

To the Graduate Council:

I am submitting herewith a dissertation written by Granville M. Sawyer, Jr. entitled "A Longitudinal Analysis of Mergers and Acquisitions as Homogeneous Groups." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

Ronald E. Shrieves

Ronald E. Shrieves, Major Professor

We have read this dissertation
and recommend its acceptance:

G. M. Wachowicz

R. S. H. J.

John W. Philpot

Accepted for the Council:

Lew Mink

Vice Provost and Dean of the
Graduate School

A LONGITUDINAL ANALYSIS OF MERGERS AND ACQUISITIONS
AS HOMOGENOUS GROUPS

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Granville M. Sawyer, Jr.

March 1986

ABSTRACT

Many previous research efforts in finance have dealt with the issue of merger motives. In these studies, which were empirical in nature, data collection procedures were not designed to accommodate the analysis of intra-firm merger relationships. As a result of this, researchers were not able to determine if mergers over a multi-year period for an individual firm were related. The purpose of this study is to: (1) collect and analyze information which can be used to establish and evaluate longitudinal intra-firm merger relationships, and (2) evaluate the impact of these relationships on firms' financial performance via relevant measures of risk and return.

Data were collected on 295 mergers consummated between 1960 and 1978. Factor analysis was used to reduce the number of variables from 57 to 18 using Principal Components Analysis and Image extraction methods along with Varimax rotation procedures. All 295 mergers were clustered together using the 18 variables from factor analysis and 16 additional variables which were used to enhance development of cluster descriptions. Hypergeometric probability calculations were used to identify acquiring firms with unusual merger distribution patterns across clusters developed. Performance comparisons were then done between acquiring firms with three mergers, those with four or more

mergers but no unusual merger distribution patterns, and those acquiring firms with four or more mergers and unusual merger patterns.

Results showed that 38 percent of the firms analyzed had merger distribution patterns with less than a 5 percent probability of occurring by chance. Chi square tests were used to show that such a high proportion of firms with unusual merger distributions had less than a .01% probability of occurring by chance alone. Therefore, in the sample studied, an unusually large number of firms did show unlikely merger patterns. No significant performance differences were detected between any of the sub-groups analyzed.

TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION.....	1
A. Chapter Description.....	1
B. Study Overview.....	1
C. Statement of Purpose.....	3
D. Expected Results and Study Organization...	4
II. LITERATURE REVIEW.....	7
A. Chapter Description.....	7
B. Growth Maximization.....	8
C. Financial Synergy.....	12
D. Diversification.....	16
E. Bankruptcy Avoidance.....	21
F. Profit Maximization.....	23
1. Studies Involving Accounting Based Measures of Performance for Acquired Firms.....	23
2. Studies Involving Accounting Based Measures of Performance for Acquired and Acquiring Firms.....	28
3. Studies Involving Market Based Measures of Performance.....	32
4. Section Summary.....	37
G. Discrepancies in Firm Value.....	38
H. Managerial Synergy.....	40
I. Economies of Scale.....	41
J. Other Factors Influencing the Merger Decision	42
K. Summary.....	43
III. STATEMENT OF HYPOTHESES AND METHODOLOGICAL OVERVIEW.....	46
A. Chapter Description.....	46
B. Statement of Hypotheses.....	46
C. Methodological Overview.....	50
D. Anticipated Methodological Problems.....	53
E. Summary.....	56
IV. FACTOR AND CLUSTER ANALYSIS.....	57
A. Chapter Description.....	57
B. Factor Analysis.....	58
C. Factor Interpretations.....	59

CHAPTER	PAGE
D. Factor Analysis Summary.....	61
E. Anticipated Data Problems.....	61
F. Cluster Analysis Using Inflation Adjusted Logarithms of Sales and Assets Variables..	62
G. Summary of Sub-Group Cluster Analysis.....	71
H. Whole Group Cluster Analysis.....	73
1. Preliminary Discussion.....	73
2. Discussion of Clustering Results.....	74
V. CLUSTER INTERPRETATION.....	78
A. Chapter Description.....	78
B. Data Used for Cluster Interpretation.....	79
C. Procedures Used to Determine Cluster Characteristics.....	82
D. Cluster Descriptions.....	86
1. Introduction.....	86
2. Cluster 1 Description.....	87
3. Cluster 2 Description.....	89
4. Cluster 3 Description.....	92
5. Cluster 4 Description.....	95
6. Cluster 5 Description.....	98
7. Cluster 6 Description.....	100
8. Cluster 7 Description.....	102
9. Macro-Economic Factors and Merger Activity.....	105
E. Summary.....	105
VI. STATISTICAL TESTS OF FIRM MERGER DISTRIBUTIONS AND ACQUIRING FIRM PERFORMANCE COMPARISONS..	109
A. Methodology.....	109
B. Merger Distribution Results.....	111
C. Merger Behavior Descriptions.....	113
D. Acquiring Firm Performance Analysis.....	119
VII. SUMMARY AND CONCLUSIONS.....	125
A. Study Overview.....	125
B. Hypotheses Tested and Methodological Overview	125
C. Major Conclusions and Summaries Based on Test of Hypotheses.....	127
1. Hypothesis 1.....	127
2. Major Conclusions.....	127
3. Summary of Test Procedure.....	128
4. Hypothesis 2.....	136

CHAPTER	PAGE
5. Major Conclusions.....	137
6. Summary of Test Procedure.....	137
D. Conclusions Concerning Study Value.....	139
E. Study Limitations	143
F. Implications for Further Research.....	145
REFERENCES.....	147
APPENDIX	153
VITA	181

LIST OF TABLES

TABLE	PAGE
IV-1 Factor Analysis Results.....	60
IV-2 Variables Used in Cluster Analysis.....	64
IV-3 Merger Distributions with Inflation Adjusted Variables.....	65
IV-4 Intra-Series Merger Relationship Table.....	66
IV-5 Mean Values for Assets and Sales Variables Across Merger Series.....	69
IV-6 Variance Ratio Data.....	70
IV-7 Merger Movement Matrix.....	77
V-1 Variables Derived from Factor Analysis.....	80
V-2 Merger Cluster Characteristics based on Significant Differences between Means for Cluster and Total Group Less Cluster Mergers	83
V-3 Univariate F-Ratios and Significance Levels for Data Used in Cluster Descriptions.....	84
V-4 Relevant Variables for Cluster 1 Description	88
V-5 Relevant Variables for Cluster 2 Description	90
V-6 Relevant Variables for Cluster 3 Description	93
V-7 Relevant Variables for Cluster 4 Description	96
V-8 Relevant Variables for Cluster 5 Description	99
V-9 Relevant Variables for Cluster 6 Description	101
V-10 Relevant Variables for Cluster 7 Description	103
V-11 Cluster Interpretations Based on Previously Researched Merger Motives.....	107
VI-1 Firms Used in and Results from Hypergeometric Probability Analysis.....	113

TABLE		PAGE
VI-2	Variables Used for Acquiring Firm Performance Analysis.....	120
VI-3	Wilcoxon Rank Sums Tests Between Groups Based on Selected variables.....	122
A-1	Geometric Probability Listing.....	164
A-2	Cumulative Probability Calculation.....	165
A-3	Merger Distributions with Normalized Variables.....	169

CHAPTER I

INTRODUCTION

A. Chapter Description

This chapter contains three sections. First, the study overview which is used to: (1) introduce subject matter dealt with; (2) discuss briefly this study's relationship to previous research; and (3) describe this study's usefulness in both the academic and private sectors. Section two contains the statement of purpose. The chapter concludes with a discussion of expected results and study organization in subsequent chapters.

B. Study Overview

Many previous research efforts in Finance have dealt with the issue of merger motives [2, 5, 6, 7, 11, 22, 23, 33, 34, 42, 44, 49, 50, 51, 52]. In these studies, researchers investigated several possible answers to the same question: Why do firms participate in mergers? Researched responses to this question include: (1) growth maximization [44], (2) financial synergy [37], (3) diversification [56], (4) bankruptcy avoidance [51], (5)

increased acquiring firm profitability [38], (6) discrepancies in firm valuation [23], (7) managerial synergy [40], (8) economies of scale [7], and (8) other factors influencing the decision to merge [52].

In the studies cited above, which were empirical in nature, data collection procedures were not designed to accommodate the analysis of intra-firm merger relationships. As a result of this, researchers were not able to determine if mergers over a multi-year period for an individual firm were related. Establishing and analyzing these relationships will provide information relevant to research in Finance and to practitioners in the private sector. In terms of financial research, a study of this type would contribute to what is known about merger motives by determining if firms consistently participate in one or more types of mergers with identifiable characteristics. To the author's knowledge, a comprehensive study of this type has not been done.

Managers and/or investors should be concerned with the strategic impact of merger patterns on the financial condition of firms analyzed. This issue can be addressed via collection of data for relevant measures of risk and return in firms with detectable merger patterns. It will then be possible to determine if the impact is favorable or unfavorable in relation to firms without detectable merger patterns. [17]

C. Statement of Purpose

The purpose of this study is to: (1) collect and analyze information which can be used to establish and evaluate longitudinal intra-firm merger relationships, and (2) evaluate the impact of these relationships on firms' financial performance via relevant measures of risk and return.

The results of a study dedicated to this purpose can be used to deal more effectively with the following issues not adequately addressed in merger research:

1. Do firms consistently participate in a type or types of mergers with identifiable motivational characteristics?
2. Do discernible merger patterns strategically influence the financial performance of firms when compared to firms without these merger patterns?

