measure and the Trinet Establishment Database market share measure; further analysis used in the comparison is given in Appendix B.

Table V

Summary of Variable Measures (Data Set GEO31M)

Variable	Mean	Standard Deviation	Minimum	Maximum
Profitability				
ROS (%)	12.21	6.26	-1.02	29.91
ROA (%)	20.06	11.08	-0.98	59.60
Capital Cost Control				
A/S	66.08	37.05	21.74	481.23
S/A	173.53	62.98	20.78	396.07
(204 cases)				
Mktshr (%)	8.53	9.79	1.04	74.12
C4 (%)	34.76	15.56	7.0	76.0
Efficiency				
Cost/sales	0.69	0.11	0.37	0.90
Sales/ employees	61.70	30.81	18.72	228.10
Growth	0.186	0.133	-0.352	0.735
Size (ln Assets)	5.01	1.19	2.18	8.52
Adv/Sales (170 cases)	0.027	0.031	0.001	0.179

The market shares of firms in ten 4 digit SIC industries are compared. Only ten industries are used due to the cost of Trinet data. Only 1984 Trinet data (current data) is available through the Dialog online service. The Trinet data provides a market share and the sales for each requested firm's business activity in the specified industry. The four largest Trinet shares are summed in each industry to obtain a Trinet C4. These are compared with the 1977 Census C4 and 1977 Segment C4 in Table VI.

Table VI

C4 Comparisons

4 digit SIC Industry	1984 Trinet C4	1977 Segment C4	1977 Census C4
2295	23.2	39.9	39
2621	21.3	26.3	23
2841	56.5	63.6	59
3411	53.6	56.5	59
3662	19.1	28.9	20
3674	34.2	36.9	42
3714	34.2	11.3	62
3721	59.3	47.5	59
3743	35.3	53.5	51
3861	47.3	43.9	72

Two 1984 market share measures are computed using Compustat segment sales and value of shipments data for comparison with the Trinet market share. The first measure is the ratio of 1984 Compustat sales to 1982 Census value of shipments (4). The second measure is the ratio of 1984 Compustat sales to 1984 Trinet value of shipments (30). Both market share measures correlate well with Trinet market share as shown in Table VII.

Chapter three has discussed the additive and interaction models, the sources and limitations of the data in the thesis, and how the variables in the models are operationally measured from the available data. In addition, this chapter has shown how the data set with a reasonable estimate of market share is selected. Since the market share measure in GEO31M is positive and significant in the profitability relation and because it compares favorably

Table VII

Trinet Market Share Correlation with Compustat Market Share

	Compustat Market Share	
	Census Value of Shipment	Trinet Value of Shipment
# Segments	41	41
Correlation (r) with Trinet Mktshr	.911	.877
# Segments with Mktshr within 5% of Trinet Mktshr	27	32
Correlation (r) with Trinet Mktshr	.965	.960

with the Trinet market share estimates, this Compustat subset will be used exclusively in the chapter four efficiency analysis.

IV. Efficiency Analysis

This chapter discusses the results that are obtained by taking the selected data set, GEO31M, and applying it to the models that are presented in chapter three. The BMDP statistical software is used to obtain the estimates (9). Most results in the chapter are given for both the return on sales (ROS) and return on assets (ROA) profitability measures. ROS results are presented with two subsets, the Mktshr $\geq$ 1% and Mktshr $\geq$ 5% sets. ROA results are presented with three subsets, Mktshr $\geq$ 1%, 5% and 7%. The large share subsets are used to determine how sensitive the results are to the portion of the firm size distribution used. The additive model results with the efficiency variables, cost to sales ratio (COSTSA) and the sales to employee ratio (SEMP), are examined first. Next, the interaction model results with COSTSA, SEMP, and the cost advantage ratio (CAR) are discussed. Finally, the implications of the results are pointed out. Table VIII reviews the definitions of variable abbreviations used in this chapter. The data used in the analysis is presented in Appendix C.

Additive Model Analysis

This section discusses the results from applying the additive models given in Eq (11), Eq (12) and Eq (13) from chapter three to the data set. The BMDP "all possible

Table VIII

Review of Terms in Chapter IV

$adjR^2$	= adjusted coefficient of multiple correlation
ADVSAL	= (advertising expense/net sales) for firm
AS	= assets/net sales for segment
C4	= four firm concentration ratio
CAR	= cost advantage ratio for industry
COSTSA	= cost of goods sold/net sales for firm
D_i	= binary variable
GEO31M	= designator for subset of Compustat segment data (see Table V page 62)
GROW	= firm growth (1979-1977)/1977 sales
Mktshr	= market share for Compustat segment
ROA	= profits/assets
ROS	= profits/sales
SA	= sales/assets
SEMP	= sales/number of employees for firm
SIZE	= natural log (assets) for segment

subsets regression" (9:264) is used for the analysis in this section. The change in the market share coefficient when either COSTSA or SEMP is included in the model is discussed. The results from adding the control variables growth, size and advertising/sales in the model are shown as well.

Table IX and X review the basic model regression results for return on sales (ROS) and return on assets (ROA), respectively. Results are given with and without C4 to determine the effects of the correlation between market share and C4 on the efficiency results. Market share and the capital cost control variables are positive and statistically significant for all subsets. For the large share subsets, the market share coefficient becomes more significant and larger when C4 enters the model. In

Table IX

Basic Model Regression (ROS is dependent)

Mktshr	C4	AS	adjR^2
Mktshr ≥ 1% (N = 207) Avg Mktshr = 8.53%			
0.089 (2.03)**	-----	0.032 (2.75)***	0.042
0.081 (1.67)**	0.012 (0.39)	0.032 (2.74)***	0.038
Mktshr ≥ 5% (N = 108) Avg Mktshr = 13.88%			
0.109 (2.08)**	-----	0.067 (2.45)***	0.064
0.148 (2.37)***	-0.053 (-1.14)	0.068 (2.54)***	0.067

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

addition, the correlation between Mktshr and C4 is higher for the high share data (0.545 vs 0.424). C4 is not significant for the small share subsets, but for the subsets with market share ≥ 5%, the C4 coefficient becomes significantly negative. The negative C4 is consistent with both Gale and Branch and Sturm results, though the Gale and Branch C4 coefficient is significant only at the 80% confidence level.

The ROA efficiency results are presented in Tables XI and XII. The ROS efficiency results are presented in Tables XIII and XIV. COSTSA is statistically significant (mostly at the 99% confidence level) and largely negative in all cases. The data confirms that, as expected, profitability will decrease if the cost per sale increases.

Table X

Basic Model Regression (ROA is dependent)

Mktshr	C4	SA	adjR^2
		Mktshr ≥ 1% (N = 204) Avg Mktshr = 8.53%	
0.158 (2.20)**	-----	0.070 (6.25)***	0.176
0.153 (1.92)**	0.007 (0.15)	0.070 (6.19)***	0.172
		Mktshr ≥ 5% (N = 107) Avg Mktshr = 13.81%	
0.182 (2.24)**	-----	0.072 (4.87)***	0.215
0.266 (2.78)***	-0.116 (-1.62)*	0.074 (5.00)***	0.227
		Mktshr ≥ 7% (N = 80) Avg Mktshr = 16.48%	
0.176 (1.88)**	-----	0.072 (4.21)***	0.204
0.286 (2.60)***	-0.155 (-1.83)**	0.074 (4.41)***	0.228

SEMP, on the other hand, is only statistically significant for the subsets with market share ≥ 1%. The SEMP coefficient is negative. This result may point out the breakdown of the firm proportionality assumption used in applying the number of employees data to the segments, since the SEMP coefficient should be positive. The employee data may be better for the large share firms as indicated by the positive SEMP term in the Mktshr ≥ 7% set. COSTSA has almost twice the correlation with market share that SEMP does (Table XVII). The market share coefficients in the basic models and the efficiency models show some differences.

Table XI

Regression with Efficiency - COSTSA (ROA is dependent)

Mktshr	C4	SA	COSTSA	adjR^2
		Mktshr ≥ 1% (N = 204)		
0.094 (1.36)*	-----	0.081 (7.49)***	-31.97 (-4.87)***	0.259
0.084 (1.10)	0.015 (0.32)	0.081 (7.41)***	-32.04 (-4.86)***	0.256
		Mktshr ≥ 5% (N = 107)		
0.141 (1.83)**	-----	0.082 (5.77)***	-29.00 (-3.76)***	0.303
0.205 (2.23)**	-0.086 (-1.26)	0.083 (5.83)***	-27.81 (-3.59)***	0.307
		Mktshr ≥ 7% (N = 80)		
0.121 (1.34)*	-----	0.084 (5.06)***	-30.52 (-3.21)***	0.290
0.195 (1.78)**	-0.098 (-1.17)	0.084 (5.11)***	-27.77 (-2.84)**	0.294

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

A direct comparison between market share coefficients in the tables leads to the conclusion that COSTSA has an effect on the market share coefficient, since the coefficients' values in the COSTA models (Tables XI and XIII) are always less than the corresponding values in the basic models (Tables X and IX). The decrease in market share coefficient does not differ with C4 in or out of the model. About the same percentage change in the observed difference occurs in all the subsets, with the Mktshr ≥ 1% sets showing a slightly

Table XII

Regression with Efficiency - SEMP (ROA is dependent)

Mktshr	C4	SA	SEMP	adjR^2
		Mktshr ≥ 1% (N = 204)		
0.171 (2.38)***	-----	0.072 (6.43)***	-0.045 (-1.98)**	0.188
0.164 (2.07)**	0.010 (0.19)	0.072 (6.36)***	-0.045 (-1.98)**	0.184
		Mktshr ≥ 5% (N = 107)		
0.183 (2.25)**	-----	0.073 (4.89)***	-0.016 (-0.58)	0.210
0.265 (2.76)***	-0.114 (-1.59)*	0.075 (5.01)***	-0.014 (-0.51)	0.222
		Mktshr ≥ 7% (N = 80)		
0.173 (1.84)**	-----	0.068 (3.84)***	0.030 (0.70)	0.199
0.284 (2.58)***	-0.158 (-1.86)**	0.071 (4.02)***	0.033 (0.79)	0.224

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

larger percentage decrease. There is no difference in the COSTSA effect between profitability measures.

The SEMP efficiency measure has very little effect on the market share coefficient. This is not surprising due to its low correlation with market share and its general lack of significance in the relation.

Table XV shows the effect on the basic relation with the size and growth variables included. Size is negative, and the growth variable is positive. Both variables are

Table XIII

Regression with Efficiency - COSTSA (ROS is dependent)

Mktshr	C4	AS	COSTSA	adjR^2
		Mktshr ≥ 1% (N = 207)		
0.050 (1.20)	-----	0.024 (2.23)**	-20.37 (-5.28)***	0.153
0.036 (0.78)	0.020 (0.70)	0.024 (2.21)**	-20.52 (-5.30)***	0.151
		Mktshr ≥ 5% (N = 108)		
0.084 (1.66)**	-----	0.052 (2.01)**	-16.84 (-3.35)***	0.147
0.109 (1.79)**	-0.033 (-0.74)	0.053 (2.05)**	-16.31 (-3.20)***	0.143

Table XIV

Regression with Efficiency - SEMP (ROS is dependent)

Mktshr	C4	AS	SEMP	adjR^2
		Mktshr ≥ 1% (N = 207)		
0.095 (2.18)**	-----	0.032 (2.78)***	-0.023 (-1.69)**	0.051
0.086 (1.79)**	0.013 (0.44)	0.032 (2.76)***	-0.023 (-1.70)**	0.047
		Mktshr ≥ 5% (N = 108)		
0.111 (2.11)**	-----	0.066 (2.48)***	-0.019 (-1.08)	0.066
0.147 (2.36)***	-0.050 (-1.08)	0.067 (2.52)***	-0.018 (-1.02)	0.067

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Table XV

Additive Model with Size and Growth

Mktshr	C4	SA	SIZE	COSTSA	GROW	adjR^2
			ROA			
			Mktshr ≥ 1% (N = 204)			
0.263	-0.008	0.059	-1.585	-----	14.19	0.218
(2.98)***	(-.16)	(5.06)***	(-2.24)**		(2.62)***	
0.155	0.004	0.073	-0.832	-27.73	12.01	0.276
(1.74)**	(0.09)	(6.23)***	(-1.18)	(-4.08)***	(2.29)**	
0.101	0.010	0.079	-----	-29.82	12.74	0.274
(1.32)*	(0.21)	(7.24)***		(-4.54)***	(2.44)***	
			Mktshr ≥ 7% (N = 80)			
0.316	-0.144	0.070	-1.657	-----	4.424	0.226
(2.78)***	(-1.7)*	(3.99)***	(-1.25)		(0.49)	
0.201	-0.094	0.083	-0.266	-26.74	3.186	0.276
(1.69)**	(-1.10)	(4.69)***	(-0.19)	(-2.47)***	(0.36)	
0.193	-0.093	0.085	-----	-27.56	3.166	0.285
(1.75)**	(-1.09)	(5.09)***		(-2.80)***	(0.36)	
			ROS			
			Mktshr ≥ 1% (N = 207)			
0.140	0.000	0.046	-0.744	-----	10.46	0.098
(2.58)***	(0.0)	(3.76)***	(-1.74)**		(3.28)***	
0.067	0.013	0.033	-0.250	-18.15	8.627	0.178
(1.23)	(0.46)	(2.75)***	(-0.59)	(-4.55)***	(2.81)***	
0.049	0.016	0.030	-----	-18.76	8.783	0.181
(1.09)	(0.55)	(2.74)***		(-4.87)***	(2.88)***	

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

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significant in the small share subsets, but in the large share subset they lose significance. The size and growth variables in the model cause the market share coefficient to increase 50 to 80%. The adjusted R^2 more than doubles for one data set. When COSTSA is added, the market share coefficient decreases. In percentages, the decrease is almost the same as without the size and growth variables. Size loses it significance when COSTSA is added. For this reason and because size is correlated with both market share and the capital cost control variables, Table XV also shows the COSTSA model without size. The market share decreases its influence in the relation further. The adjR^2 does not change for the small share data and increases for the large share data.