As a result of the statistical techniques used, the analysis of multiple merger motives will be possible in this study. This is important because all merger motives are not mutually exclusive. For example, growth maximization may be positively associated with market power enhancement due to increased sales and firm influence resulting from growth. Multi-motive procedures will allow for analysis of these motives and the relationship between them.

D. Expected Results and Study Organization

If motives investigated in previous research and other factors mentioned above consistently influence mergers, as studies have shown [49], then one should be able to form homogeneous groups of mergers across and/or within firms using data consistent with these studies. The common characteristics within each group should be consistent with one or more motives and factors listed in Section A above. Firms which show these commonalities among their mergers have chosen to participate consistently in a type or types of mergers even though mergers of other types may have been possible. Of interest is whether there exist favorable differences in financial performance between these firms and firms with no detectable merger patterns.

The study is organized as follows. Chapter II is a comprehensive literature review covering previous merger motive research. Techniques and procedures from this research effort which could be used to modify and/or improve these studies are also discussed in this chapter. Chapter III contains the statement of hypotheses and methodological overview for the study. Chapter IV deals with factor and cluster analysis. Chapter V begins with a listing of the 34 variable data set and contains descriptions of clusters developed in Chapter IV. Chapter VI begins with a description of statistical procedures used to identify acquiring firms with unusual merger patterns using the seven

previously developed clusters. The second part of Chapter VI deals with performance comparisons done between acquiring firms with three mergers, those with four or more mergers but no unusual merger patterns, and those acquiring firms with four or more mergers and unusual merger patterns. Chapter VII contains a summary of work done, a discussion of this study's contribution to financial research, and implications for further research. Figure I-1 is a flow chart of the study.

STUDY FLOW CHART

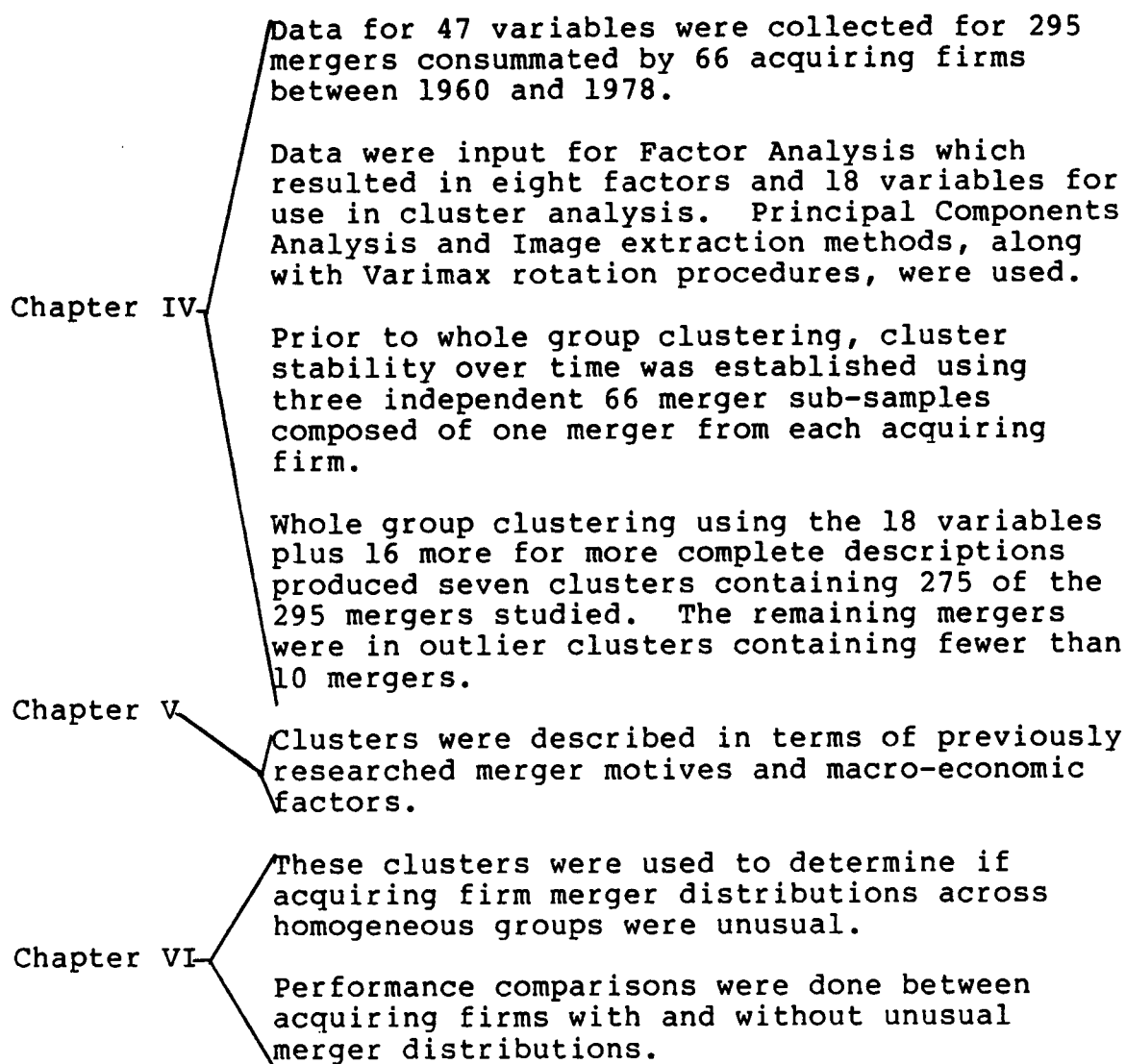


Figure I-1

Study Flow Chart

CHAPTER II

LITERATURE REVIEW

A. Chapter Description

As mentioned previously, no studies have directly dealt with multi-year, intra-firm relationships. In this chapter, several studies relevant to the issue of why firms merge will be discussed. Analysis will focus on how the existence of multi-year, intra-firm merger relationships could affect the data gathered, analytical procedures used, and study conclusions.

The studies reviewed in this section will be grouped by merger motive. Motives discussed will be (1) growth maximization, (2) financial synergy, (3) diversification, (4) bankruptcy avoidance, (5) profit maximization, (6) discrepancies in firm value, (7) managerial synergy, (8) economies of scale, and (9) legal and economic factors.

The potential multiplicity of merger motives will also be discussed in this chapter. Examination of the merger motives set out above shows that they may not be independent and mutually exclusive. Growth maximization, for instance, may be associated with other motives such as economies of scale and profit maximization. As firms increase total

assets and sales via merger, economies of scale may become available that can be exploited to improve profitability. Growth maximization may also be related to diversification if growth is accomplished via conglomerate mergers. Economic factors such as interest levels may be related to rapid economic growth and forecasting difficulties such as those discussed by Gort [23]. Bankruptcy avoidance may also be related to other motives if, for instance, acquiring firms take over troubled businesses to replace poor management and improve profitability [40].

B. Growth Maximization

Growth maximization as a merger motive was studied by Mueller [44]. According to Mueller [44], mergers should only occur when there is a synergistic relationship between acquiring and acquired firms. This relationship can be based on market power, managerial/technological scale economies, or managerial synergy. Post-war merger waves must, therefore, have been the result of many synergistic merger opportunities or poor managerial decisions. Mueller [44] stated that neither of these positions is easily accepted or adequately explains the rise in mergers between unrelated firms in which the acquired firm is allowed to operate autonomously. He hypothesized that growth maximization rather than shareholder wealth maximization was the motive for conglomerate mergers. In the early stages of

corporate development, managers have ample external growth opportunities which are in their and the stockholders' best interest. As investment opportunities decline, it will be in the stockholders' best interest to have profits paid out as dividends so that they can be invested elsewhere. Managers intent on growth maximization will tend to ignore this alternative and continue to maximize growth via conglomerate mergers. This hypothesis is supported by research which shows growth to be one of the goals pursued by management and that managerial compensation is often based on the rate of firm growth [4]. Mueller [44] showed that growth maximization in the absence of synergy between the acquiring and the acquired firms can only occur when the managers and stockholders of the acquiring firm use different discount factors to determine the present value of the acquired firm's future earnings. The managers use a lower discount factor than the stockholders to increase present value calculations and make growth via merger more attractive. Without a managerial monitoring process with penalties for not maximizing shareholder welfare, mergers of this type will be consummated to the stockholders' detriment.

Mueller [44] conceded that rigorously testing the growth maximization hypothesis is difficult due to unobservable key variables such as managerial and stockholder discount rates. The hypothesis may be

indirectly supported, however, if, as Mueller [44] suggested, nonconglomerate mergers are more likely to be synergistic in nature. The surge in conglomerate mergers during the 1960's must, therefore, have been motivated by other factors, such as growth maximization.

Growth maximization was also studied by Reid [46]. He analyzed 6,174 mergers consummated by 478 Fortune 500 firms during the period 1951-1961. He collected data on measures of managerial welfare (the percentage increase in sales, assets, and employees from year to year) and stockholder welfare (the relative change in stock price as well as earnings to assets, and earnings to sales ratios from year to year). His analysis showed that managerial ratios were significantly better for merger active firms and that stockholder ratios were significantly worse. The merger active firms were, therefore, more growth-oriented and less profitable than the merger inactive firms.

In both of these studies, two important aspects of data collection were ignored. First, more than one merger may have been associated with each acquiring firm. As a result, each merger was not an independent event. The ability to examine relationships between mergers would allow Mueller to test more conclusively for consistent growth maximizing behavior by using variables similar to Reid's. This type of analysis would also improve Reid's study by allowing him to determine if a relatively small group of sample firms,

responsible for many of the mergers analyzed, showed significant differences in merger behavior over time.

A multi-motive analytical procedure would also be beneficial in these studies. Each author investigated only one merger motive with procedures used. A multi-motive analytical procedure such as cluster analysis would allow them to use more data to determine if characteristics consistent with other motives and factors were present in sample data. This would have enabled Mueller and Reid to be more accurate and complete in ascribing variable behavior to one or more merger motives.

An example of improving study results via homogenization of groups analyzed can be found in work by Melicher and Nielson [42]. In their study, they examined the extent to which financial data relationships explain the acquisition prices for firms acquired in 116 mergers. Similar analysis is also done on more homogeneous groups composed of: (1) product line extension mergers, (2) mergers to diversify, and (3) mergers involving acquiring firms that became known as conglomerates. The sample of 116 mergers was obtained from Federal Trade Commission data on Larger Mergers in Mining and Manufacturing during the 1960's. The sample was further restricted to mergers which were financed via a common stock-for-common stock exchange.

Melicher and Nielsen used measures of profitability (earnings and earnings per share), leverage (debt to total

assets), variability in earnings per share (the coefficient of determination), and FTC merger type classifications in a linear regression analysis to predict the percentage premium payment made by the acquiring firm. The explanatory power of the model was low when all 116 mergers were analyzed. More than one-half of the variation in premiums was explained, however, for more homogeneous merger samples involving diversified acquirers and the subsets of conglomerate acquirers and where the diversified acquirers were entering into product extension mergers.

C. Financial Synergy

Lewellan [37] investigated another motive for mergers between unrelated firms. He stated that there are financial opportunities available for acquiring and acquired firms when their cash flows are not perfectly correlated. Under these circumstances, the acquiring and acquired firms act as co-insurers of each other's outstanding debt. In other words, the probability of default for either firm has been decreased because additional cash flows are now available for debt repayment if they are needed. Lewellan emphasized that this is a property of virtually any merger involving firms with imperfectly correlated cash flows and that it cannot be realized by either firm independently. He also stated that this aspect of mergers is different from simple portfolio diversification which previous research has shown

can be done by investors as well as firms in perfect capital markets [36]. The difference is that investor diversification does not change individual borrower characteristics whereas borrower mergers will. The changes can be beneficial to the lender in terms of risk reduction when mergers involve firms with imperfectly correlated cash flows. As a result, the risk of default for the combined entity is less than that for the individual firms and its value is therefore greater than the sum of the individual firms. The lower level of risk will also make it possible for the combined firm to borrow more capital without exceeding pre-merger risk levels. This suggests the use of debt financing in mergers of firms with dissimilar cash flows because debt is cheaper than equity due to the associated tax subsidy. Empirical studies by Shrieves and Pashley [49] and Choi and Philippatos [11] tested the Lewellan [37] hypothesis.

Choi and Philippatos [11] investigated the synergistic aspects of increased debt capacity due to merger. In their study, 81 mergers between 1950 and 1973 were selected for examination. Through the use of average and cumulative average residuals analysis, Choi and Philippatos [11] showed that those firms which restructured their debt after merger to take advantage of increased post-merger debt capacity experienced significantly higher pre- and post-merger average and cumulative average returns. As a result of

these findings, they concluded that both operating and financial synergism contributed to the observed abnormal returns. Furthermore, those firms that did not increase their debt levels after merger could have helped shareholders more if they had done so.

In their study, Shrieves and Pashley [49] empirically verified that increased debt capacity, as described by Lewellan [31], was a motive to merge. They analyzed pre- and post-merger data for 50 merging and 50 non-merging firms to determine if there were identifiable merger characteristics associated with pre- and post-merger leverage ratios. They found significant increases in leverage, relative to the non-merging control group, for mergers that were not stock-for-stock exchanges and used the purchase method of accounting. This increase was not present in stock-for-stock mergers using the pooling of assets accounting method. They concluded that in non-stock-for-stock purchase mergers, anticipated increases in leverage can be a factor in the merger decision. These study results are consistent with other research which shows significant post-merger increases in acquiring firm leverage [32].

In a study by Galai and Masulis [21], they used the option pricing model to show that increasing post-merger debt levels are also important in relation to shareholder wealth maintenance. They stated that, due to merger, the

acquiring and acquired firms become co-insurers of each other's debt, making the risk of default lower. This results in wealth being transferred from shareholders to bondholders. This transfer is reversed via the issue of more debt after merger which will increase default probabilities to pre-merger levels, transferring wealth from bondholders back to shareholders.

Melicher and Nielsen [42] used group homogenization procedures to derive additional support for financial synergy as a merger motive. Their analysis showed that conglomerate acquirers paid larger premiums in mergers that led to a reduction in the acquirer's pre-merger financial leverage ratios. This, in turn, provided the opportunity for further debt issues by the acquirers.

Financial gain via post-merger debt level increases was also important in work done by Gordon and Yagil [22]. In this study, average cumulative residuals analysis was used to show that financial gain can be derived from pursuing an optimal post-merger debt level which is greater than optimal acquired or acquiring firm debt levels prior to merger. The higher optimal debt level is due to financial synergy.

In the Shrieves and Pashley [49] study, collection of data on a series of mergers for individual firms could have been used to enhance results and conclusions. This information would allow evaluation of trends in merger financing over time for firms studied. They would have been

able to determine if firms consistently participate in this type of merger over time and the factors which may affect decisions to acquire. The Choi and Philippatos [11] study could have benefitted from another aspect of analysis included in this research effort: cluster analysis to form homogeneous groups. This would have allowed them to determine if certain categories of mergers, such as conglomerates, produce more or less of the abnormal pre- and post-merger returns associated with favorable debt restructuring.

D. Diversification

Another merger motive which has been the subject of recent research efforts is diversification. Mergers to diversify firm operations have been justified in the past based on their ability to stabilize the firm's earnings over time. The decrease in earnings variability will lower risk levels in the firm while maintaining or improving earnings per share figures for stockholders.

Levy and Sarnat [36] contested this diversification rationale in the presence of perfect capital markets. In this environment, investors can obtain for themselves all of the benefits associated with diversification by diversifying their personal portfolios efficiently. Therefore, firm diversification is of no value to them. When market imperfections are present, all securities may not be

available to all investors. Firm diversification may then be of value to stockholders because it will allow them to invest indirectly in securities (via diversification of the firm) which may not otherwise be available to them. They [36] added that shareholders may not gain and, in fact, may lose from this type of merger. While gaining the additional degree of freedom to invest indirectly in the shares of firm securities otherwise unavailable to them, investors lose the option of investing directly in shares of the diversifying firm only. Levy and Sarnat [36] concluded that a stronger case for diversification can be made if one considers the portfolio effect and associated risk reduction as developed by Lewellan [37]. Under these circumstances, firm diversification can accomplish a form of risk reduction which investor diversification cannot.

If there are market imperfections and firm diversification is of value to investors, the performance of conglomerate firms involved in diversified merger activity should reflect this. Weston and Mansinghka [56] investigated this possibility. In this study, 63 firms were classified as conglomerates based on the following criteria. Each firm selected grew at a rate of at least 10% between 1960 and 1968, or had acquisitions totalling more than \$500 million, or was involved in at least two major mergers between 1960 and 1968, or was involved in a number of smaller mergers during the same period. Furthermore,

each firm selected experienced at least 20% of its growth in assets between 1960 and 1968 via acquisition and was involved in at least 10 3-digit SIC industry categories or in five or more 2-digit SIC categories in 1968. Analysis of these firms showed that arithmetic mean growth in total assets, sales, net income, earnings per share, and market price was higher for the conglomerate firms when they were compared to non-conglomerate control samples. Conglomerate measures of profitability went from below control group levels in 1958 to above group levels in 1968.

The improvement in earnings performance is consistent with the successful achievement of defensive diversification by the conglomerate firms. Firms were diversifying defensively to avoid: (1) sales and profit instability, (2) adverse growth development, (3) adverse competitive shifts, (4) technological obsolescence, and (5) increased uncertainty associated with their industries. As a result of defensive diversification, Weston and Mansinghka [56] stated that the most appropriate test of the earnings performance of conglomerate firms is not superior earnings performance, but their ability to achieve at least average earnings performance. The authors also went into some detail for two categories of diversification: firms moving out of the aerospace and natural resources industries. This categorizing process, which Weston and Mansinghka [56] admitted may involve some over-generalization, could have

been improved via the use of cluster and multinomial statistical procedures described above. They could be used to homogenize the sample firms and determine important aspects of diversification strategies based on homogeneous group characteristics. Results may show that some diversification strategies were more profitable than others.

Another explanation of conglomerate mergers was explored by Amihud and Lev [2]. They stated that conglomerate mergers are managerially motivated because they can reduce variability in earnings for management portfolios which are dominated by securities from the firm in which they work. Conglomerate mergers will also reduce the undiversifiable "Employment Risk" (e.g., risk of losing job, professional reputation, etc.) associated with any managerial position. The consequence of these mergers can therefore be regarded as an agency cost resulting in the possible wealth transfer from stockholders to bondholders, as suggested by options models [21].

Amihud and Lev [2] hypothesized that there should be a significant difference in the level of risk reducing activities between manager- and owner-controlled firms--that is, firms in which ownership is widely dispersed among many shareholders, none of whom have a dominant percentage of control, and firms which are closely held and/or have owners who actively participate in the managerial process.