Only a fraction of the segments in the data set have advertising expense values, so the differentiated products control variable (the advertising expense to sales ratio-ADVSAL) is regressed with a smaller data set. Table XVI gives two examples of the effect ADVSAL has on the market share coefficient. The increase in the market share coefficients' size and significance that occurs with size and growth variables in the model did not happen when ADVSAL is added with them. On the other hand, with COSTSA in the model, the inclusion of ADVSAL does have an effect on market share. The negative correlation between COSTSA and ADVSAL makes the effect on market share difficult to sort out. The ADVSAL simple correlations are also shown in Table XVI.

Table XVII shows the simple correlations for all of the remaining variables. While the correlations are for the

Table XVI

Regression with Advertising/Sales

Mktshr	C4	SA	SIZE	COSTSA	GROW	ADVSAL	adjR^2
			ROA				
			Mktshr ≥ 5% (N = 56) Avg Mktshr = 15.64%				
0.216 *	-0.037	0.082 ***	-----	-----	-----	-----	0.235
0.199 *	-0.023	0.086 ***	0.456	-----	10.13	4.853	0.202
0.231 **	-0.037	0.111 ***	0.528	-67.17 ***	-5.39	-146.47 ***	0.398
0.137	-0.011	0.099 ***	1.669	-32.99 ***	8.116	-----	0.308
ADVSAL Correlations							ROA
0.270	0.189	0.122	-0.279	-0.682	-0.259	1.000	0.090
			ROS				
			Mktshr ≥ 1% (N = 102) Avg Mktshr = 9.76%				
0.078 *	0.073 *	0.051 **	-----	-----	-----	-----	0.053
0.088	0.073 *	0.050 **	0.397	-----	9.029 **	-17.69	0.081
0.046	0.084 **	0.012	0.772	-33.23 ***	4.026	-78.40 ***	0.287
-0.008	0.083 **	0.018	1.190 **	-20.95 ***	8.10 **	-----	0.192
ADVSAL Correlation							ROS
0.294	0.153	-0.053	-0.10	-0.548	-0.148	1.000	-0.067

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Mktshr ≥ 1% set, they are generally the same for the large share subsets with three exceptions. One already mentioned is between Mktshr and C4, it increases to 0.545. The other two, ROA vs SEMP and C4 vs COSTSA both switch sign and increase to 0.197 and 0.112 respectively.

The additive model results show that for one efficiency measure, COSTSA, the market share impact on profitability (coefficient) decreases from 20 to 55% when the efficiency measure is used in the model. This demonstrates that at least a small part of the explanation for the share-profitability relation is due to cost savings. The sales to employee ratio appears to fail as an efficiency variable with the present data. In addition to its negative relation to the profitability measures, its small correlation with COSTSA (Table XVII) implies that SEMP is not a good measure for the output to input variable. The trends indicated from this additive model are generally confirmed with the interaction model results presented next.

Interaction Model Analysis

This section discusses the results from applying the interaction model, Eq (14), to the data. The BMDP "multiple linear regression" (9:237) is used for the analysis in this section. The difference in the market share coefficient is shown when the data are divided into high and low efficiency sets based on COSTSA, SEMP, and CAR, in turn. Sensitivity of the results to how the cut between

Table XVII

Correlation Matrix for MKTSHR ≥ 1%

ROA SET (N = 204)

	MKTSHR	C4	SA	SEMP	COSTSA	ROA	GROW	SIZE
MKTSHR	1.000							
C4	.424	1.000						
SA	.046	.116	1.000					
SEMP	.091	.064	.079	1.000				
COSTSA	-.175	-.026	.203	.239	1.000			
ROA	.159	.114	.405	-.080	-.226	1.000		
GROW	-.048	.023	.068	-.176	-.108	.205	1.000	
SIZE	.456	.095	-.288	.281	.073	-.189	-.170	1.000

ROS SET (N = 207)

	MKTSHR	C4	AS	SEMP	COSTSA	ROS	GROW	SIZE
MKTSHR	1.000							
C4	.426	1.000						
AS	-.063	-.010	1.000					
SEMP	.087	.065	.004	1.000				
COSTSA	-.167	-.024	-.115	.224	1.000			
ROS	.127	.081	.179	-.101	-.376	1.000		
GROW	-.049	.018	-.160	-.184	-.122	.194	1.000	
SIZE	.457	.097	.296	.265	.094	-.001	-.182	1.000

high and low efficiency segments is made will also be examined. Since both the additive and the interaction models provide consistent results whether ROS or ROA is used as the profitability measure, and because ROA generally gives twice the $adjR^2$ that ROS does, only ROA results are reported in this section.

To use the interaction model, the data is divided into high, medium and low efficiency sets depending on the level of the particular efficiency measure. The Gale criterion is used as a starting point to define the cut points between sets for COSTSA and SEMP. He uses the mean plus or minus fifteen percent of the interaction term's standard deviation (efficiency here) for an upper and lower boundry on the middle set (11:416). The objective is to use the middle set as a buffer between high and low efficiency segments. That allows any significant differences in the market share - profitability relation to stand out.

Since CAR is an industry measure, the set cutpoints are determined by industry, and the size of the middle set is harder to control. Results from two cuts are presented. The first cut assigns to the buffer set any segments in industries with $0.9 \leq CAR \leq 1.1$. The second cut places more of the buffer segments into the lower efficiency set with $0.95 \leq CAR \leq 1.1$.

Tables XVIII, XIX, and XX show the coefficient estimates with their t-statistics from using the interaction

Table XVIII

Market Share Interaction with COSTSA

D2	D3	SA	D1SHR	D2SHR	D3SHR
		Di = N (Avg Mktshr)			
		Mktshr ≥ 1% (N = 204)			
-0.6	-3.5	0.08	0.216	0.306	-0.008
(-0.19)	(-1.74)**	(6.98)***	(2.25)**	(0.97)	(-0.07)
D1 = 72 (10.28%); D2 = 29 (7.39%); D3 = 103 (7.62%)					
		Mktshr ≥ 5% (N = 107)			
-0.6	-3.1	0.08	0.245	0.169	0.031
(-0.10)	(-1.1)	(5.23)***	(2.34)**	(0.53)	(0.25)
D1 = 39 (14.78%); D2 = 10 (15.17%); D3 = 58 (12.93%)					
		Mktshr ≥ 7% (N = 80)			
8.2	-2.1	0.08	0.259	-0.154	-0.013
(1.03)	(-0.54)	(4.82)***	(2.14)**	(-0.4)	(-0.09)
D1 = 27 (18.72%); D2 = 9 (17.76%); D3 = 44 (14.84%)					

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

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model with ROA as the dependent variable. Each table also gives the number of segments in the respective high, medium and low efficiency sets with the average market share of the sets. D1 represents high efficiency when COSTSA is used and low efficiency when SEMP and CAR are used.

The difference in market share coefficients between the high and low COSTSA sets is apparent in Table XVIII. The high efficiency (low COSTSA) segments provide a positive and statistically significant market share coefficient (DISHR) for all three data sets. The low efficiency segments show

Table XIX

Market Share Interaction with SEMP

D2	D3	SA	D1SHR	D2SHR	D3SHR
		Di = N (Avg Mktshr)			
		Mktshr ≥ 1% (N = 204)			
-2.6	-2.5	0.07	0.17	0.07	0.15
(-0.86)	(-1.18)	(6.41)***	(1.89)**	(0.25)	(1.08)
		D1 = 108 (8.48%); D2 = 30 (7.08%); D3 = 66 (9.26%)			
		Mktshr ≥ 5% (N = 107)			
2.6	0.5	0.08	0.21	-0.31	0.11
(0.34)	(0.15)	(5.01)***	(2.17)**	(-0.51)	(0.64)
		D1 = 63 (14.21%); D2 = 12 (11.37%); D3 = 32 (13.94%)			
		Mktshr ≥ 7% (N = 80)			
9.6	1.3	0.08	0.22	-0.73	0.08
(0.97)	(0.30)	(4.29)***	(1.96)**	(-0.97)	(0.41)
		D1 = 46 (17.36%); D2 = 8 (12.02%); D3 = 26 (16.29%)			

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

---

no statistical significance, and the Mktshr ≥ 1% and 7% sets have slightly negative coefficients (D3SHR) for market share. In addition, the average market share between the high and low efficiency sets are statistically significant. The high efficiency segments have a higher average market share than the low efficiency group.

The SEMP efficiency measure used as an interaction term shows the market share coefficient strong and statistically significant for low SEMP segments (Table XIX). The high SEMP group of segments give a positive, though not

Table XX

Market Share Interaction with CAR

D2	D3	SA	D1SHR	D2SHR	D3SHR
Di = N (Avg Mktshr)					
Mktshr $\geq$ 1% (N = 204)					
5.2 (1.8)**	1.5 (0.52)	0.07 (6.35)***	0.125 (0.45)	-0.03 (-0.27)	0.269 (2.834)***
D1 = 46 (7.10%); D2 = 84 (8.48%); D3 = 74 (9.47%)					
0.04 (0.02)	-1.6 (-0.7)	0.07 (6.38)***	0.136 (0.822)	-0.079 (-0.54)	0.269 (2.813)***
D1 = 79 (7.60%); D2 = 51 (8.60%); D3 = 74 (9.47%)					
Mktshr $\geq$ 5% (N = 107)					
-0.85 (-0.17)	-1.1 (-0.22)	0.08 (5.09)***	-0.168 (-0.45)	0.080 (0.58)	0.229 (2.099)**
D1 = 25 (10.49%); D2 = 46 (13.34%); D3 = 36 (16.72%)					
-0.22 (-0.06)	0.75 (0.21)	0.07 (5.00)***	0.208 (1.04)	0.001 (0.005)	0.229 (2.116)**
D1 = 43 (11.57%); D2 = 28 (13.51%); D3 = 36 (16.72%)					

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

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significant, market share coefficient. There is no significant or consistent difference in the average market share between high and low SEMP groups.

When CAR is used as the efficiency interaction term it performs similarly to COSTSA (Table XX). That is, the high efficiency segments (high CAR) give a statistically significant and positive market share (D3SHR) coefficient while the low efficiency segments (low CAR) do not give a significant market share coefficient (D1SHR). Unlike COSTSA, though, the difference between the D1SHR and D3SHR coefficients with CAR is not significant. The average market share for the segments in the high CAR industries is significantly higher than the average share in the low CAR industries. The two different cuts with CAR provide similar results, as shown in Table XX, although the difference in market share coefficients (D3SHR - D1SHR) increases with the second cut for the Mktshr $\geq$ 5% data set.

Table XXI gives the market share coefficient difference, with its t-statistic, between the coefficient estimate for high efficiency and low efficiency data. COSTSA is the only efficiency term that gives a difference that is statistically different than zero at the 90% confidence level. This significance for the difference in market share coefficients between the high COSTSA data and the low COSTSA data means that the stronger market share relationship to profitability shown by the high efficient (low COSTSA) segment data is likely to show up in data sets other than the one used. On the other hand, for the differences in market share coefficients based on SEMP and CAR, no such significance is apparent from this data set. Note that this difference (and its significance) is sensitive to the size of the buffer set, as indicated by the two CAR data cuts for the Mktshr $\geq$ 5% data.