Amihud and Lev [2] used a sample of 309 firms from the 1965 Fortune 500 listing which had been classified as owner- or manager-controlled by Palmer [45]. Their analysis showed that the manager-controlled firms participated in significantly more conglomerate or risk reducing mergers during the time period analyzed (1961-1970). Differences in the number of other types of mergers consummated during this period were not significant. These differences suggest that manager-controlled firms tend to engage in more conglomerate acquisitions than owner-controlled firms. Further analysis showed the rate of return for managerially-controlled firms was significantly more correlated to the market return, indicating the degree of diversification as measured by this correlation was greater for manager-controlled firms.

The Amihud and Lev [2] study could also have benefitted from data gathering and statistical procedures listed above. Collection of merger data over an extended period of time for individual firms would have allowed the authors to determine when and if firms studied changed their control types and how these changes affected the characteristics of mergers consummated.

Multi-motive analytical procedures such as cluster analysis could have been used to more conclusively link observed results with other motives investigated for conglomerate mergers. If additional data had been collected

consistent with these motives, their influence on study results could have been more effectively evaluated.

The potential usefulness of group homogenization procedures such as cluster analysis can also be seen in Langetieg, Haugen, and Wichern [34]. In this study, a group of mergers consummated via an exchange of common stock was studied. Results showed that risk levels in the acquiring firms increased rather than decreased after the merger. The authors stated that one reason for this increase may be higher debt levels after merger but that data on more financial and non-financial variables should be collected in order to evaluate other factors. The use of cluster analysis on their augmented data base would have provided information on the effect of changes in leverage and any other factors consistent with data gathered.

E. Bankruptcy Avoidance

Bankruptcy avoidance as a merger motive was investigated by Shrieves and Stevens [51]. They used the Altman [1] bankruptcy prediction model to forecast the number of future bankruptcies avoided via merger in a group of 135 acquired firms selected at random from the Federal Trade Commission list of Larger Mergers in Manufacturing and Mining during the period 1948-1971. A non-acquired group was also selected by matching these firms to the acquired group based on industry, size, assets base, and year. The

control group was also restricted to firms not acquired at least five years subsequent to the sample year. Their results showed that the predicted rate of bankruptcy for both groups was significantly greater than the population average for firms of similar size during the time period analyzed. The predicted bankruptcy rate for the acquired firms, however, was over three times larger than for the non-acquired firms. This difference led Shrieves and Stevens [51] to conclude that avoiding bankruptcy costs or taking advantage of bankruptcy cost economies was a motive for merger.

This study could have been expanded and enhanced via the use of data collection and analytical procedures discussed above. Information on a series of mergers for acquiring firms would enable Shrieves and Stevens [51] to determine if these firms consistently acquired firms which seemed headed for financial reorganization. If this is the case, measures of risk and return could be used to determine if this merger strategy contributed to superior firm performance in comparison to firms not pursuing such a strategy. A multi-motive analytical procedure would also have been useful because it would have allowed Shrieves and Stevens [51] to investigate other motives that contributed to the number of mergers in their sample.

F. Profit Maximization

Another potential motive for merger is acquiring firm profit maximization. The studies discussed employ accounting based (Section 1) or market based (Section 2) measures of performance and attempt to answer one of the following questions: (1) Do acquiring firms seek to improve profitability via consistent acquisition of firms more profitable than themselves? (2) Can acquiring firms improve stock return figures by taking advantage of some or all of the pre-merger abnormal returns associated with the "good news" aspect of merger announcements?

1. Studies Involving Accounting Based Measures of Performance for Acquired Firms. In this section, studies dealing with acquired firm data only will be discussed. The studies use statistical techniques such as multiple discriminant analysis to identify merger attractive firms. This type of analysis is important because it could be used to select likely merger targets before the fact. Investors could then use this information to profit from price increases for acquired firm stock prior to merger. In his paper, Stevens [53] analyzed financial ratios associated with a group of non-acquired and a group of acquired forms in order to determine if a model based on this type of data could effectively distinguish between the two groups. The samples studied include 40 unacquired firms and 40 firms which were acquired during 1966. The initial phase of the

study involved the use of factor analysis. To facilitate interpretation, one ratio was used to represent each of six factors, as follows:

1. Profitability-EBIT/sales;
2. Liquidity-net working capital/total assets;
3. Activity-sales/total assets;
4. Leverage-long term liabilities/total assets;
5. Dividend policy-dividend payout and price earnings ratios.

Data for these ratios were used in multiple discriminant analysis to obtain the desired model. The model developed correctly identified 70% of the acquired firms. The remaining acquired firms were classified as non-acquired by the model. Further validation showed that the model was stable over time and could therefore be used to monitor attractive unacquired firms for possible future mergers.

The analytical techniques used by Stevens [53] on financial data from potential merger targets were also used on merger active companies by Libby [38]. In his study, Libby [38] proposed that merger active firms have financial characteristics which are less favorable than those of an average firm. Therefore, these companies are motivated to seek mergers which will improve their financial position. This proposition was explored through systematic examination of financial data for merger active firms and comparison

with results from the Stevens study [53]. Fifty-five merger active firms and 55 merger inactive firms were included in the sample analyzed.

The results of the factor analysis phase of the study showed close agreement with the Stevens (53) study in terms of ratio clustering on factors and factor loading magnitudes. The seven factors used for multiple discriminant analysis were: (1) profitability--EBIT/sales, (2) activity--sales/total assets, (3) leverage--long-term liabilities/total assets, (4) liquidity--working capital/total assets, (5) dividend payout--dividends/net income, (6) price earnings--the price earnings ratio, and (7) size--total assets. Univariate F tests performed on the seven variables showed merger active firms to be significantly larger, more highly levered, and less liquid than merger inactive firms. These differences were in the opposite direction of those discovered by Stevens [53] between acquired and non-acquired firms.

The multiple discriminant analysis phase of the project used ratios associated with Factors 1, 2, 3, 4, and 7 (above) in order to be consistent with the Stevens [53] study. The model developed was 74.55% accurate at classifying firms as merger active. The results of this study strongly support the proposition that financial characteristics of buying and selling firms are explicit

decision variables or reflect other considerations in the merger decision.

The Stevens [53] and Libby [38] studies could have been enhanced via data collection and statistical procedures discussed above. Collection of data on a series of mergers for individual firms would have allowed both researchers to determine if subsets of firm mergers were more effectively classified than others. These subjects could then be examined to ascertain their relationships with other merger subsets and factors external to the firm such as levels of economic activity and inflation. Group homogenation may also improve study results via development of merger groups with significant commonalities. The classification models could then be used on these groups with potentially better results.

One important aspect of the Stevens [53] and Libby [38] studies is that they were cross-sectional in nature. That is, they were not able to evaluate variations in study results due to changes over time in data collected. This issue was examined by Harris, Stewart and Carleton [25]. In their study, two sample groups were developed for separate time periods (1974-1975 and 1976-1977) to check for changes through time in the financial characteristics of acquired firms. Profit analysis was used on samples of acquired and non-acquired firms in an attempt to discriminate between these groups. The acquired samples consisted of: (1) a

sample of 61 firms acquired in 1976 and 1977, and (2) a sample of 45 firms acquired in 1974 and 1975.

Major conclusions drawn from this study were:

1. In sample design, it is important to keep the ratio of acquiring to acquired firms approximately equal to the population ratio because differences here can affect model classification effectiveness.
2. The models developed were not very powerful in explaining the determinants of merger activity over time.
3. Focussing on the acquired firms only prevented analysis of potentially relevant acquiring firm data.

Although the Harris, et al. study dealt with changes in important merger variables over time, it did not address the issue of how the changes may vary between firms or industries. Some of the firms or industries represented in the sample analyzed may have important differences in behavior of relevant merger variables over time. Data collection procedures consistent with those described earlier would have allowed investigation of this issue. A multi-motive approach to merger analysis using pre- and post-merger acquiring and acquired firm data would also have been beneficial in this study. Harris, Stewart and Carleton [25] conceded that analysis of acquired firm data only may result in synergistic relationships between acquiring and

acquired firms being ignored. The data collection and analytical procedures proposed for this study will eliminate this problem by collecting and analyzing data for both acquiring and acquired firms.

2. Studies Involving Accounting Based Measures of Performance for Acquired and Acquiring Firms. The studies discussed above have dealt with the characteristics of acquired firms only to determine if acquiring firms improve earnings performance via acquisition of relatively profitable companies. The research suggested that this is the case, particularly for conglomerate mergers. While this aspect of merger theory is certainly important, consideration must also be given to the financial performance of constituent firms prior to merger and the combined corporate entity after merger. In their study, Ronald Melicher and David Rush [43] analyzed this issue. They examined pre-merger financial characteristics of conglomerate companies as well as the firms they acquired. The same characteristics are examined for a sample of acquisitions by non-conglomerate companies.

Using conglomerate as defined by Weston and Mansinghka [56], Melicher and Rush [43] selected data for conglomerate firms from Federal Trade Commission and New York Stock Exchange data. Data were obtained for 132 mergers: 61 involving conglomerates, and 71 involving non-conglomerates. Statistical analysis of the data showed that

when conglomerate and non-conglomerate acquisitions were compared, conglomerate firms were significantly larger than non-conglomerates in terms of sales and assets but not net profits. Acquired firms for conglomerates were also found to be larger in terms of sales and assets and profit. Earnings performance data showed that conglomerates were less profitable than non-conglomerates and that they acquired firms which were relatively more profitable than those purchased by non-conglomerates. In addition to these findings, Melicher and Rush [43] determined that the conglomerates were more levered than non-conglomerates. An analysis of the relationship between acquired and acquiring firms supported these conclusions. In both groups, acquiring firms were more highly levered and had higher price earnings ratios than the acquired firms.

The final phase of the analysis involved comparison of profitability and leverage ratios before and after merger for both groups. Data showed that conglomerates were able to realize improvements in excess of 2% in net profit margin and return on total assets, which was more than those achieved by non-conglomerate firms. This lent further support to the contention that conglomerate firms acquire relatively more profitable firms. Data also showed conglomerates' leverage ratios (total debt/total assets) decreasing 3.5% more than corresponding non-conglomerate figures. The conglomerate firms, therefore, were able to

more closely approach pre-merger leverage values through the use of "latent debt capacity" in acquired firms.

Examination of conglomerate merger financing also showed heavy reliance on levered securities to lessen the impact of acquisitions on their pre-merger returns on common equity.

The Melicher and Rush [43] study provided valuable information concerning the acquisition related performance of a particular type of firm--conglomerates. More insight into the value of mergers can be gained through analysis of the acquisition related performance of acquiring firms in general. In their study, Lev and Mandelker [35] used the "paired sample" approach to data selection for analysis. Sixty-one acquiring firms were first chosen so that data for the firms were available on both the CRSP and COMPUSTAT tapes for five years before and five years after the year in which the merger occurred. This allowed for study of the long-term effects relatively large mergers have on an otherwise random selection of firms. A corresponding group of non-merging firms was also selected from CRSP and COMPUSTAT data for the same time period. Pairing is based on industry and asset size.

After sample selection, data were gathered to calculate five-year pre- and post-merger averages for variables relevant to firm profitability, risk, growth, capital structure, earnings per share, liquidity, leverage, return on assets, and return on common equity. Differences between

these arithmetic averages for merging and non-merging firms were then determined and tested for statistical significance in relation to expected values using standardized Z scores. Analysis of profitability data showed that acquiring firms were more profitable than non-acquiring firms.

Lev and Mandelker [35] also develop variable profiles over the years covered by the sample data. This analysis showed that returns for acquiring firms increased relative to non-acquiring firms during the merger year, but decreased to parity in years after the merger. Accounting based measures of profitability, net return on assets and return on equity did not show this trend because they do not reflect investor expectations as return variables (market annual rate of return and price relative) do. Pre-merger growth in earnings per share and total assets also favored the acquiring firms but post-merger figures showed growth reaching parity while earning per share continued to favor the acquiring firms. Lev and Mandelker [53] noted that the earnings per share data employed income available for common stock which is determined in part by the retained earnings ratio. Therefore, changes in earnings per share may not have been due to actual increases in earnings power.

3. Studies Involving Market Based Measures of Performance. The studies in this section all used the return on acquiring and/or acquired firm stock over time as a measure of performance. In each study, stock price information, along with other data, was employed to determine if the acquiring and/or acquired firms experienced stock returns that were more than the market average before and after merger.

The first paper discussed in this section is somewhat more comprehensive than the previous two. In his study, Gershon Mandelker [39] analyzed the acquisition related performance of acquiring firms, as he did with Lev above, and the merger related performance of acquired firms.

Mandelker developed his analysis around the theory that if the market for acquisitions operates competitively, then the return from an acquisition should be the same as from any other investment-production decision with similar risk. Consequently, two questions are addressed in the paper: (1) If they exist, what is the magnitude, timing, and distribution of abnormal returns associated with mergers? (2) Is the capital market efficient with respect to mergers?

Mandelker compared and contrasted his theory with those developed by others. These included:

1. The Perfectly Competitive Acquisitions Market theory which assumes rational investors will equate rates of

return on assets of similar risk and direct their investment to any area representing the best risk-return relationship;

2. The Efficient Capital Markets Hypothesis which states that stock prices adjust instantaneously to new information providing the investor unbiased signals for efficient resource allocation; and

3. The Abnormal Gains Hypothesis which asserts mergers are good news for investors in acquiring firms and can result in gains from economies of scale, monopoly power, tax considerations, undervaluation, or diversification.

The model that Mandelker [39] used to develop support of his theory is consistent with the relationship between risk and return established in the Capital Asset Pricing Model. The principal sources of data for the model were the Federal Trade Commission Listing of mergers from 1948 to 1967, the CRSP file, Moody's industrials, and Standard and Poor's Corporation records.

The first section of reported results using the model above analyzed trends in risk, beta and return for acquiring and acquired firms. Data showed cumulative average residuals (c.a.r.) rising prior to merger, and falling along with beta after merger for acquiring firms. These results were consistent with the abnormal gains hypotheses stated above. Investors seemed to overshoot future performance of acquiring firms and then make adjustments downward after the merger. The returns for acquired firms also showed abnormal

gains concentrated in the seven months prior to merger. Abnormal returns average 14% and were not offset by decreases after the merger. Further data analysis showed that the abnormal pre-merger returns for acquired firms had high t-statistic values, meaning their occurrence could be attributed to chance alone. Therefore, it was difficult to conclude whether the stockholders in acquiring firms earn normal or abnormal positive returns from mergers. This fact contradicted the good news hypothesis since no abnormal behavior was observed during the pre-merger period. Post-merger residuals and t-values for acquiring and acquired firms were also low, indicating abnormal returns cannot be obtained after merger. These results are consistent with the Efficient Capital Markets hypothesis and other research [3, 24, 30].

From his analysis, Mandelker [39] concluded that the acquiring firms operated in a perfectly competitive market for mergers and did not earn abnormal returns. The acquired firm did earn abnormal returns in the seven months prior to merger. The study also showed that for the sample data efficient capital markets existed for mergers. Therefore, all information concerning anticipated returns after merger was impounded in the stock prices for the acquired and acquiring firms prior to merger. No abnormal returns were earned after consummation of the merger.

Richard Shick and Frank Jen [48] took a somewhat different approach to merger analysis. They stated that the difference between merger returns and hypothetical non-merger returns can be decomposed into compensation due to merger benefits and compensation due to changes in risk. In order to support this hypothesis, Shick and Jen [48] had to develop estimates of hypothetical non-merger returns. This was done using a logarithmic stock valuation formula which showed the log of stock price to be a function of dividends, short-term growth, long-term growth, current liabilities, the standard deviation of EBIT for the past 10 years, and the book value of total assets, all expressed as logarithms, as well as a moving average of previous residuals calculated with the model. Shick and Jen [48] collected three years of data on 24 acquiring firms.

Empirical results using this type of analysis showed 17 of 24 firms had positive merger benefits during the first year. Analysis also showed that the number of firms receiving positive benefits decreased steadily from year one to year three. Therefore, the probability of receiving positive merger benefits apparently decreased over time and did not depend only on past success. The data showed that the opposite was true for seven firms experiencing negative merger benefits in the first year. Passage of time seemed to improve their chances of a positive return.

The Shick and Jen [48] study showed mergers can be beneficial even if significant premiums are paid for acquired companies. The use of cash or stock and cash in 85% of the mergers, as opposed to some hybrid security, also means merger benefits must be due to operating economies of some form. Finally, the method of analysis employed here could be used to simulate results of a merger before the fact.

The importance of an appropriate measure of stockholder gains was also highlighted by Langetieg [33]. In his paper, the one factor capital asset pricing model was used in a modified form to include an industry factor and a non-merging control group factor.

Analysis was done on 149 mergers involving N.Y.S.E. listed firms with data from the Center for Research in Security Prices. Langetieg's [33] results for returns 72 months before and after merger were similar to Mandelker's [39] in sign but not in magnitude for several sub-periods studied. Furthermore, statistical analysis showed merging firms had negative excess returns in every post-merger time interval tested. This would lead to an inefficient markets conclusion without further evidence. These additional data were supplied by the control group of firms which also showed negative excess returns. Therefore, Langatieg [33] concluded that capital markets are in fact efficient. The presence of the control group resulted in acceptance of the

efficient markets hypothesis, further emphasizing its importance in reducing bias due to error in measurement and model development.

Langetieg's [33] results for acquiring firms were also consistent with previous research [39]. He found that firms had positive excess returns as much as 72 months prior to merger, but their returns could not be conclusively associated with merger. Overall, acquiring firms experienced normal or slightly superior returns for their stockholders.

4. Section Summary. The five studies [48, 43, 35, 39, 33] showed that acquiring firms may have positive returns before and after merger, but do not share equally in the relatively large abnormal returns prior to merger. Most of these excess returns go to the acquired firm. Any superior return for acquiring firms after merger, in comparison to non-acquiring firms, was transient, decreasing to parity within a three-year, post-merger period. A summary of such studies can be found in Jensen and Ruback [30].

Of the five studies discussed above, only one, Melicher and Rush [43], made any attempt at homogenizing samples studied as outlined in this proposal. Even the study of conglomerate firms only, as in Melicher and Rush [43], is only a partial solution because all conglomerates are not alike. These firms, although diversified, are not all in the same industries and/or are not concentrated equally in

industries where they compete. As a result, there may be significant merger motivational differences in a group of conglomerates based on data similar to that which will be collected for this study. Homogenizing firm samples will more effectively control these variations and may significantly influence study results. In the other four studies, this procedure may be even more beneficial because no distinction is made between potentially different types of acquiring firms such as conglomerates and non-conglomerates. Previous research efforts [11, 42] have shown that classification procedures of this type can yield statistically significant results.