Table XXI

Market Share Coefficient Difference Between High and Low Efficiency Data

	COSTSA	SEMP	CAR
Mktshr ≥ 1%	0.224 (1.53)*	-0.016 (0.10)	0.144 (0.49)
			0.133 (0.70)
Mktshr ≥ 5%	0.214 (1.31)*	-0.102 (0.53)	0.397 (1.01)
			0.021 (0.09)
Mktshr ≥ 7%	0.272 (1.45)*	-0.140 (0.63)	N/A

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

To test this sensitivity further, COSTSA is used to vary the buffer set size from no buffer (only two dummy variables) to a buffer set size of about 30% of the data. While the size and significance of the market share coefficient difference changes:

Mktshr ≥ 1% (N = 204)

	D2 = 0	D2 = 58
COSTSA D1SHR - D3SHR (t*)	0.079 (0.44)	0.145 (0.78)

the trend in Table XVIII where high efficiency (low COSTSA) gives a significant market share coefficient (D1SHR) and a data set with significantly higher average market share does not change.

Implications

The analysis clearly shows that the cost savings represented by the firm segment cost of goods sold to sales ratio and the industry cost advantage ratio has an effect on the market share-profitability relation. The additive model results show that the effect of a one percent increase in market share on profitability decreases by 35 to 50% when COSTSA is included in the model (Table XV). The interaction model results show a high likelihood that no significant relation exists between market share and profitability for firm segments and within industries with relatively low efficiency. In addition, the interaction model results show that on average, high market shares and high efficiencies coexist. This evidence implies that for manufacturing firms in the U.S., market share does not relate to profitability unless some efficiencies are present.

The efficiency results show no sensitivity to the portion of the firm size distribution used (with the exception of SEMP results, which is considered a data problem). Concentration is significantly negative for the large share subsets; why is difficult to sort out.

While the present analysis shows that decreased costs (efficiency) may be necessary for a positive share-profitability relationship, it does not show how important to the relation decreased costs are relative to price raising effects. The data does not provide a measure of

Table XXII

The Relative Influence of COSTSA and C4 on Market Share

C4	COSTSA	adjR^2
	Mktshr ≥ 1% (N = 204)	
0.263 (6.68)***	-0.152 (-2.61)***	0.199
	Mktshr ≥ 5% (N = 107)	
0.410 (6.76)***	-0.144 (-1.79)**	0.303
	Mktshr ≥ 7% (N = 80)	
0.440 (6.20)***	-0.246 (-2.59)***	0.337

relative prices (like Gale and Branch used) to compare with the effect COSTSA has on market share, but a comparison is made with C4 to determine whether industry price raising ability affects market share more than COSTSA.

The regression of C4 and COSTSA on market share in Table XXII shows that a one percentage point change in C4 will change market share 1.7 to 2.8 times more than a one percentage change in the cost to sales ratio does. Even though COSTSA does impact market share significantly, the influence of industry price raising ability (as roughly measured by C4) is a greater influence. However, when C4 is treated as an interaction variable with COSTSA, it becomes apparent that the two effects are related. Table XXIII shows the difference in the COSTSA influence on market share for segments in high concentration industries (D2COST)

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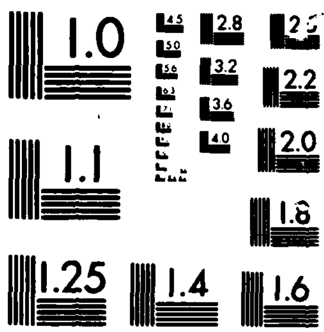

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Table XXIII

COSTSA Interaction With C4

D2	D1COST	D2COST	adjR^2
	Mktshr ≥ 1% (N = 204)	D2: N = 96	
13.69	-0.103	-0.213	0.119
(1.61)*	(-1.19)	(-2.48)***	
	Mktshr ≥ 5% (N = 107)	D2: N = 57	
15.91	-0.077	-0.176	0.167
(1.32)*	(-0.59)	(-1.51)*	
	Mktshr ≥ 7% (N = 80)	D2: N = 46	
31.22	-0.074	-0.372	
(2.25)**	(-0.50)	(-2.69)***	

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

---

relative to low concentration industries (D1COST). The influence of efficiencies embodied in the cost to sales ratio on market share appears to decrease in low concentration industries.

Another price raising influence is the differentiated product advantage firms may have if their product is higher in quality relative to competitors (20:285). With the present data, a rough measure for a firm with differentiated products is the advertising expense to sales ratio. The firms with advertising expense data show that COSTSA is not significantly related to market share when ADVSAL is included as an independent variable (Table XXIV). The implication is that product differentiation may have more influence on market share than cost saving efficiencies.

Table XXIV

Relative Influence of COSTSA, ADVSAL and C4 on Mktshr

C4	COSTSA	ADVSAL	adjR^2
	Mktshr ≥ 1% (N = 101)		
0.330 (4.44)***	-0.160 (-1.69)**	-----	0.179
-----	-0.033 (-0.27)	0.955 (2.37)**	0.067
0.311 (4.21)***	-0.037 (-0.33)	0.748 (1.99)**	0.203
	Mktshr ≥ 5% (N = 56)		
0.560 (5.36)***	-0.084 (-0.67)	-----	0.336
-----	0.151 (0.74)	1.177 (2.01)**	0.048
0.532 (5.03)***	0.078 (0.46)	0.688 (1.39)*	0.347

Table XXV

COSTSA Interaction With ADVSAL

D2	D1COST	D2COST	adjR^2
	Mktshr ≥ 1% (N = 101) D2: N = 48		
7.30 (0.44)	-0.110 (-0.54)	-0.207 (-1.47)*	0.007

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

The study of interaction between ADVSAL and COSTSA shows the two are related. High product differentiation (D2=1) coexists with a large COSTSA effect on market share (D2COST) as shown in Table XXV.

Table XXVI

Mktshr and ADVSAL vs COSTSA

Mktshr	ADVSAL	$adjR^2$
	Mktshr ≥ 1% (N = 101)	
-0.023 (-0.27)	-1.831 (-6.27)***	0.297
	Mktshr ≥ 5% (N = 56)	
0.067 (0.74)	-2.014 (-6.77)***	0.450

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

The Gale and Branch approach to compare the price raising effect of product differentiation with the cost savings aspect of market share was to regress their quality variable with market share on relative cost. Table XXVI gives the result of using the Gale and Branch approach with ADVSAL and market share regressed on COSTSA. Unlike the Gale and Branch result, market share is not significantly different than zero here. On the other hand, continuing with the Gale and Branch approach, when C4 is used as a measure for price raising ability, and market share and ADVSAL are regressed against C4, market share is significant and positive (Table XXVII). This is also opposite to the Gale and Branch result.

The analysis demonstrates that cost savings can explain part of the positive market share-profitability relationship. The results also show that cost savings may

Table XXVII

Mktshr and ADVSAL vs C4

Mktshr	ADVSAL	adjR^2
	Mktshr $\geq$ 1% (N = 1Ø1)	
Ø.495 (4.22)***	Ø.139 (Ø.34)	Ø.156
	Mktshr $\geq$ 5% (N = 56)	
Ø.619 (5.13)***	Ø.1Ø5 (Ø.27)	Ø.331

Parameter significance levels are (one tailed t test):
*** = Ø.Ø1, ** = Ø.Ø5, * = Ø.1Ø

not have the most influence on the relation. Finally, the analysis indicates that the strength of the costs savings relation to market share is affected by price raising leverage from high concentration and high product differentiation.

V. Summary and Recommendations

This thesis has attempted to determine whether market share reflects efficiency or price raising ability in its positive role with profitability. The empirical studies that are used as a guide for this work give support for both roles. The focus of this work is to establish a data set that contains a reasonable market share measure and to compare three different efficiency measures' impacts on market share.

One of the major limitations to overcome in this investigation is to obtain a sample of firm data which contains an accurate estimate of market share. The market share estimate is computed from publicly available Compustat and Census data. The data analysis provides a set of firm data with market share estimates that perform similarly to previous empirical work in the profitability--market share relation and also compare favorably to market share estimates available from the Trinet Establishment Data base.

Two of the efficiency measures (the firm cost of goods sold to sales ratio and the industry cost advantage ratio) influence market share significantly. A third efficiency variable, the sales to employee ratio does not relate to market share well, possibly due to misapplication of data. The interaction model shows that for high efficiency segments (as measured by high CAR and low COSTSA, respectively) market share is significantly related to profitability while for low efficiency firms market share is not. In addition, COSTSA decreases the significance of market share when regressed directly in an additive model against profitability. The conclusion from this analysis is that market share is partially a measure for efficiency in the market share-profitability relationship.

Comparisons of the relative effects of the efficiency variable COSTSA with four firm concentration ratio (C4) and the advertising expense to sales ratio (ADVSAL) show that the efficiency effect on market share may be dominated by other effects. If C4 estimates the ability of industry wide prices to be raised and ADVSAL estimates the firm ability to raise prices due to product differentiation, then the results here show price effects on market share to be larger than the efficiency effects.

These results agree with some of the results from earlier work and disagree with others. Sturm's (29) result that economies of scale are not the primary influence on market share is confirmed here since the COSTSA measure includes such economies. The Gale and Branch (10) conclusion that market share represents cost savings is supported by the results here, although their analysis demonstrates price effects on market share to be small--opposite to the conclusion here. Finally, unlike COSTSA, Shepherd's estimate of scale economy cost savings (23) did not change his market share relation to profitability when it was regressed with market share.

The investigation of several limitations in this study may provide a basis for further work in understanding the market share and other industry structural elements' relation to profitability. Some of these limitations are the weak measures of the price raising ability of firms, the assumption that causal direction goes from structural elements (including market share) to profitability, a potential bias in the dependent variable related to inefficiencies in manufacturing, and a bias in the market share variable caused by ignoring the import effects on domestic markets.

The measures of price raising ability that are used in the analysis, C4 and ADVSAL, are measures of the potential for firms to be in a position where they have price raising leverage. They do not measure actual higher prices relative to competitors. As such, the inference that cost effects are less than price effects might be in error. Indeed, Gale and Branch found price effects to be small when they use a relative price measure. Their study uses specific company line of business data from a private source not accessible to the public. Since data to measure price effects is not generally available, an investigation in what measures might better capture price advantages is warranted.

This thesis is based on the assumption that market share leads to profitability. If profitability also leads to market share there may be biases in the estimates due to an interdependence between the dependent and independent variable (20:290). A structure--performance investigation with a simultaneous model would help determine the importance of the dual causality effects in understanding the market share role. A consensus has not been reached as to the importance of a simultaneous equation specification in understanding the relation between industry structure and performance (18;15;6).

A systematic bias in the dependent variable may be caused by the way in which companies respond to their ability to raise prices above cost (5). If a company has this ability to earn monopoly profits, in order to report normal profits it may choose to spend the extra profit as business expenses--new company headquarters building, executive bonuses, etc; or, if the workers in the industry have enough bargaining leverage, the monopoly profits may be passed on to the workers as higher wages (5). In both cases the effect would be to decrease the reported profits for the company. If such a practice is widespread, the market share profitability relation, such as estimated here, would be understated. One possible way to minimize this bias would be to take into account the degree of collective bargaining in an industry (5). A study to identify any relation between unionization and concentration in an industry might provide insight to the bias.

The use of ordinary least squares to estimate additive linear models will cause the coefficient of the independent variable to be biased "unambiguously downward" (14:294) if the independent variable has measurement error. Market share has some measurement error due to not considering imports in the denominator of the market share computation (5). For example, if General Motors has 25% of the domestic sales in the U.S. the market share used in this study is 25%. However, the U.S. auto market includes foreign cars. If 50% of cars sold in the U.S. were foreign made, the true General Motors domestic market share is about 17%. The extent of this bias on the results should be investigated.

Appendix A

This appendix describes the detailed steps and comparisons made in the data set selection process. The chapter three "Data Set Selection" section discussed the two criteria applied to selecting the data and reported how well the selected data, SET31M, compared to previously published regression results in the profitability-market share model. Those comments will not be repeated here. Instead, this appendix reports the steps used in data selection procedures and shows how SET31M compared to the data sets not used in the final efficiency analysis.

Data Set Formation

While the final analysis of the market share variable is done using a three year average of data for 1977-1979, the initial data cutting was done using only 1977 data. The 1977 Industrial Segment file contains 2920 segments which were identified as four digit SIC lines of business in the manufacturing sector (SIC code of 2000-3999). A market share was computed for each segment after the segment's sales, profits and assets were adjusted for foreign business activity. The Geographic Segment file contained the amount of foreign sales, assets, and profits for a firm, so the segment data was multiplied by the percentage of firm domestic business (i.e. adjusted segment profit = segment profit

X firm U.S. profit/firm total profit). Some firms did not have data in the Geographic file, so the data was split into two groups, one that had been adjusted for foreign business activity and one that had not. Segments of firms that were on the Geographic file, yet had zero foreign business activity indicated, were included in the unadjusted group.