G. Discrepancies in Firm Value

The previous sections have shown that merger motives associated with firm financial characteristics and performance have been well researched and important. They are not the only reasons firms merge. Motives may also be derived from more favorable managerial interpretations of financial data. In his study, Gort [23] asserted that one reason for divergent interpretations of financial data was the presence of economic disturbances in the market place which increase the probability of valuation discrepancies in two ways. First, they can randomly reorder investor expectations, meaning there will be movement above and below original investment positions. Second, economic

disturbances make historical information less useful and predictions of future performance are difficult.

The two primary reasons that Gort [23] cited for economic disturbances were technological change and rapid changes in a firm's stock price. Technological changes in a company or industry may result in new products for which demand is difficult to predict, or they can result in production cost decreases which may also be difficult to predict. Rapid changes in a company's stock price make historical data less useful. This makes future stock prices harder to predict, resulting in more variation among investors whose valuations have increased. Gort [23] stated that one reason for changes in stock prices can be rapid growth which can induce sharp rises in security valuation. This aspect of Gort's [23] study related to Mueller's [44] analysis of growth as a merger motive discussed earlier. However, Gort [23] assumed that growth alone was not a sufficient motive for merger. Valuation discrepancies must be present also in order to generate variance in firm valuation and increased likelihood of merger. Gort [23] added further support to the security valuation aspect of his economic disturbance theory by arguing against the bargains theory of mergers. This theory asserts that mergers are motivated by an undervaluation of the acquired company's stock in terms of price and/or the price earnings ratio. Gort [23] used statistical analysis of a 51-merger

sample between 1951 and 1964 to show that price earnings ratios for the selling company were not always higher than price earnings ratios for acquired firms. Gort [23] concluded by stating that results were not inconsistent with his economic disturbance theory because they do not support the bargains theory of mergers.

In his study, Gort [23] stated that one criterion for data selection is obtaining a "broad" industry sample. This requirement was imposed, no doubt, to eliminate industry and/or firm specific variables from biasing study results. Although this procedure certainly improves external validity in the study, a systematic means, such as cluster analysis, would have been more effective. It would have allowed Gort [23] to homogenize his study sample based on data that he collected and/or other data consistent with other merger motives and influencing factors external to the firms. Studies of these groups would more effectively support his conclusions or change them to be more consistent with all of the information available for sample mergers.

H. Managerial Synergy

Research by Manne [40] suggests that many mergers are motivated by a desire to replace poor acquired firm managers. The lower the acquired firm's stock price is in relation to what it could be with more efficient managers, the more attractive a take-over becomes to firms who believe

they can manage the firm more efficiently. Research shows that, at least for the early 1960's, acquired firms show characteristics of poor management, relatively unprofitable, sluggish, over-liquid, with static or declining earnings and dividends [27]. More recent studies of acquired firms have not shown this to be true [25, 53].

I. Economies of Scale

Another motive which is applicable to conglomerate and non-conglomerate mergers focuses on scale economies. In any business, there is an optimum level of operations which results in the most efficient use of firm resources. Scale economies are realized as firms increase their size to approach this optimal level. This size increase can be accomplished via merger. Previous research in this area suggests that these economies may be related to managerial skills, production and distribution, capital costs or promotional expenditures [5, 6, 7, 47].

Managerial scale economies can be realized via merger when the acquired firm is such that available acquiring firm managerial skills are readily transferable [47]. The acquired firm will be able to take advantage of the acquiring firm's larger more sophisticated managerial function to make better decisions in areas such as capital budgeting. This condition is more likely to occur in mergers of similar firms. As mergers become more

conglomerate in nature, transferability will become more limited.

Production and distribution economies of scale can be realized via merger if acquisition results in the combined entity being able to move further along the learning curve for products manufactured or use more efficient machinery in the manufacturing process. Changes of this type should be reflected in firm unit cost data.

Financial economies are realizable if a merger results in the acquiring or acquired firm being able to take advantage of new capital sources or markets unavailable in its smaller pre-merger form [5]. Firms large enough prior to any type of merger should therefore be uninterested in this potential scale economy.

Firm size is also important in promotional economies of scale. Sufficiently large promotional expenditures allow firms to take advantage of quantity discounts offered by advertising agencies and media management [7]. These economies will be realized via merger if the combined firm has significantly more promotional purchasing power than the acquiring and/or the acquired firms.

J. Other Factors Influencing the Merger Decision

The economic environment in which a firm operates can also influence its merger decisions [52]. In good economic times when firms are operating profitably, there will be

more capital available for investments such as acquisitions. Inflation can also be an important factor in merger decisions. Shrieves and Pashley [50] have shown that "inflationary-tax-loss-avoidance" is a motive for merger when historical inflation has been high and the fixed assets for the acquired firm are relatively old. The cost of borrowing is also of obvious importance because it can determine when and/or how a firm's acquisitions are financed.

The legal environment in which a firm operates is also important. The Anti-Trust Division's vigorous pursuit of cases against firms participating in vertical, horizontal or concentric mergers in the 1960's illustrates this fact. As a result of this action, conglomerate mergers became more attractive to merger active firms who became more conglomerate in nature. Other research has shown that governmental action against merging firms does not prevent their stockholders from obtaining abnormal returns prior to merger and may prevent replacement of incompetent managers in the acquired firms [15].

K. Summary

The major theories of merger motivation have been reviewed. These provide the motivation for including variables in later stages of this research. Furthermore, extant empirical research in merger motivation has been

summarized, and problems in methodology pointed out. These problems provide the motivation for methodology to be used in this study. A summary of the problems commonly found were based on the fact that none of the studies above took as its primary objective the evaluation of longitudinal intra-firm merger relationships. Therefore, they cannot necessarily be faulted for suffering from one or more of the following defects in empirical methodology with respect to the issues at hand.

They did not use, as a data base, information collected on a series of mergers over time for several firms. In Mueller's [44] study, for example, a data base of this type would have allowed him to determine if one or more firms consistently pursued growth maximizing mergers using variables similar to those in Reid's [46] study. It would also have enabled Mueller [44] to determine if a relatively small group of firms was responsible for an inordinate number of sample mergers. This fact would suggest that a single sample merger is not the appropriate unit of analysis because the events within one firm may not be independent. Furthermore, this subset of sample firms could be analyzed to determine if there are systematic differences that could bias study results.

No attempt is made to statistically separate the mergers in samples analyzed into homogeneous groups so that similarities and differences between mergers could be more

effectively examined. In the Choi and Philippatos [11] study, for example, cluster analysis to form homogeneous groups would have allowed the authors to determine if certain categories of mergers, such as conglomerate, produced more or less of the abnormal pre- and post-merger returns associated with favorable debt restructuring. The Gort [23] study could also benefit from a multi-merger analytical process. In his study, Gort [23] used a "broad" sample of mergers for analysis. This selection procedure was used, no doubt, in an attempt to eliminate systematic biases in data analyzed via randomization. A more systematic method such as cluster analysis could have been used instead to more effectively control for such variances and provide a means of examining how other merger motives influenced mergers studied. This would have given Gort [23] more conclusive support for his hypothesis. This fact is important because Gort's [23] analysis only allowed him to state that the bargains theory of mergers is not supported and therefore growth maximization may be a motive for merger.

CHAPTER III

STATEMENT OF HYPOTHESES AND METHODOLOGICAL OVERVIEW

A. Chapter Description

In this chapter, the hypotheses to be tested are stated. Both of these hypotheses deal with relationships between firm mergers over time. Support for them is derived from a discussion of merger relationships suggested by previous research. Methodology used to test the hypotheses is also outlined in this chapter. This discussion includes procedures for: (1) data collection, (2) data base size reduction through the use of factor analysis, (3) the development of homogeneous groups using cluster analysis, (4) identifying those firms with unlikely merger distributions across clusters, and (5) performance comparisons between firms with and without unlikely merger distributions. Anticipated methodological problems are also discussed.

B. Statement of Hypotheses

The hypotheses tested in this study are:

1. Firms exhibit a statistically detectable pattern of participation in one or more types of mergers with

characteristics consistent with previous merger motive research.

2. Merger patterns had a measurable impact on the financial condition of firms studied when measured in terms of: (1) geometric mean market return, (2) mean return on total assets, (3) mean return on equity, (4) the mean ratio of long-term debt to total assets, (5) the mean ratio of total debt to total assets, and (5) Treynor's Measure of Performance [55].

These hypotheses are reasonable and logically consistent. For Hypothesis 1, the existence of and ability to analyze homogeneous groups is reasonable if one considers the following. The decision to merge or acquire can have a long-term impact on the acquiring firm in areas such as capital structure [49]. It is therefore possible that participation in a major merger could influence the capacity of the acquiring firm to undertake subsequent mergers or the characteristics of subsequent merger candidates.

In Mueller's [44] study, for instance, he stated that growth maximizing managers must use lower discount factors than stockholders in order to justify mergers that are not in shareholders' best interest but do contribute to growth in assets and/or earnings. If the market for managerial talent is reasonably efficient, these growth maximizing managers should be concerned with some future settling-up

procedure that will penalize them for not acting in the shareholders' best interest [18]. This belief could influence future merger decisions and make consistent growth maximization unattractive to managers. Analysis of a series of mergers from a growth-oriented firm would shed additional light on this issue.

The method of financing acquisitions may also influence subsequent merger decisions. In the study by Melicher and Nielsen [42], the authors concluded that larger premiums were paid for firms with lower price earnings ratios than the acquiring firms'. This suggests merger profits from favorable P/E ratio differentials as an acquisition motive [41]. Further analysis shows these acquiring firms suffered dilution of earnings because they paid such large premiums for their acquisitions. In firms that have participated in such mergers, data on a series of acquisitions would assist in determining if managers can continue consummating mergers of this type in spite of potentially adverse shareholder reactions to dilution of earnings.

In the Shrieves and Stevens [51] study, bankruptcy avoidance was shown to be a potential merger motive. The study did not deal with the financial impact on acquiring firms associated with absorbing these poorly performing companies. The potentially negative impact, in the absence of synergy, could prevent firms from consistently participating in these mergers. Analyzing a series of

mergers from acquiring firms participating in this type of merger would address this issue.

The pursuit of market power through acquisition may also influence a firm's future merger decisions. If, in the opinion of government, some mergers do represent significant increases in market influence, they may be deemed anti-competitive and disallowed. A decision of this type will surely discourage similar mergers until government attitudes change. Government intervention of this type was to some extent responsible for the conglomerate merger wave of the 1960's. Government anti-trust lawyers vigorously pursued rulings against vertical, horizontal, concentric and product extension mergers as being anti-competitive. This left only conglomerate mergers for firms interested in external expansion.

Conglomerate mergers may also be motivated by "defensive diversification" as discussed by Weston and Mansinghka [56]. Diversification of this type, to improve profit via movement out of unprofitable areas, may result in intra-merger relationships. These relationships should result from profitable diversification strategies. The firms analyzed in this study no doubt used different strategies for diversification with varying degrees of success. An analysis of a series of mergers for individual firms would help determine whether or not their mergers were related.

Hypothesis 2 is reasonable because mergers do contribute to multi-year change in firms' financial conditions [49]. Therefore, firms with merger motive patterns may perform differently when compared to firms which had no motivational pattern of mergers over time. These differences can be measured using data collected in this study. This issue, which has not been dealt with in previous research, is directly addressed in Hypothesis 2.

C. Methodological Overview

Data collected on merger series within firms were used to develop homogeneous groups of mergers. This information was gathered for 66 firms between 1960 and 1978 (see Exhibit 1 in the Appendix for a list of acquiring firms and their acquisitions). This time period was chosen to be consistent with data availability and to cover the intensely merger active period of the 1960's. Analyzing this merger cycle also facilitated collecting data for firms that were merger active over a multi-year period. The 66 firms were selected by screening data to get only firms that participated in three or more large mergers (based on Federal Trade Commission reports on large mining and manufacturing mergers) between 1960 and 1978. Three mergers was selected as the minimum number in order to minimize sampled firms with infrequent unrelated mergers and to provide an adequate sample size (295 mergers). Higher minimum merger numbers

resulted in unacceptably small sample sizes due to the number of firms and/or mergers with necessary data. Data to be collected for acquiring and acquired firms are shown in Exhibit 2 in the Appendix. Exhibit 3 in the Appendix contains explanations for all calculated data.

The development of homogeneous groups began with application of factor analysis to raw data. This step was necessary because variables used to explain differences in mergers were not independent. That is, two or more variables, to some degree, measured the same source of variation between mergers. As a result of these dependencies, subsequent procedures to develop merger clusters would be confounded because cluster characteristics could be influenced by variable dependence as well as similarity in variation measured. Therefore, factor analysis was used to select an independent subset of variables that best accounted for variance in the data. The variables and analysis appear in Exhibit 4 in the Appendix.

After factor analysis had been used to select a set of independent variables, a procedure of some type was required to form homogeneous groups. Cluster analysis was well suited for two reasons. First of all, it aggregated those mergers that were "closest" to each other when distances were measured in terms of data collected. Second, cluster analysis facilitated the study of multiple rather than individual motives for merger. The positive association

between growth maximization and scale economies discussed in Section A of Chapter II, for instance, could result in such a multi-motive homogeneous group. Cluster analysis grouped mergers based on similarities as measured by any subset of variables used so that data suggesting multiple merger motives could be characteristic of any group.

After homogeneous groups were formed, all mergers from each firm were examined to determine into which homogeneous group each merger went. Each firm's merger behavior was established by determining if an improbable number of its mergers went into a single group or subset of groups. A hypergeometric probability distribution was used to analyze firm merger distributions. Examples of the analysis appear in Exhibit 5 and Exhibit 6 in the Appendix. Firms with unusual merger distributions were evaluated to determine the nature of their behavioral patterns based on the characteristics of the homogeneous groups into which their mergers fell.

Finally, performance differences between firms with and without unusual merger patterns were evaluated with Wilcoxon Rank Sums comparisons among three groups: (1) firms without improbable merger distributions, (2) firms with improbable merger distributions, and (3) the overall market represented by the Standard and Poors 500 stocks. This was done using a unique set of variables which are listed in Hypothesis Two in Section A of this chapter. The null hypothesis tested

was that the mean values of relevant variables from different groups were identical.

D. Anticipated Methodological Problems

There were two potential problems associated with the methodology discussed above. The first dealt with the issue of independence between mergers in the data base. The question was whether sources of dependence in the data biased cluster formation. Two sources of dependence were evaluated: (1) mergers consummated in close chronological proximity to each other, and (2) mergers consummated by the same acquiring firm. Source 1 was important because in order to develop homogeneous groups using cluster analysis, mergers from the entire 1960-1978 period were clustered. This approach was reasonable if one assumed that at least some of the fundamental phenomena or motivations underlying mergers were present throughout the period studied. If they were not, dependence of cluster characteristics on time would make interpretation of clusters formed with all mergers difficult. It would be impossible to separate differences in cluster characteristics due to data analyzed from differences in cluster characteristics due to the time period over which mergers were consummated. In order to deal with this problem, three samples of mergers were selected for preliminary cluster analysis. Sample 1 contained the first merger for each of the 66 acquiring

firms. The second and third mergers were put into Samples 2 and 3, respectively.¹ This procedure increased the likelihood of segregating mergers by time period because they were chosen in chronological order for sample inclusion. This chronological grouping resulted in time varying systematically between samples. If there were no similarities in characteristics of clusters from Samples 1, 2, and 3, due to time period differences, then the hypothesis that acquiring firms exhibit detectable statistical "patterns" could be rejected without further testing. Thus, if further analysis with the entire data base was to be meaningful, cluster "stability" through time had to be established. A description of and results from analysis of these samples can be found in Chapter IV.

The second source of dependence, the same acquiring firm for more than one merger, was important because two mergers from the same acquiring firm cannot be considered "independent" observations. This dependency was eliminated in the three sample analyses because each sample contained only one merger from each acquiring firm. In order to determine if this source of dependence was a problem, the

¹This grouping procedure resulted in the maximum number of samples composed of independent observations because no acquiring firm, including those with only three major mergers, was represented more than once in each sample. This was necessary because cluster analysis is based on the assumption of data independence.

characteristics of clusters formed in each of the three samples were compared to the cluster characteristics when all mergers were clustered. In "whole group" clustering, acquiring firm dependencies were not eliminated because all clusters from all acquiring firms were used. Therefore, if the same characteristics appeared in each set of clusters, this dependency would not be a problem. A discussion of "whole group" clustering and its relationship to the three independent samples can be found in Chapter IV.

The second potential methodological problem dealt with analysis of the samples described above. Some procedure had to be devised to evaluate cluster quality within each sample. That is, to determine if, based on data gathered, the clusters within a sample really had different characteristics.² A necessary characteristic of this procedure is scale independence. In other words, procedure results cannot be sensitive to absolute scale differences in the data. If this is not the case, we would expect the general growth in size of firms through time to have an impact on clusters formed from different time periods, even

²This procedure was also used to help verify stability of cluster characteristics through time. Each sample formed should have had the same number of clusters with characteristics similar to clusters in the other samples. Therefore, each cluster in Sample 1, for instance, should have been similar to one and only one other cluster in Samples 2 and 3. No cluster should have been similar to more than one cluster in any other sample.

if there were no other differences in the data. This is particularly important in this study because absolute dollar variables such as total sales and assets were much larger than many of the other variables being used. The choice of scaling methods for these size-related variables should not change conclusions concerning cluster stability through time. A discussion of procedures chosen and analytical results is in Chapter IV.

E. Summary

In this chapter, the hypotheses to be tested were stated. It was shown that they are reasonable and consistent when potential relationships between mergers are considered. These relationships were shown to be consistent with previous merger motive research. The procedures to be used for hypothesis testing were also outlined in this chapter. This discussion emphasized the statistical procedures to be used and explained why each procedure was chosen for this study. Potential methodological problems were also discussed with emphasis on sources of dependence in the data.

CHAPTER IV

FACTOR AND CLUSTER ANALYSIS

A. Chapter Description

In this chapter, factor and cluster analysis procedures used are discussed. The factor analysis section describes: (1) how the data base was reduced from 57 to 18 variables using factor loadings derived from factor analysis, (2) interpretations of factors based on variables used to represent them, and (3) anticipated data problems. The cluster analysis section describes: (1) cluster analysis using the 18 variables derived from factor analysis, (2) adjustments in variable values to eliminate the effect of inflation, (3) methods used to evaluate stability of cluster characteristics over time, and (4) methods used to evaluate potential sources of systematic dependence between mergers in the data base. The chapter concludes with a discussion of cluster analysis involving all 295 mergers in the data base.