The first step in identifying which data would provide reasonable market shares was to determine, for each four digit SIC industry, how close the total net sales from the segment data was to the census value of shipment; the first data selection criterion discussed in chapter three. As explained in chapter three, an industry total share was defined by taking the total segment net sales as a percentage of the value of shipment. Figure 1 shows the frequency distribution of the 373 industries *in Compustat*, based on ten percent total share increments. Over half of the industries had total shares less than 30%. Thirty-nine industries had total shares greater than 100%.

The major reason the total share distribution was weighted toward the low end was due to incomplete data. The distribution only accounted for those 1977 segments that were identified with 4-digit SIC codes. Some segments in the 1977 Industry Segment file were identified with two or three digit SIC codes, or none at all. As an example, for the Sony Corp-ADR, Compustat reported $674 million in 1977 *net sales over four different segments.*

Figure 1. Numbers of Industries Distributed
Over Total Share

```
| Total                                                             |
| Share(%)   0   10   20   30   40   50   60   70   80   90  100  110 |
|            +---+---+---+---+---+---+---+---+---+---+---+           |
|   0-10     ***************************************** 102          |
|  10-20     ************************ 61                            |
|  20-30     *************** 34 ---------------------- 25%          |
|  30-40     ************** 32                                      |
|  40-50     *************** 35                Industries           |
|  50-60     ************* 30                  Considered           |
|  60-70     ******** 18                       for                  |
|  70-80     **** 7                            SET21M &             |
|  80-90     ***** 9 -------------- 80%        SET31M               |
|  90-100    *** 6      SET41M                                      |
| 100-110    **** 7 --------------- 110%                            |
| 110-120    ***** 9 ------------------------------- 120%           |
| OVER120    ********** 23                                          |
|            +---+---+---+---+---+---+---+---+---+---+---+           |
|            0   10   20   30   40   50   60   70   80   90  100  110 |
|                                                                   |
|                     Numbers of Industries                         |
```

While Compustat identified the company as belonging in industry 3651 (Radio's and T.V.'s), they did not (evidently) have enough information to identify which industry the four segments belonged to since the segments' industry code was missing. If all four segment's sales belonged in 3651, the firm would have contributed 37% to the total share of the industry. The Sony segments (and others) were not included in the analysis because the segments were not identified with a four digit SIC industry.

The total share distribution was used as a basis for selecting the main population of segments studied, designated SET21M. The 125 industries with a total share between 25 and 120% and containing at least 4 segments were selected for analysis. All segments in the Compustat Industry Segment file with three years of data (77-79), and identified in one of the above 125 industries were included in SET21M. Table A-I lists the 125 industries with their total shares, by SIC. Together with another criterion described below, total share was also used as the basis for the two sub-populations, designated SET31M and SET41M.

One way that was used to gauge how differently Compustat and the Census Bureau applied four digit SIC industry categories was to compare concentration ratios from each data source; the second criterion discussed in chapter three. The Census Bureau four firm concentration ratio (C4) was compared to a concentration ratio computed from the largest four (based on market share) firms in the segment data from Compustat. This market share C4 was computed for each of the 125 industries. The result is given in Table A-I along with the census C4 and number of segments in each industry. The number of segments also represented the number of firms in each industry since any segment from the same firm in the same industry were combined into one segment. A comparison between the C4's assumed that the segment data for each industry included the largest four firms. The two measures used to compare market share C4 and census C4 were the average C4 and correlation coefficient between the sets of C4.

Table A-I

125 Industies in SET21M

	SIC	TOTSHR	MKTSHR C4	CENSUS C4	# OF SEGMENTS
*	2032.	54.61	54.61	63.	4
*	2041.	43.88	27.84	33.	7
	2047.	49.22	47.19	58.	7
	2048.	46.58	33.85	22.	14
	2052.	72.64	72.64	59.	4
*	2065.	32.63	29.45	38.	8
	2082.	119.24	84.43	64.	12
*	2084.	47.40	47.40	49.	4
*	2086.	30.94	19.02	15.	13
	2095.	45.22	45.22	61.	4
	2099.	53.82	52.17	28.	8
*	2295.	39.92	39.92	39.	4
	2421.	56.03	33.77	17.	18
*	2451.	31.76	21.48	24.	12
+ *	2621.	105.72	26.30	23.	41
*	2631.	62.12	34.94	27.	17
*	2641.	25.94	20.79	30.	9
*	2648.	30.30	30.30	38.	4
	2654.	71.66	71.66	48.	4
*	2711.	25.24	16.43	19.	15
*	2721.	28.87	15.51	22.	16
*	2731.	47.21	18.14	17.	34
	2761.	53.96	49.91	38.	6
+ *	2812.	92.08	75.01	66.	7
*	2819.	58.12	38.66	33.	17
+	2821.	87.18	41.41	22.	28
	2822.	27.76	27.76	60.	4
	2824.	59.50	55.72	78.	5
	2833.	52.68	51.68	65.	5
*	2841.	67.82	63.59	59.	11
*	2842.	47.44	31.27	41.	14
+	2844.	101.02	58.26	40.	36
*	2851.	35.03	24.36	24.	20
	2865.	55.81	52.36	42.	7
*	2869.	44.15	31.73	38.	19
	2873.	82.23	73.74	34.	7
*	2891.	41.37	29.79	24.	10
	2899.	76.01	34.75	15.	23
	2952.	68.24	68.24	45.	4
	3041.	107.03	80.52	55.	8
*	3079.	38.11	16.81	7.	95
	3211.	47.17	45.84	90.	5

Table A-I (continued)

SIC	TOTSHR	MKTSHR C4	CENSUS C4	# OF SEGMENTS
3221.	117.54	89.99	54.	10
3229.	50.95	42.88	61.	8
* 3241.	62.97	31.67	24.	19
+ 3275.	92.50	92.50	79.	4
3291.	34.60	34.60	58.	4
3292.	115.55	99.22	42.	7
3296.	113.92	98.42	72.	10
3297.	97.68	93.62	46.	6
* 3312.	65.48	39.60	45.	46
3317.	49.06	44.38	24.	9
* 3334.	79.23	75.55	76.	6
3341.	110.60	104.94	22.	12
3356.	30.64	23.49	42.	8
* 3411.	61.95	56.51	59.	9
* 3421.	52.73	51.95	53.	5
* 3423.	46.20	34.65	25.	9
3431.	107.55	98.04	54.	10
3432.	55.91	54.46	33.	6
3441.	31.61	31.07	10.	8
* 3452.	40.12	14.91	13.	25
3479.	55.57	53.68	22.	8
3483.	27.29	23.90	52.	7
3496.	26.11	20.32	10.	11
* 3499.	34.55	21.58	13.	18
3519.	34.31	29.93	49.	9
* 3523.	73.77	55.60	46.	21
* 3531.	51.68	38.65	47.	29
* 3533.	68.99	38.46	30.	21
3535.	33.80	31.65	19.	8
3536.	104.20	76.60	16.	13
* 3537.	42.65	40.86	45.	5
* 3541.	40.83	20.59	22.	22
3542.	51.88	50.53	18.	7
* 3546.	54.98	50.13	50.	6
3551.	62.55	55.44	14.	14
3555.	31.87	27.40	40.	7
3559.	58.02	34.46	13.	32
* 3561.	43.45	24.94	17.	22
* 3562.	52.48	51.40	56.	6
+ * 3563.	81.84	53.12	45.	15
3567.	62.69	50.10	26.	9
* 3569.	41.05	16.65	10.	24
3573.	118.52	82.40	44.	58
3579.	35.27	29.10	60.	14
3585.	35.67	28.09	41.	19
3612.	119.37	110.38	56.	11
3613.	29.10	28.35	51.	5

Table A-I (continued)

	SIC	TOTSHR	MKTSHR C4	CENSUS C4	# OF SEGMENTS
*	3622.	42.51	32.74	42.	17
*	3623.	51.09	51.09	47.	4
	3634.	31.30	24.35	46.	11
	3643.	49.98	46.19	26.	9
	3645.	41.41	41.41	25.	4
*	3652.	55.96	55.96	48.	4
*	3662.	66.51	28.89	20.	97
*	3674.	57.98	36.91	42.	28
*	3675.	44.99	43.44	47.	6
	3679.	31.92	13.79	29.	51
+	3711.	83.03	78.06	93.	13
	3713.	58.51	53.88	33.	8
	3714.	27.89	11.29	62.	53
	3721.	62.89	47.46	59.	15
+ *	3724.	84.39	82.55	74.	10
	3728.	36.13	24.85	45.	20
	3731.	30.56	23.50	43.	12
	3732.	29.98	26.75	11.	8
*	3743.	62.76	53.54	51.	10
	3761.	42.39	41.71	64.	5
	3792.	44.29	42.53	31.	7
	3822.	85.05	79.77	59.	5
	3823.	91.23	52.90	32.	33
	3824.	25.96	25.96	43.	4
*	3825.	45.66	39.12	33.	15
*	3832.	41.02	28.24	30.	15
*	3842.	35.93	30.85	38.	9
	3843.	56.45	44.91	33.	8
	3851.	36.70	30.77	45.	9
	3861.	52.32	43.95	72.	21
*	3914.	52.73	48.35	51.	5
*	3931.	42.20	36.36	31.	8
	3944.	77.15	47.26	34.	17
*	3949.	54.78	27.07	21.	25
*	3951.	43.75	40.73	50.	6
*	3952.	44.66	44.66	49.	4

* denotes 56 industries in SET31M

+ denotes 8 industries in SET41M

Table A-II

Census C4 Correlation with Market Share C4

	All 125 Industries (SET21M)	Select 56 Industries (SET31M)	Select 8 Industries (SET41M)
Correlation Coefficient (r)	Ø.382Ø	Ø.9229	Ø.9163
Average Census C4 (%)	4Ø.26	37.13	55.25
Average Mktshr C4 (%)	36.86	37.69	63.4Ø

Table A-II gives those measures for SET21M and two select subsets. While the difference in average C4 was less than 4 points for SET21M, the correlation coefficient was small at Ø.38, indicating quite a difference in market share C4 and census C4 for the 125 industry set. The larger average census C4 meant either on average the Compustat segments understated sales for the industries, or there were some of the largest four firms missing from the segment data, negating the previous assumption. SET31M included all the SET21M industries whose market share C4 were within ten percentage points of the census C4. By design, the correlation coefficient for SET31M was high. In this set, the average marketshare C4 was very close to the census C4 (see Table A-II).

SET41M segments represented eight industries that had total shares ranging from 8Ø to 11Ø percent and had market share C4's within 20 percentage points of census C4s. Again, by design, this set had a high C4 correlation coefficient. The average market share C4 was 8 points higher than average census C4. That clearly indicated for the eight industries as a whole, the Compustat business activity was overstated in the top four segments. "Overstating" means that for a given segment, the amount of business activity actually in the industry assigned to the segment, is less than the amount of business activity reported. If the eight industries contained segments that represented a sample of the best segments defined in Compustat (they do based on the industry total share and C4 criterea used), then the conclusion is that the Compustat segment data, on average, does indeed contain business activity from outside a single 4 digit SIC industry.

Some summary statistics for SET21M, SET31M, and SET41M are given in Table A-III. The designator "GEOi" refers to a subpopulation of SETi which contains only segments that were corrected for foreign sales. The average market share for each set refers to the average for only segments with a market share greater than 1%. Before describing the performance of these segment based data sets in the basic statistical model, the construction of a primary product based data set will be outlined.

Table A-III

Profile for Segment Based Data Sets

	Total Number of Segments	Number of Industries	Segments with Mktshr > 1% Number of Segments	Avg Mktshr
SET21M	1199	125	733	8.3
GEO21M	624	125	450	9.2
SET31M	573	56	345	7.2
GEO31M	290	56	207	8.5
SET41M	115	8	89	7.8
GEO41M	81	8	68	8.3

A small percentage of the compustat industrial segment tape contains segments with net sales broken out by principal product. Compustat reports principal product data

> If a company derives 10 percent or more of consolidated revenue (15% or more if revenue did not exceed $50,000,000 during the fiscal year) from any class of similar products or services in an industry segment (27:5-A-21).

Up to four principal products are listed and identified by four digit SIC.

The principal product sales and the value of shipment for the 4 digit SIC industry were used to compute a principal product market share. The sum of the principal product sales equaled the segment sales in all cases. Any other principal product variables such as assets and profits

Table A-IV

Profile for Principal Product Based Data Sets

	Total Number of Records	Lines of Business with Mktshr > 1% Number of Records	Average Mktshr
SET11M	249	205	7.8
SET12M	125	115	9.2

were computed by weighting the respective segment value with the ratio of principal product sales to segment sales. Since each segment record could contain up to four principal products, there was a potential for up to four principal product lines of business for each segment. Any of the four principal product lines of business that had identical four digit SICs were combined into a single line of business.

SET11M was formed by including only the principal product lines of business which were corrected for foreign sales. A subpopulation of SET11M was developed into SET12M by taking only the largest principal product line of business (based on sales) from each segment. The purpose for the subpopulation was an attempt to get a cleaner principal product population by excluding the relatively smaller products which may be subject to more noise. Table A-IV gives the total lines of business and average market share for the principal product sets. Both sets had average market shares in the 8 - 9% range which is comparable to the segment based data sets (Table A-III).

Because the initial regression results of the principal product data sets gave unexpected results, and because some sort of validation check of the data cutting procedures was desireable, two data subsets were formed using segments that were in both SET12M and SET31M. If the unusual regression results from SET12M held true for the subset of common segments from SET31M, then there could be more confidence the reason for the unusual results were not in the data cutting procedure. The formation of SET12M and SET31M (starting with the same initial data source) were independent of each other. Set SHO12M was formed from SET12M by including about 30 primary product lines of business whose segments were also in SET31M. Set SHO31M was formed from those common segments in SET31M. The following summarizes characteristics of the two sets.

	SHO12M	SHO31M
MKTSHR > 1%		
# cases	31	32
Avg. MKTSHR	6.74	8.49

SHO12M contained one less case than SHO31M because one of the primary product lines of business fell below the 1% market share cutoff. The higher average market share for SHO31M was expected since the cases were full segments, not just a primary product segment fraction.

Data Set Comparison

The initial regressions applied the data sets to the following models:

ROS = MKTSHR + C4 + AS
ROA = MKTSHR + C4 + SA

where
ROS = (PROFITS/SALES)
AS = (ASSETS/SALES)
ROA = (PROFITS/ASSETS)
SA = (SALES/ASSETS)

Results were also provided for several subsets of the models.

Table A-V summarizes the statistical significance of all the full model regressions for SET21M, SET31M, and SET41M. References are given to the Tables with specific regression results. Several characteristics of the data are noted based on the trends in Table A-V. First of all, every full regression has at least 9Ø% confidence that not all the coefficients in the model equal zero (F test significance of Ø.1 or better). Also, for each main data set, the adjusted multiple correlation ($adjR^2$) decreases when the subsets of data corrected for foreign sales are used. While this generally holds true for the subset regressions, SET31M with ROA is an exception (Table A-X). The $adjR^2$ increases with corrected data for all three subsets.

The trend of $adjR^2$ between SET21M, SET31M, and SET41M appears different than expected. If, in fact, the data became cleaner (less noisy) as we progressed through the data cutting of SET31M and SET41M, the $adjR^2$ should have

Table A-V

Summary of Segment Based Data Sets' Regressions

ROS

Mktshr $\geq$ 1%

	F Significance	MKTSHR	C4	AS	$adjR^2$
(Table A-VI)					
SET 21M	0.001	**	0	***	.073
GEO 21M	0.001	*	0	***	.051
(Table A-VII)					
SET 31M	0.001	0	*	***	.067
GEO 31M	0.05	*	0	***	.038
(Table A-VIII)					
SET 41M	0.005	**	0	***	.126
GEO 41M	0.1	*	0	**	.072

ROA

Mktshr $\geq$ 1%

	F	MKTSHR	C4	SA	$adjR^2$
(Table A-IX)					
SET 21M	0.001	**	0	***	.098
GEO 21M	0.001	*	0	***	.082
(Table A-X)					
SET 31M	0.001	*	0	***	.230
GEO 31M	0.001	**	0	***	.172
(Table A-XI)					
SET 41M	0.01	**	0	***	.108
GEO 41M	0.05	**	0	**	.074

*** = 0.01 Significance level
** = 0.05 Significance level
* = 0.1 Significance level
0 = Greater than 0.1 significance level

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improved. For every simple regression of market share versus ROS or ROA, $adjR^2$ does increase. However, in the full regression models the data performs differently. The ROA full regression shows a 100% increase in explanation power ($adjR^2$) from SET21M to SET31M, and a 50% decrease from SET31M to SET41M. Generally, the ROS full model regressions reviewed in Table A-V do increase $adjR^2$ with the clean data (with the exception of GEO31M).

Finally, the significance of the regression coefficients for market share in the full models appear to decrease for SET31M with ROS and ROA. The true picture of market share significance in the data sets may be clouded by the highly correlated C4 variable. Without C4, market share is most significant in GEO31M and SET41M for both ROS and ROA regressions.

One way an improvement in the market share coefficient significance was sought was to cut the data set further by raising the minimum market share allowed. If a large amount of noise in the data was caused by the large variability of smaller lines of business profitability, then a more significant structure-profitability relationship might result when restricting the data to larger share line of business. Table A-XII summarizes the improvement (if any) to the market share coefficient significance for all the segment based data sets. Each set that showed improvement to the market share significance also increased $adjR^2$ in the full model regression.

If one of the segment based data sets had to be selected (without comparing to previous empirical results) for further analysis, the choice would be between SET31M and

SET41M. SET41M loses its appeal, though, when it is regressed without some potential outliers. Table A-XI and Table A-XVI show regression results without one outlier. It is quite obvious the initial results are quite dependent on one case. The outlier deleted had already been considered an outlier for SET21M and SET31M. In addition, it has the largest standardized residual (outlier indicator) as well as the maximum value of Cook's distance, "a measure of the influence of an observation on the regression function fit" (16:407). Because of SET41M's sensitivity to this outlier, as well as the other indicators pointing to the strength of the SET31M data set, SET31M is considered the best data set to work with. In addition, SET31M represents 56 industries which allow the results from that set to be applied to the manufacturing sector as a whole more readily than would the 8 industry SET41M. With all data sets, ROA seems to give a larger explanatory ability to the variables used than ROS.

The plots of market share versus ROA (or ROS) and plots of market share versus the residuals seem to suggest that the variance of the regression error term decreases with increasing market share. If indeed the error term variance is not constant, it would reflect a problem of heteroscedasticity which would cause incorrect tests of significance for the estimated coefficients (19:29). The apparent heteroscedasticity could also simply reflect the fact that the number of observations decreases as market share increases.

A test for heteroscedasticity (16:123) was performed on the 35Ø cases of SET31M data that were used in the regressions of Table A-X. The test concluded there was no significant problem of non constant error variance in the data.

Principal Product Data

Tables A-XVII to A-XX give samples of regression results for SET11M and SET12M. In general, the significance of the results indicate either no relationship or a negative relationship between ROS/ROA and market share. SET12M results are not better or worse than SET11M results.

When SET12M cases (SHO12M) are compared to the corresponding SET31M cases (SHO31M), the results are almost identical (see Tables A-XXI and A-XXII). Even when two possible outliers are excluded from the ROA regression, the results are identical. (Note the first outlier excluded was considered an outlier in all previous ROA regressions). These results give some confidence that data manipulation errors did not cause the negative market share results that are obtained with the principal product data.

Table A-VI

SET21M Regression Results with ROS

Mktshr	C4	AS	R^2	adjR^2
All Cases Mktshr ≥ 1% (N = 728) ++++				
.043 (1.95)**			.005	.004
.042 (2.01)**		.058 (7.48)***	.076	.074
.051 (2.21)**	-.016 (-1.16)		.007	.004
.046 (2.08)**	-.007 (-.55)	.058 (7.40)***	.077	.073
All GEO Cases Mktshr ≥ 1% (N = 446) ++++				
.027 (.98)			.002	-.000
.032 (1.22)		.049 (5.04)***	.056	.052
.042 (1.45)*	-.027 (-1.47)*		.007	.002
.039 (1.37)*	-.012 (-.65)	.048 (4.85)***	.057	.051

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-VII

SET31M Regression Results with ROS

All Cases Mktshr $\geq$ 1.0% (N = 345) ++++

Mktshr	C4	AS	R^2	adjR^2
.069 (1.76)**			.009	.006
.070 (1.85)**		.045 (4.70)***	.069	.063
.046 (1.08)	.030 (1.29)*		.014	.008
	.044 (2.13)**	.045 (4.76)***	.072	.066
.045 (1.08)	.034 (1.50)*	.045 (4.76)***	.075	.067

All GEO Cases Mktshr $\geq$ 1.0% (N = 207) ++

Mktshr	C4	AS	R^2	adjR^2
.081 (1.83)**			.016	.011
.089 (2.03)**		.032 (2.75)***	.051	.042
.072 (1.47)*	.013 (.43)		.017	.007
	.043 (1.21)**	.030 (2.62)***	.039	.029
.081 (1.67)*	.012 (.39)	.032 (2.74)***	.052	.038

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-VIII

SET41M Regression Results with ROS

Mktshr	C4	AS	R^2	adjR^2
All Cases Mktshr ≥ 1.0% (N = 89) +++				
.104			.028	.017
(1.60)*				
.136		.085	.156	.136
(2.22)**		(3.60)***		
.128	-.024		.033	.010
(1.69)**	(-.63)			
.128	.009	.087	.156	.126
(1.80)**	(.24)	(3.53)***		
All GEO Cases Mktshr ≥ 1.0% (N = 68) +				
.074			.018	.003
(1.09)				
.101		.077	.113	.086
(1.52)*		(2.64)***		
.118	-.049		.036	.006
(1.50)*	(-1.11)			
.106	-.006	.076	.113	.072
(1.38)*	(-.13)	(2.36)**		

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-IX

SET21M Regression Results with ROA

Mktshr	C4	SA	R^2	adjR^2
All Cases Mktshr ≥ 1.0% (N=717) ++++				
.049 (1.24)			.002	.001
.067 (1.79)**		.044 (8.85)***	.101	.098
.045 (1.10)	.007 (.28)		.002	-.000
.077 (1.96)**	-.020 (-.82)	.044 (8.88)***	.102	.098
All GEO Cases Mktshr ≥ 1.0% (N = 443) ++++				
.062 (1.34)*			.004	.002
.057 (1.27)		.045 (6.33)***	.087	.083
.058 (1.17)	.006 (.21)		.004	-.000
.071 (1.49)*	-.025 (-.83)	.046 (6.38)***	.088	.082

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-X

SET31M Regression Results with ROA

Mktshr	C4	SA	R^2	adjR^2
All Cases Mktshr ≥ 1% (N = 336) ++++				
.102 (1.41)*			.006	.003
.127 (2.00)**		.076 (9.99)***	.235	.231
.065 (.82)	.050 (1.17)		.010	.004
	.054 (1.56)*	.075 (9.84)***	.232	.227
.104 (1.50)*	.031 (.82)	.075 (9.93)***	.237	.230
GEO Cases Mktshr ≥ 1% (N = 204) ++++				
.179 (2.28)**			.025	.020
.158 (2.20)**		.070 (6.25)***	.184	.176
.152 (1.75)**	.040 (0.74)		.028	.018
	.048 (1.05)*	.070 (6.14)***	.169	.161
.153 (1.92)**	.007 (.15)	.070 (6.19)***	.184	.172

Parameter significance levels are (one tailed t test): *** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are: ++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XI

SET41M Regression Results with ROA

Mktshr	C4	AS	R^2	adjR^2
All Cases Mktshr ≥ 1.0% (N = 87) +++				
.299 (2.64)***			.076	.065
.269 (2.43)***		.036 (2.45)***	.137	.117
.269 (2.03)**	.029 (.44)		.078	.056
.298 (2.31)**	-.031 (-.44)	.039 (2.43)***	.139	.108
All GEO Cases Mktshr ≥ 1% (N = 68) ++				
.215 (1.73)**			.043	.029
.196 (1.61)*		.037 (2.06)**	.102	.074
.217 (1.50)*	-.002 (-.03)		.043	.014
.270 (1.90)**	-.087 (-1.01)	.046 (2.29)**	.116	.074
Without One Outlier (N = 67)				
.163 (1.29)	-.032 (-.42)	.025 (1.36)*	.055	.010
Without Two Outliers (N = 66)				
.115 (1.02)	.002 (.03)	.012 (.72)	.035	-.011

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XII

Improvement in Mktshr Variable Significance with Large Average Market Share Subset

		All Cases	GEO Cases
SET 21M	ROS	NONE	NONE
	ROA	NONE	SLIGHT (Table A-XIII)
SET 31M	ROS	NONE	YES (Table A-XIV)
	ROA	NONE	YES (Table A-XV)
SET 41M	ROS	NONE	SLIGHT
	ROA	NONE	YES (Table A-XVI)

NOTE: Average market share is given in referenced Tables and Table A-III.

Table A-XIII

SET21M Regression Result ROA GEO Cases

Mktshr	C4	SA	R^2	adjR^2
		Mktshr ≥ 5% (N = 221) ++++		
		Average Market Share = 15.97%		
.076 (1.28)			.007	.003
.069 (1.22)		.043 (4.15)***	.080	.072
.095 (1.48)*	-.036 (-.75)		.010	.001
.099 (1.60)*	-.055 (-1.21)	.044 (4.26)***	.086	.074

Parameter significance levels are (one tailed t test): *** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are: ++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XIV

SET31M Regression Result ROS
GEO Cases

Mktshr	C4	AS	R^2	adjR^2
		Mktshr ≥ 5% (N = 1Ø8) ++		
		Average Market Share = 13.88%		
.Ø92 (1.73)**			.Ø27	.Ø18
.1Ø9 (2.Ø8)**		.Ø67 (2.49)***	.Ø82	.Ø64
.128 (2.Ø1)**	-.Ø49 (-1.Ø3)		.Ø37	.Ø19
	.ØØ7 (.17)	.Ø6Ø (2.2Ø)**	.Ø44	.Ø26
.148 (2.37)**	-.Ø53 (-1.14)	.Ø68 (2.54)**	.Ø93	.Ø67

Parameter significance levels are (one tailed t test):
*** = Ø.Ø1, ** = Ø.Ø5, * = Ø.1Ø

Regression relation significance levels (F test) are:
++++ = Ø.ØØ1, +++ = Ø.Ø1, ++ = Ø.Ø5, + = Ø.1Ø

Table A-XV

SET31M Regression Results ROA GEO Cases

Mktshr	C4	SA	R^2	$adjR^2$
		Mktshr ≥ 5% (N = 107) ++++		
		Average Market Share = 13.81%		
.220 (2.47)***			.055	.046
.182 (2.24)**		.072 (4.87)***	.230	.215
.287 (2.71)***	-.092 (-1.16)		.067	.049
	-.009 (-.15)	.075 (4.97)***	.193	.178
.266 (2.78)***	-.116 (-1.62)*	.074 (5.00)***	.249	.227
		Mktshr ≥ 7% (N = 80) ++++		
		Average Market Share = 16.48%		
.200 (1.94)**			.046	.034
.176 (1.88)**		.072 (4.21)***	.224	.204
.288 (2.35)**	-.124 (-1.32)		.067	.043
	-.035 (-.48)	.074 (4.27)***	.191	.170
.286 (2.60)***	-.155 (-1.83)**	.074 (4.41)***	.257	.228

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XVI

SET41M Regression Results ROA
GEO Cases

Mktshr	C4	SA	R^2	adjR^2
With Outliers Mktshr ≥ 5% (N = 26) ++				
Average Market Share = 17.93%				
.140 (.64)			.017	-.024
.103 (.51)		.109 (2.35)**	.207	.138
.406 (1.29)	-.246 (-1.16)		.071	-.009
.596 (2.21)**	-.470 (-2.49)**	.149 (3.32)***	.381	.297
Exclude One Outlier Mktshr ≥ 5% (N = 25)				
Average Market Share = 17.80%				
.108 (.63)			.017	-.026
.095 (.56)		.050 (1.16)	.074	-.010
.317 (1.28)	-.193 (-1.16)		.074	-.010
.454 (1.87)**	-.341 (-1.97)**	.089 (1.97)**	.218	.107

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XVII

SET11M Regression Results with ROS

Mktshr	C4	AS	R^2	$adjR^2$
		Mktshr ≥ 1.0% (N = 205) ++++		
-.038 (-.71)			.002	-.002
-.010 (-.19)		.069 (4.53)***	.094	.085
-.026 (-.45)	-.015 (-.62)		.004	-.005
.005 (.10)	-.019 (-.80)	.070 (4.54)***	.097	.084
		Mktshr ≥ 7.0% (N = 76) +++ Average Market Share = 15.71%		
-.174 (-1.84)**			.043	.031
-.132 (-1.48)*		.109 (3.54)***	.184	.161
-.153 (-1.52)*	-.030 (-.67)		.049	.023
-.100 (-1.06)	-.043 (-1.03)	.112 (3.62)***	.196	.162

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XVIII

SET11M Regression Results with ROA

Mktshr	C4	SA	R^2	adjR^2
Mktshr ≥ 1.Ø% (N = 2Ø6) ++				
-.ØØ3 (-.Ø4)			.ØØØ	-.ØØ5
-.Ø35 (-.42)		.Ø28 (2.88)***	.Ø39	.Ø3Ø
.Ø13 (.15)	-.Ø21 (-.55)		.ØØ1	-.ØØ8
-.Ø19 (-.22)	-.Ø2Ø (-.55)	.Ø28 (2.87)***	.Ø41	.Ø26
Mktshr ≥ 7.Ø% (N = 74)				
Average Market Share = 15.85%				
-.152 (-1.13)			.Ø17	.ØØ4
-.176 (-1.3Ø)*		.Ø24 (1.5Ø)*	.Ø47	.Ø21
-.12Ø (-.84)	-.Ø46 (-.73)		.Ø25	-.ØØ3
-.146 (-1.Ø2)	-.Ø42 (-.66)	.Ø23 (1.46)*	.Ø53	.Ø13

Parameter significance levels are (one tailed t test):
*** = Ø.Ø1, ** = Ø.Ø5, * = Ø.1Ø

Regression relation significance levels (F test) are:
++++ = Ø.ØØ1, +++ = Ø.Ø1, ++ = Ø.Ø5, + = Ø.1Ø

Table A-XIX

SET12M Regression Results with ROS

Mktshr	C4	AS	R^2	adjR^2
		Mktshr ≥ 1.0% (N= 115) +++		
-.087 (-1.22)			.013	.004
-.050 (-.73)		.083 (3.72)***	.121	.106
-.081 (-1.05)	-.008 (-.20)		.013	-.004
-.032 (-.43)	-.023 (-.63)	.084 (3.75)***	.124	.101
		Mktshr ≥ 8.0% (N=48) ++		
		Average Market Share = 17.09%		
-.266 (-2.36)**			.108	.089
-.206 (-1.80)**		.071 (1.80)**	.168	.131
-.238 (-2.02)**	-.043 (-.78)		.120	.081
-.167 (-1.38)*	-.055 (-1.02)	.076 (1.91)**	.187	.132

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XX

SET12M Regression Results with ROA

Mktshr	C4	SA	R^2	adjR^2
Mktshr > 1.0% (N = 114)				
-.034 (-.32)			.001	-.008
-.057 (-.53)		.019 (1.32)*	.016	-.001
-.022 (-.20)	-.016 (-.28)		.002	-.016
-.048 (-.41)	-.011 (-.20)	.019 (1.30)*	.017	-.010
Mktshr > 7.0% (N = 51)				
Average Market Share = 16.40%				
-.184 (-1.13)			.025	.005
-.225 (-1.31)*		.019 (.80)	.038	-.002
-.111 (-.64)	-.089 (-1.13)		.051	.011
-.150 (-.80)	-.081 (-1.01)	.015 (.62)	.058	-.002

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XXI

Compare Common Cases: SET12M vs SET31M with ROS

Mktshr	C4	AS	R^2	adjR^2
SHO12M Mktshr ≥ 1% (N = 31)				
-.220 (-1.06)			.038	.004
-.152 (-.78)		.097 (2.30)**	.190	.133
-.156 (-.66)	-.053 (-.57)		.048	-.019
-.112 (-.50)	-.034 (-.39)	.095 (2.22)**	.195	.105
SHO31M Mktshr ≥ 1% (N = 32)				
-.217 (-1.21)			.047	.015
-.153 (-.90)		.094 (2.29)**	.192	.137
-.169 (-.82)	-.042 (-.46)		.054	-.011
-.125 (-.64)	-.026 (-.30)	.093 (2.21)**	.195	.108

Parameter significance levels are (one tailed t test):
*** = 0.01, ** = 0.05, * = 0.10

Regression relation significance levels (F test) are:
++++ = 0.001, +++ = 0.01, ++ = 0.05, + = 0.10

Table A-XXII

Compare Common Cases: SET12M vs SET31M ROA

Mktshr	C4	SA	R^2	$adjR^2$
W/O 1 Outlier SHO12M Mktshr ≥ 1.Ø% (N = 3Ø) ++				
-.392 (-.86)			.Ø26	-.ØØ9
-.395 (-.98)		.Ø86 (2.91)***	.258	.2Ø3
-.426 (-.8Ø)	.Ø28 (.13)		.Ø26	-.Ø46
-.3Ø4 (-.64)	-.Ø75 (-.4Ø)	.Ø88 (2.89)***	.262	.177
Without Two Outliers (N = 29)				
-.ØØ4 (-.Ø1)	-.Ø36 (-.29)	-.ØØ3 (-.12)	.ØØ6	-.113
W/O One Outlier SHO31M Mktshr ≥ 1.Ø% (N = 31) ++				
-.384 (-.97)			.Ø32	-.ØØ2
-.385 (-1.1Ø)		.Ø85 (2.96)***	.262	.21Ø
-.435 (-.94)	.Ø46 (.22)		.Ø33	-.Ø36
-.326 (-.79)	-.Ø53 (-.28)	.Ø87 (2.91)***	.264	.183
Without Two Outliers (N = 3Ø)				
.ØØ1 (Ø)	-.Ø3Ø (-.24)	-.ØØ3 (-.14)	.ØØ4	-.11Ø

Parameter significance levels are (one tailed t test):
*** = Ø.Ø1, ** = Ø.Ø5, * = Ø.1Ø

Regression relation significance levels (F test) are:
++++ = Ø.ØØ1, +++ = Ø.Ø1, ++ = Ø.Ø5, + = Ø.1Ø

Appendix B: Market Share Comparison with Trinet

This Appendix gives additional results for the comparison between the market share that is computed from Compustat and census data and the market share that is obtained from the Trinet Establishment Database. Table B-I provides the Trinet and Compustat data for the forty-one segments used in the comparison. The "TKR" column in Table B-I refers to the New York Stock Exchange symbol for the company whose segment is listed. Recall from Chapter three that a Compustat market share is computed two ways by using first the 1982 value of shipments and then the 1984 Trinet market share (Table VII page 64). The comparisons in this Appendix are also done for both Compustat market shares.

While the simple correlation coefficient indicates a linear relationship between market share measures it does not give any information for the values of the slope and intercept of the linear relation. The following regression model was used to estimate those values for the market shares:

$$T_{mktshr} = b + m\, C_{mktshr}$$

where

T_{mktshr} = Trinet Market Share

C_{mktshr} = Compustat Market Share

The closer m is to one, the closer the market share measures are to each other. m and b are given for the Compustat market shares that were within 5% of the trinet shares in

Table B-I

Market Share Comparison Data

TKR	SIC	TRINET Mktshr	TRINET SALES	Mktshr*	COMPUSTAT SALES	COMPUSTAT PROFITS	Mktshr**
R	2295	1.73	17.10	22.73	276.74	19.09	26.20
KMB	2621	1.61	331.60	10.82	2289.15	290.10	9.55
OLN	2621	.77	158.30	1.12	236.91	25.10	.99
PG	2841	39.02	3967.00	71.13	6519.06	1117.48	68.22
RLM	3411	3.89	381.70	14.78	1605.38	93.24	16.68
BLL	3411	2.81	276.10	6.54	710.31	70.10	7.38
TXN	3674	6.70	1079.00	13.74	1820.50	304.23	12.27
MOT	3674	8.34	1347.00	12.02	1592.97	304.70	10.74
BS	3743	2.05	79.00	16.16	559.30	.00	14.18
EK	3861	18.15	3153.00	29.93	5116.20	941.14	25.81
XRX	3861	17.40	3024.00	20.69	3537.07	.00	17.84
BA	3721	22.03	7121.00	29.62	8531.75	363.00	24.81
MD	3721	19.12	6175.00	25.63	7382.20	539.70	21.47
GD	3721	8.13	2628.00	13.05	3759.49	323.49	10.93
GQ	3721	6.39	2065.00	8.16	2350.75	169.38	6.84
NOC	3721	6.64	2146.00	8.90	2563.90	203.30	7.46
PH	3714	.38	174.50	.62	221.49	24.68	.41
BOR	3714	2.55	1176.00	2.25	807.72	138.62	1.49
FTR	3714	1.88	860.90	2.01	722.14	66.18	1.33
ROK	3714	2.06	955.30	3.91	1402.88	179.42	2.59
TRW	3714	1.95	891.40	3.42	1224.82	95.38	2.26
HON	3662	2.65	965.80	3.46	1149.40	82.61	3.08
WX	3662	1.76	636.80	10.56	3508.11	312.94	9.41
ESY	3662	.73	264.30	2.21	732.97	96.87	1.97
HRS	3662	2.81	1022.00	3.11	1031.50	71.90	2.77
MOT	3662	3.93	1432.00	6.17	2050.77	171.55	5.50
RTN	3662	2.87	1042.00	8.29	2753.19	408.50	7.39
ROK	3662	6.60	2399.00	5.74	1904.83	183.93	5.11
TRW	3662	.79	284.90	6.02	1998.24	158.04	5.36
FIR	3714	.46	214.70	.81	290.52	24.78	.54
SPD	3714	.26	119.50	.46	164.16	15.80	.30
UTX	3714	1.01	467.20	7.67	2751.73	208.45	5.08
ETN	3714	1.86	855.40	3.50	1253.40	297.24	2.32
GE	3662	3.97	1443.00	10.62	3528.72	387.49	9.47
TRR	3662	.46	169.40	.22	73.24	10.65	.20
RCA	3662	4.33	1571.00	4.34	1442.30	104.50	3.87
RTN	3721	2.58	832.70	2.03	585.63	5.69	1.70
SMF	3662	.81	295.30	1.89	626.43	33.99	1.68
UTX	3721	5.42	1751.00	6.98	2010.47	170.07	5.85
LK	3721	10.07	3254.00	11.26	3243.89	236.71	9.43
PRD	3861	4.10	712.90	4.35	742.94	23.78	3.75

* with 1982 Census Value of Shipment
** with 1984 Trinet Value of Shipment

Table B-II

Compustat Market Share Relation to Trinet Market Share

	Compustat Value of Shipment (n = 27)	Trinet Value of Shipment (n = 32)
b	-Ø.Ø9	-Ø.27
m	Ø.78	Ø.88

Table B-II. The Trinet value of shipment gives Compustat market share estimates closer to the Trinet market share.

Another comparison between the market shares is their performance in the basic market share-profitability relation:

$$ROS = a_1 + a_2 \text{ Mktshr}$$

where ROS = Profits/Sales

The relation is estimated using Compustat reported profits in the ROS computation. Trinet sales are used for the Trinet ROS computation. Table B-III shows the market share coefficients for the alternate market shares. There are some small differences in the way Trinet sales and market shares estimate the relation compared to the Compustat sales and market share. The differences do not appear significant and could be caused by differences in sales as much as market share.

Table B-III

Trinet Market Share Comparison Regressions on ROS

	41 Cases	32 Cases	27 Cases
Trinet Mktshr	-Ø.42Ø (-Ø.88)	-Ø.868 (-2.12)**	-Ø.771 (-1.79)**
Compustat Mktshr (Trinet Value of Shipment)	Ø.Ø47 (Ø.68)	-Ø.235 (-1.67)*	N/A
Compustat Mktshr (Census Value of Shipment)	Ø.Ø45 (Ø.69)	N/A	-Ø.259 (-1.25)

Parameter significance levels are (one tailed t test):
*** = Ø.Ø1, ** = Ø.Ø5, * = Ø.1Ø

Appendix C: DATA

This appendix provides a listing of the segment data used for the analysis in chapter four. The 207 segments are listed by increasing 4 digit SIC code (SSIC1) which identifies the industry associated with each segment. Each segment is uniquely identified by a Compustat company number and segment identification code (SID). The following measures are given:

Net Sales (SALES - millions $)
Profit (millions $)
Assets (millions $)
Market Share (MKTSHR - %)
Number of Employees (EMPLOY - thousands)
Cost of Goods Sold (COSTOFGOODS - millions $)
Growth (GROW)
Advertising Expense / Sales (ADVSAL)
Census C4 (%)

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
2032.	26609.	3.	443.986	54.358	112.098	16.280	7.616	209.469	.141	.080	63.
2041.	460043.	1.	271.243	18.072	86.085	7.009	2.501	226.355	.132	.014	33.
2065.	890516.	1.	52.211	4.175	25.366	1.136	.944	30.089	.177	.038	38.
2065.	852245.	8.	221.023	39.709	148.122	4.810	5.569	110.279	.130	.047	38.
2084.	191216.	99.	562.109	34.823	283.425	34.225	5.032	303.857	.219	.057	49.
2086.	713448.	1.	1380.746	184.317	559.020	13.611	30.182	680.204	.213	.061	15.
2086.	718167.	99.	437.089	41.893	692.125	4.309	5.601	261.761	.291	.071	15.
2295.	758556.	5.	48.182	9.282	15.573	4.561	1.280	38.952	.237	.000	39.
2295.	909160.	3.	289.921	10.060	149.972	27.444	5.598	227.152	.060	.019	39.
2451.	886498.	1.	50.411	2.063	12.736	1.389	.803	42.407	.161	.000	24.
2621.	158525.	5.	983.094	133.078	749.288	7.033	12.829	757.106	.111	.000	23.
2621.	373298.	2.	939.108	88.333	984.667	6.719	8.952	721.246	.198	.000	23.
2621.	962166.	13.	547.459	17.892	182.955	3.917	7.272	377.935	.157	.002	23.
2621.	228669.	1.	674.341	81.706	574.118	4.824	9.012	525.355	.064	.009	23.
2621.	252669.	4.	150.705	8.202	169.671	1.078	2.751	121.575	.133	.000	23.
2621.	494368.	3.	1012.811	135.425	452.183	7.246	16.271	639.913	.107	.023	23.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
2621.	582834.	8.	1006.767	87.018	492.567	7.203	13.679	791.014	.275	.000	23.
2621.	793453.	12.	491.280	88.803	364.514	3.514	7.181	381.542	.152	.002	23.
2621.	809877.	4.	824.466	89.094	728.066	5.898	10.594	521.956	.135	.018	23.
2621.	680665.	3.	182.736	18.906	95.792	1.307	2.754	138.443	.059	.012	23.
2621.	607059.	12.	525.189	39.545	623.950	3.757	8.971	391.594	.081	.000	23.
2621.	97383.	3.	679.940	111.761	658.830	4.864	10.155	526.809	.111	.000	23.
2631.	97383.	4.	605.873	38.267	239.018	8.210	9.049	469.423	.111	.000	27.
2631.	228669.	2.	359.442	7.227	247.374	4.870	4.804	280.029	.064	.009	27.
2631.	252669.	1.	397.937	29.293	238.956	5.392	7.264	321.020	.133	.000	27.
2631.	460146.	2.	1312.084	79.861	857.406	17.779	17.283	936.117	.131	.000	27.
2631.	582834.	6.	504.819	59.397	251.433	6.840	6.859	396.635	.275	.000	27.
2641.	248631.	3.	50.663	4.395	31.126	1.441	1.060	30.191	.148	.011	30.
2641.	878504.	1.	48.319	2.735	23.803	1.375	.960	38.809	.087	.000	30.
2641.	478160.	4.	179.055	16.662	143.318	5.094	3.561	86.180	.200	.045	30.
2641.	604059.	2.	540.496	130.941	380.473	15.377	10.403	270.404	.171	.012	30.
2648.	248631.	2.	149.802	18.813	79.326	21.188	3.133	89.271	.148	.011	38.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
2721.	728117.	6.	93.053	1.336	25.026	1.395	1.624	74.804	.332	.114	22.
2721.	161177.	4.	109.405	-.020	46.420	1.640	.511	96.436	.392	.018	22.
2731.	554790.	5.	156.035	21.393	178.850	2.890	5.107	85.741	.080	.041	17.
2812.	252741.	5.	356.135	88.848	368.373	20.291	2.545	245.674	.096	.004	66.
2812.	302491.	6.	574.480	85.252	502.562	32.732	9.945	426.479	.271	.000	66.
2812.	459884.	6.	181.430	15.911	101.807	10.337	1.326	129.159	.152	.000	66.
2812.	451542.	2.	60.385	15.593	48.937	3.441	.642	43.672	.188	.000	66.
2819.	25321.	4.	549.526	34.172	496.793	6.349	9.345	328.683	.138	.058	33.
2819.	383883.	9.	1653.195	170.195	1073.764	19.100	22.383	1126.811	.084	.000	33.
2819.	611662.	8.	917.023	208.559	592.809	10.595	11.864	630.800	.092	.004	33.
2819.	9158.	2.	302.085	26.268	205.759	3.490	4.258	160.323	.097	.000	33.
2819.	492386.	2.	403.011	29.591	524.661	4.656	2.132	320.216	-.043	.000	33.
2819.	629853.	2.	90.401	17.083	19.653	1.044	.805	47.536	.069	.000	33.
2841.	619356.	2.	112.542	14.795	31.384	1.948	1.808	57.552	.201	.061	59.
2841.	742718.	1.	2195.423	254.941	666.282	38.006	14.924	1467.871	.281	.061	59.
2842.	25321.	5.	244.964	15.712	102.443	7.904	4.166	146.518	.138	.058	41.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
2842.	775371.	2.	144.445	22.394	99.024	4.661	1.584	94.135	.115	.000	41.
2842.	110097.	4.	195.529	25.868	72.788	6.309	2.679	71.991	.118	.179	41.
2842.	189054.	1.	408.687	64.691	164.548	13.187	2.846	286.346	-.352	.070	41.
2842.	746252.	3.	92.294	9.440	27.097	2.978	1.194	67.434	.280	.051	41.
2851.	784015.	1.	362.067	32.085	192.724	5.247	6.359	259.204	.273	.020	24.
2851.	824348.	1.	755.980	21.091	355.101	10.954	13.138	525.351	.093	.022	24.
2869.	611662.	7.	440.832	105.021	621.509	1.875	5.703	303.238	.092	.004	38.
2869.	905581.	1.	2013.262	238.148	2262.560	8.563	30.665	1419.757	.118	.010	38.
2869.	48825.	6.	1573.872	92.953	1679.511	6.694	6.900	1215.163	.121	.000	38.
2869.	718507.	2.	1258.129	79.659	759.080	5.351	7.044	889.989	.114	.000	38.
2869.	977385.	2.	276.385	26.541	143.597	1.176	2.273	223.736	.189	.009	38.
2869.	909160.	2.	274.226	38.045	200.284	1.166	5.295	214.855	.060	.019	38.
2869.	277461.	2.	843.048	195.217	865.977	3.586	11.189	451.259	.175	.032	38.
2891.	25321.	6.	249.689	14.688	202.284	11.976	4.246	149.344	.138	.058	24.
2891.	53627.	3.	147.551	10.277	63.120	7.077	2.268	95.234	.144	.000	24.
2891.	252165.	4.	134.845	18.082	74.279	6.468	1.447	84.533	.165	.000	24.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
2891.	291210.	5.	124.371	11.012	52.147	5.965	3.172	81.620	.123	.000	24.
2891.	671400.	6.	49.029	6.441	34.376	2.352	2.414	35.084	.272	.000	24.
3079.	263534.	2.	1726.184	281.496	1218.549	6.457	22.717	1215.770	.122	.009	7.
3079.	611662.	6.	868.095	47.302	709.078	3.247	11.231	597.143	.092	.004	7.
3079.	297659.	2.	330.931	29.693	199.481	1.238	3.977	245.950	.109	.000	7.
3079.	211452.	6.	489.095	25.434	304.367	1.829	7.335	413.250	.077	.000	7.
3241.	451542.	1.	305.218	44.474	357.261	8.681	3.247	220.742	.188	.000	24.
3241.	542290.	4.	433.115	45.387	350.359	12.318	5.943	327.646	.268	.000	24.
3241.	736245.	4.	65.005	7.246	76.277	1.849	1.112	52.673	.143	.000	24.
3312.	17372.	1.	697.209	49.888	411.252	1.489	13.485	561.984	.303	.003	45.
3312.	42170.	8.	2420.819	140.554	1064.933	5.170	28.083	2005.091	.228	.000	45.
3312.	912656.	5.	7722.835	-33.656	5031.816	16.492	124.367	6978.529	.150	.000	45.
3334.	761763.	3.	1540.459	162.979	1515.733	30.852	21.285	1247.727	.203	.000	76.
3411.	58498.	1.	300.337	44.043	173.786	3.503	5.208	234.516	.149	.000	59.
3411.	761763.	4.	1045.764	66.335	341.147	12.199	14.449	847.038	.203	.000	59.
3411.	24843.	1.	1920.034	136.000	887.294	22.397	26.307	1507.584	.157	.018	59.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
3411.	211452.	4.	1530.224	102.958	606.187	17.850	22.950	1292.928	.077	.000	59.
3411.	228255.	1.	686.263	69.770	346.895	8.005	10.183	573.554	.201	.000	59.
3421.	934488.	8.	134.976	13.174	129.683	17.823	2.888	57.895	.132	.136	53.
3421.	375766.	1.	561.308	166.975	343.649	74.120	10.791	248.345	.078	.136	53.
3421.	4816.	2.	13.840	2.998	8.897	1.828	.589	9.378	.178	.016	53.
3423.	93545.	3.	72.970	18.330	33.742	2.992	1.011	53.771	.263	.000	25.
3423.	833034.	2.	268.108	56.799	204.905	10.993	4.893	127.701	.214	.000	25.
3423.	854616.	1.	229.239	36.253	134.164	9.400	5.372	149.917	.177	.021	25.
3423.	932355.	7.	120.197	16.749	66.556	4.929	2.578	87.383	.152	.011	25.
3452.	609762.	2.	77.312	12.582	43.409	2.105	1.352	58.796	.336	.000	13.
3452.	452308.	1.	125.808	20.448	60.254	3.426	2.919	75.224	.177	ppp~```ppp	13.
3452.	784626.	1.	140.480	12.865	79.159	3.825	4.073	104.164	.123	.000	13.
3452.	291210.	4.	133.221	8.519	65.165	3.627	3.398	87.428	.123	.000	13.
3452.	761688.	6.	97.162	13.388	53.593	2.646	2.024	65.299	.155	.000	13.
3499.	439316.	1.	178.430	27.266	74.784	4.423	3.173	142.770	.448	.000	13.
3499.	854231.	6.	65.375	9.131	43.792	1.621	1.431	41.360	.430	.029	13.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
3499.	253651.	1.	214.464	20.335	155.790	5.317	5.549	153.245	.200	.000	13.
3499.	826690.	1.	296.615	46.276	195.576	7.353	3.588	207.396	.240	.000	13.
3499.	29717.	4.	168.441	11.335	117.229	4.176	4.389	123.554	.178	.000	13.
3523.	19645.	1.	482.573	54.745	150.138	4.496	8.176	362.377	.146	.000	46.
3523.	459578.	2.	1718.432	167.137	642.781	16.010	25.643	1383.254	.115	.000	46.
3523.	964066.	3.	268.933	10.339	117.177	2.506	2.168	236.727	-.126	.000	46.
3531.	26573.	1.	215.631	27.941	135.204	1.527	3.872	178.570	.196	.000	47.
3531.	149123.	1.	4212.350	791.057	2695.302	29.827	54.545	3114.239	.234	.000	47.
3531.	181396.	3.	413.759	32.550	144.555	2.930	6.249	321.626	.149	.010	47.
3531.	413342.	3.	253.063	33.148	191.380	1.792	4.329	182.248	.037	.006	47.
3531.	755111.	99.	192.329	20.537	96.202	1.362	3.855	154.262	.149	.010	47.
3531.	459578.	3.	572.855	24.575	252.316	4.056	8.548	461.120	.115	.000	47.
3531.	29717.	3.	163.189	13.704	89.066	1.156	4.164	119.701	.178	.000	47.
3533.	42170.	4.	603.837	84.639	175.865	14.104	4.100	500.140	.228	.000	30.
3533.	57264.	1.	513.551	88.504	418.442	11.995	8.976	251.136	.649	.000	30.
3533.	89671.	1.	151.046	45.178	148.251	3.528	1.585	83.961	.257	.000	30.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
3533.	261597.	1.	620.610	112.724	330.536	14.496	12.007	390.755	.203	.000	30.
3533.	444492.	4.	315.382	68.678	349.540	7.367	6.080	200.668	.463	.005	30.
3533.	629156.	5.	526.243	98.051	424.326	12.292	7.456	369.812	.193	.000	30.
3533.	832110.	6.	299.746	77.563	287.341	7.001	4.716	149.672	.275	.006	30.
3533.	481196.	7.	57.960	14.918	29.713	1.354	1.019	40.174	.153	.000	30.
3537.	19645.	6.	181.920	21.154	67.900	7.815	3.082	136.609	.146	.000	45.
3537.	181396.	2.	416.306	51.052	148.794	17.884	6.287	323.606	.149	.010	45.
3537.	278058.	4.	310.008	11.306	212.996	13.318	6.815	221.023	.322	.003	45.
3541.	4626.	12.	248.394	25.772	115.940	7.218	5.526	181.199	.327	.000	22.
3541.	115223.	2.	84.073	7.267	57.414	2.443	2.368	58.852	.364	.000	22.
3541.	172172.	1.	278.334	38.466	196.063	8.088	6.302	200.201	.192	.000	22.
3541.	297425.	4.	54.860	13.683	28.257	1.594	1.330	34.064	.335	.011	22.
3541.	375046.	3.	178.937	33.981	104.120	5.200	3.789	117.253	.322	.000	22.
3541.	377352.	1.	110.516	16.044	77.295	3.212	3.079	64.435	.276	.000	22.
3541.	609150.	1.	55.701	11.068	44.691	1.619	1.164	40.084	.204	.000	22.
3541.	81689.	4.	176.681	20.008	85.756	5.134	3.790	138.355	.166	.008	22.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
3541.	313549.	99.	65.897	9.158	32.597	1.915	1.702	49.543	.164	.000	22.
3541.	521894.	6.	124.641	16.646	62.131	3.622	2.725	93.372	.442	.000	22.
3546.	91797.	1.	418.727	48.666	270.634	24.029	8.335	240.786	.183	.049	50.
3546.	167898.	4.	90.109	10.792	74.981	5.171	2.499	62.944	.249	.009	50.
3546.	216669.	1.	244.003	52.250	199.005	14.002	6.008	169.659	.152	.000	50.
3546.	456866.	4.	185.918	30.066	130.367	10.669	4.011	125.242	.103	.000	50.
3561.	260003.	11.	45.847	7.990	33.362	1.100	.909	29.340	.279	.000	17.
3561.	456866.	5.	97.935	17.213	66.067	2.349	2.113	65.973	.103	.000	17.
3561.	582562.	6.	71.471	3.815	46.563	1.714	1.632	52.310	.098	.016	17.
3561.	701094.	1.	337.532	41.532	157.619	8.096	8.665	248.842	.682	.011	17.
3561.	852308.	1.	89.827	9.135	57.298	2.154	1.545	67.213	.099	.000	17.
3561.	99725.	3.	336.719	60.804	175.564	8.077	3.037	257.722	.145	.000	17.
3562.	887389.	1.	617.913	69.348	463.939	21.363	13.780	415.099	.135	.000	56.
3562.	872649.	4.	749.330	71.675	414.189	25.907	19.182	532.455	.160	.003	56.
3563.	824348.	4.	42.664	2.014	27.284	1.908	.741	29.648	.093	.022	45.
3563.	261597.	2.	476.622	114.135	152.985	21.318	6.381	300.096	.203	.000	45.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
3563.	481196.	6.	161.525	20.620	105.006	7.224	2.840	111.959	.153	.000	45.
3563.	216669.	2.	314.229	63.737	313.374	14.054	4.764	218.488	.152	.000	45.
3563.	456866.	1.	368.611	70.056	272.999	16.487	7.953	248.311	.103	.000	45.
3563.	753228.	1.	45.131	8.057	27.643	2.019	1.044	22.676	.735	.014	45.
3563.	891067.	1.	53.420	6.131	24.302	2.389	1.382	43.644	.135	.000	45.
3563.	158663.	2.	77.107	6.819	60.327	3.449	1.815	44.609	.216	.040	45.
3563.	459578.	99.	181.225	11.305	115.810	8.106	2.704	145.877	.115	.000	45.
3563.	922204.	3.	47.136	4.653	33.231	2.108	1.351	30.368	.140	.013	45.
3569.	458702.	2.	119.878	6.016	50.404	3.829	1.761	99.274	.202	.000	10.
3569.	826690.	99.	90.993	14.083	52.136	2.906	1.101	63.623	.240	.000	10.
3569.	167898.	2.	84.737	-.866	88.361	2.707	2.350	59.191	.249	.009	10.
3569.	231561.	4.	107.961	15.665	91.083	3.449	1.911	80.183	.027	.000	10.
3569.	902878.	3.	60.205	8.007	34.494	1.923	1.545	44.195	.318	.000	10.
3622.	852206.	1.	611.844	118.094	360.945	20.458	16.684	392.939	.190	.000	42.
3622.	402784.	2.	33.619	3.260	17.990	1.124	1.011	23.250	.232	.013	42.
3622.	126501.	1.	121.464	16.465	61.576	4.061	5.854	89.556	.074	.000	42.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
3622.	443510.	6.	195.734	37.688	111.301	6.545	5.925	128.055	.233	.012	42.
3623.	89671.	3.	86.655	5.087	50.442	6.944	.909	48.168	.257	.000	47.
3623.	260003.	9.	68.631	15.168	66.925	5.500	1.361	43.920	.279	.000	47.
3623.	291011.	2.	576.984	95.007	274.450	46.236	12.264	371.348	.445	.007	47.
3652.	934436.	1.	506.339	72.682	264.295	40.314	4.169	329.134	.145	.074	48.
3662.	960402.	4.	1356.369	71.950	663.438	8.213	30.004	1048.197	.086	.003	20.
3662.	620076.	1.	954.545	129.481	664.564	5.780	30.041	575.799	.201	.008	20.
3662.	755111.	1.	1493.843	203.783	1323.749	9.046	29.941	1198.169	.149	.010	20.
3662.	882508.	3.	312.770	28.302	137.961	1.894	10.009	214.156	.246	.013	20.
3662.	774347.	2.	1037.437	77.737	457.612	6.282	20.148	822.671	.054	.002	20.
3662.	666807.	2.	214.832	13.959	101.104	1.301	3.594	174.177	.143	.000	20.
3662.	370838.	6.	228.042	39.752	105.878	1.381	5.399	154.105	.176	.000	20.
3674.	620076.	2.	520.027	97.848	365.678	8.526	16.366	313.690	.201	.008	42.
3674.	370118.	2.	111.626	13.731	62.989	1.830	5.107	81.531	.095	.000	42.
3674.	458140.	1.	332.334	88.323	287.221	5.449	8.251	148.025	.415	.020	42.
3674.	882508.	1.	764.246	91.393	464.698	12.530	24.458	523.284	.246	.013	42.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
3674.	872649.	1.	859.195	48.594	376.661	14.087	21.995	610.523	.160	.003	42.
3675.	452308.	4.	45.398	3.362	19.958	5.368	1.053	27.145	.177	.000	47.
3675.	2440.	1.	55.607	10.543	46.166	6.575	2.971	38.747	.448	.000	47.
3724.	746252.	2.	87.330	11.428	47.892	1.298	1.130	63.807	.280	.051	74.
3724.	300587.	6.	111.618	14.153	53.999	1.659	2.284	81.777	.634	.000	74.
3724.	701094.	2.	96.693	12.448	49.970	1.437	2.482	71.286	.682	.011	74.
3724.	369604.	9.	3688.820	441.248	2079.968	54.826	77.900	2600.247	.122	.013	74.
3724.	913017.	1.	2264.251	174.589	939.210	33.653	55.725	1598.873	.129	.000	74.
3743.	736202.	6.	65.472	1.972	32.627	1.169	1.247	52.954	.415	.000	51.
3743.	800.	1.	446.101	47.492	568.010	7.967	8.101	338.388	.161	.004	51.
3743.	29717.	2.	466.684	52.108	235.689	8.334	11.909	342.319	.178	.000	51.
3743.	361448.	3.	199.204	44.925	958.633	3.557	3.932	125.671	-.090	.000	51.
3825.	428236.	1.	430.719	127.405	240.985	13.436	10.810	184.618	.271	.016	33.
3825.	383492.	5.	346.116	59.869	237.722	10.797	7.543	231.309	.155	.010	33.
3825.	77851.	8.	41.485	.127	33.029	1.294	.988	27.622	.155	.028	33.
3832.	812302.	7.	64.400	8.367	41.964	3.509	1.535	28.603	.132	.045	30.

SSIC1	COMPANY	SID	SALES	PROFIT	ASSETS	MKTSHR	EMPLOY	COSTOFGOODS	GROW	ADVSAL	C4
3832.	934488.	7.	225.339	9.967	185.787	12.279	4.822	96.654	.132	.136	30.
3832.	428236.	4.	55.567	10.144	36.765	3.028	1.395	23.818	.271	.016	30.
3832.	922204.	2.	71.179	2.878	50.026	3.879	2.040	45.859	.140	.013	30.
3832.	714041.	3.	84.112	17.868	26.231	4.584	1.814	45.544	.695	.010	30.
3842.	668605.	4.	117.312	13.043	68.638	4.225	3.051	73.629	.132	.000	38.
3842.	30087.	1.	72.421	8.494	57.361	2.608	1.599	48.392	.053	.008	38.
3842.	75887.	3.	89.062	14.891	55.181	3.207	2.542	46.728	.145	.014	38.
3842.	478160.	2.	611.962	81.666	420.031	22.038	12.170	294.541	.200	.045	38.
3914.	637714.	1.	21.684	1.216	11.490	4.500	.332	15.691	-.040	.000	51.
3914.	682505.	5.	88.731	8.276	56.535	18.413	2.185	64.069	.225	.005	51.
3931.	982594.	1.	60.069	2.561	47.304	6.186	1.946	39.496	.021	.031	31.
3949.	713448.	4.	197.284	3.429	186.200	7.875	4.312	97.189	.213	.061	21.
3949.	680665.	99.	97.214	5.316	88.324	3.880	1.465	73.650	.059	.012	21.
3949.	748369.	2.	124.131	7.633	88.401	4.955	2.620	85.245	-.079	.046	21.
3951.	375766.	3.	151.021	15.206	125.459	22.111	2.903	66.818	.078	.136	50.

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