B. Factor Analysis

The 57 variables shown in Exhibit 2 in the Appendix were submitted to factor analysis.¹ The number of factors to be developed was set at eight. Eight was chosen after examining the percentage of variance explained by each factor when the maximum number of factors, one per input variable, was used. The first eight factors explained 61.07% of the variance present. The next 49 factors explained the remaining 38.93% of variance with no factor explaining more than 2.9% of the variance by itself. This suggested that there would be little benefit in going beyond the eight factors because they accounted for most of the variance present in the data. Principal Components Analysis (PCA) was the extraction method used and the rotation method was Varimax.²

¹Factor analysis was used to select the subset of variables most effective at explaining variance in the data. This procedure was necessary because all variables in the data base did not explain a unique aspect of merger behavior, i.e., they were not all independent. Independence between variables or clearly defined sets of variables is important because, without it, one aspect of merger performance, such as leverage, could be evaluated more than once. This is unnecessary and makes interpretation of data difficult. Therefore, factor analysis was used to select an independent subset of variables that best accounted for variance in the data.

²In order to verify the choice of eight factors, analysis was also done with 15 factors using Principal Components and Image extraction methods while continuing to use Varimax as the rotation method. This indicated that four additional variables would improve the results of cluster analysis discussed later in this chapter. Potential improvement stems from the fact that these factors explained

Variables were chosen to represent each of the eight factors based on variable factor loadings. The term "factor loading" refers to how much of the variance associated with a factor each variable can explain. Factor loadings are expressed as percentages. Therefore, we would like to see one variable with a factor loading close to 1.0 for each factor. This would suggest that one variable could be used to represent the factor because this variable explains close to 100% of the variance associated with the factor. The factors, variables, and factor loadings are shown in Exhibit 4 in the Appendix and in Table IV-1.

C. Factor Interpretations

The factors can be interpreted as follows. Factor 1 is clearly a measure of acquiring firm size, while Factor 2 relates to acquired firm size. Factor 3 is related to the business cycle or the economic environment for acquiring and acquired firms. Factor 4 relates to the level of advertising per dollar of sales in the acquiring firm's industry and gives some indication of how consumer or retail oriented the industry is. Factor 5 is a measure of

Table IV-1

Factor Analysis Results

Factor Number	Variable	Factor Loadings
1	Acquiring Firm Total Assets Before Merger	.98
	Acquiring Firm Sales Before Merger	.93
2	Acquired Firm Total Assets Before Merger	.85
3	One Year Growth in GNP	.75
	One Year Growth in CPI	.79
4	Acquiring Firm Industry Average Advertising Per Dollar of Sales Prior to Merger	.74
5	Acquired Firm Retained Earnings to Total Assets Before Merger	.85
	Acquired Firm Sales to Total Assets Before Merger	.83
6	Acquiring Firm Debt to Total Assets Before Merger	.74
7	Acquired Firm Long-Term Debt to Total Equity Before Merger	.80
	Acquired Firm Return on Equity Before Merger	.78
8	Acquiring Firm Industry Average Gross Profit Margin Before Merger	.60
	Acquired Firm Industry Average Capital Spending per Sales Dollar Prior to Merger	.59
	Acquired Firm Industry Average Gross Profit Margin Prior to Merger	.58
Variables Added Based on Different Extraction Methods (see footnote 2):		
	Acquiring Firm Return on Equity Before Merger	.59
	Acquiring Firm Gross Margin Before Merger	.64
	Acquiring Firm Industry Research and Development Before Merger	.54
	Acquired Firm Operating Profit Margin Before Merger	.62

Note: Factor loadings for the last four variables above were obtained from additional factor analysis and do not relate to any of the eight factors listed.

acquiring firm activity or turnover. Factor five also suggests that, in this sample, high activity is associated with financing assets purchases with retained earnings. Factor 6 is clearly a measure of acquiring firm leverage, while Factor 7 measures acquired firm leverage. Factor 8 measures the relationship between acquired firm industry average profitability and investment potential, while measuring to a lesser extent the same relationship for acquiring firms. The relationship seems to be less strong for acquiring firms because acquiring firm industry capital spending per dollar of sales prior to merger loaded at only .322 on this factor.

D. Factor Analysis Summary

The purpose of factor analysis was to determine which subset of variables most effectively explained variance present in the data. It is clear from analysis that the 18 variables shown in Table IV-1 provided the parsimonious explanation of variance sought after in factor analysis. These variables were used rather than the original 57 in the cluster analysis.

E. Anticipated Data Problems

Three of the 18 variables selected via factor analysis, acquiring firm sales prior to merger, acquiring firm total assets prior to merger, and acquired firm total assets prior to merger were much larger in magnitude than the other

variables even when expressed in millions of dollars. These data were therefore subject to the effect of inflation over time which was significant during the 19 years (1960-1978) of merger activity studied.³ Since this "inflation" effect could potentially dominate the cluster analysis to the extent that the merger phenomena of interest are obscured, dollar values were adjusted for inflation using Consumer Price Index data.

F. Cluster Analysis Using Inflation Adjusted Logarithms of Sales and Assets Variables⁴

In this cluster analysis computer run, the Consumer Price Index was used to adjust assets and sales variables. (See Table IV-2 for data used in cluster analysis.) All dollar amounts of sales or assets were expressed in terms of 1967 dollars. This procedure eliminated the effect

³In addition to creating a source of uncontrolled systematic variation in the study, inflation exacerbates the size differential problem which was very significant in computer runs using step-wise multiple discriminant analysis (MDA) to evaluate cluster quality. In these runs, an F-statistic was used on pairs of cluster centroids to determine if the homogeneous groups formed were different. The results of these tests could be altered by non-linear changes in the scale of one or more variables being used.

⁴Another method of "normalization," division by overall mean values, was also used, but analysis indicated that cluster quality was inferior using this technique. Therefore results are reported only for the inflation adjustment procedure. See Exhibit VII in the Appendix for a discussion of results using this normalization procedure.

of inflation while preserving any magnitude changes due to factors other than inflation. After inflation adjustment, the natural logs of the assets and sales variables were used in cluster analysis. This was done to make differences in absolute magnitude between variables more reasonable. This is important because statistical methods used (F-tests of differences between pairs of cluster centroids) are affected by size differences between variables.⁵ The transformed variables were: (1) the log of acquiring firm total assets prior to acquisition, (2) the log of acquired firm total assets prior to merger, and (3) the log of acquiring firm sales prior to merger. The cluster analysis was done using eight clusters on the three independent groups of mergers described in Section C of Chapter III. In each merger group, there were five major clusters which accounted for at least 89% of the 66 mergers in each sample (see Table IV-3). Major clusters were defined as those containing 10% or more of the 66 mergers in each of the three groups.

F-statistics and significances between pairs of groups verified that, with one exception, all clusters within a

⁵It is important to note here that the F-tests between pairs of cluster centroids are not valid in the classical sense because they were not performed on an independent set of data. The F-tests are necessary but not sufficient tests of statistical significance. They are used her to verify the results of cluster analysis. They are not used to establish valid measures of statistical significance for differences between cluster centroids.

Table IV-2

Variables Used in Cluster Analysis

-
1. Acquiring firm total assets prior to merger.
 2. Acquiring firm sales prior to merger.
 3. Acquired firm total assets prior to acquisition.
 4. One-year growth in the consumer price index.
 5. One-year growth in gross national product.
 6. Acquiring firm industry average advertising before merger.
 7. Acquired firm retained earnings/total assets.
 8. Acquired firm sales to total assets.
 9. Acquiring firm debt/total assets prior to merger.
 10. Acquired firm long-term debt/total equity.
 11. Acquired firm return on equity.
 12. Acquiring firm industry average gross profit margin before merger.
 13. Acquired firm industry average capital spending before merger.
 14. Acquired firm industry average gross profit margin before merger.
 15. Acquiring firm return on equity prior to merger.
 16. Acquiring firm gross margin prior to merger.
 17. Acquiring firm industry average research and development before merger.
 18. Acquired firm operating profit margin prior to merger.
-

Table IV-3

Merger Distributions with Inflation Adjusted Variables

Major Cluster No.	Merger Distribution for All Groups		
	Group 1	Group 2	Group 3
1	12	12	10
2	9	6	7
3	8	9	8
4	17	25	19
5	17	11	15

merger group were unique. The F-tests also showed that in some cases, inter-merger series groups were not significantly different. See Table IV-4 for these relationships. In Table IV-4, similar clusters are on the same row.

These relationships are illustrated in the scatter plot of cluster centroids produced using Canonical Discriminant Functions 1 and 2. These functions are formulas used to generate group classification scores based on input data. Mergers with scores of similar magnitude are grouped together. The plot shows that there is a considerable amount of overlap in cluster territories, i.e., a vertical or horizontal line drawn through almost any of the cluster centroids will go through or come close to one or more of

Table IV-4

Intra-Series Merger Relationship Table

<u>1st Merger Group</u> Cluster Number	<u>2nd Merger Group</u> Cluster Number	<u>3rd Merger Group</u> Cluster Number
1- - - - -	- - - - -	-12
2- - - - -	- - - - -	-6
3- - - - -	- - - - -	-8
4- - - - -	-9- - - - -	-14
5- - - - -	- - - - -	10
	7- - - - -	-15

Note: Clusters reported on the same row were found to be similar using F-statistics and significances between pairs of cluster centroids.

the other cluster centroids. This shows that only a few of the clusters are clearly separated, i.e., have very different classification scores when Canonical Discriminant Function 1 and/or 2 is considered (see Fig. IV-1). This is important because these functions generate most of the discriminating power used to form groups in the discriminant analysis. This, as well as results from paired F-tests, suggested that there were similarities between clusters based on discriminant functions developed. These statistical similarities can be used to establish some

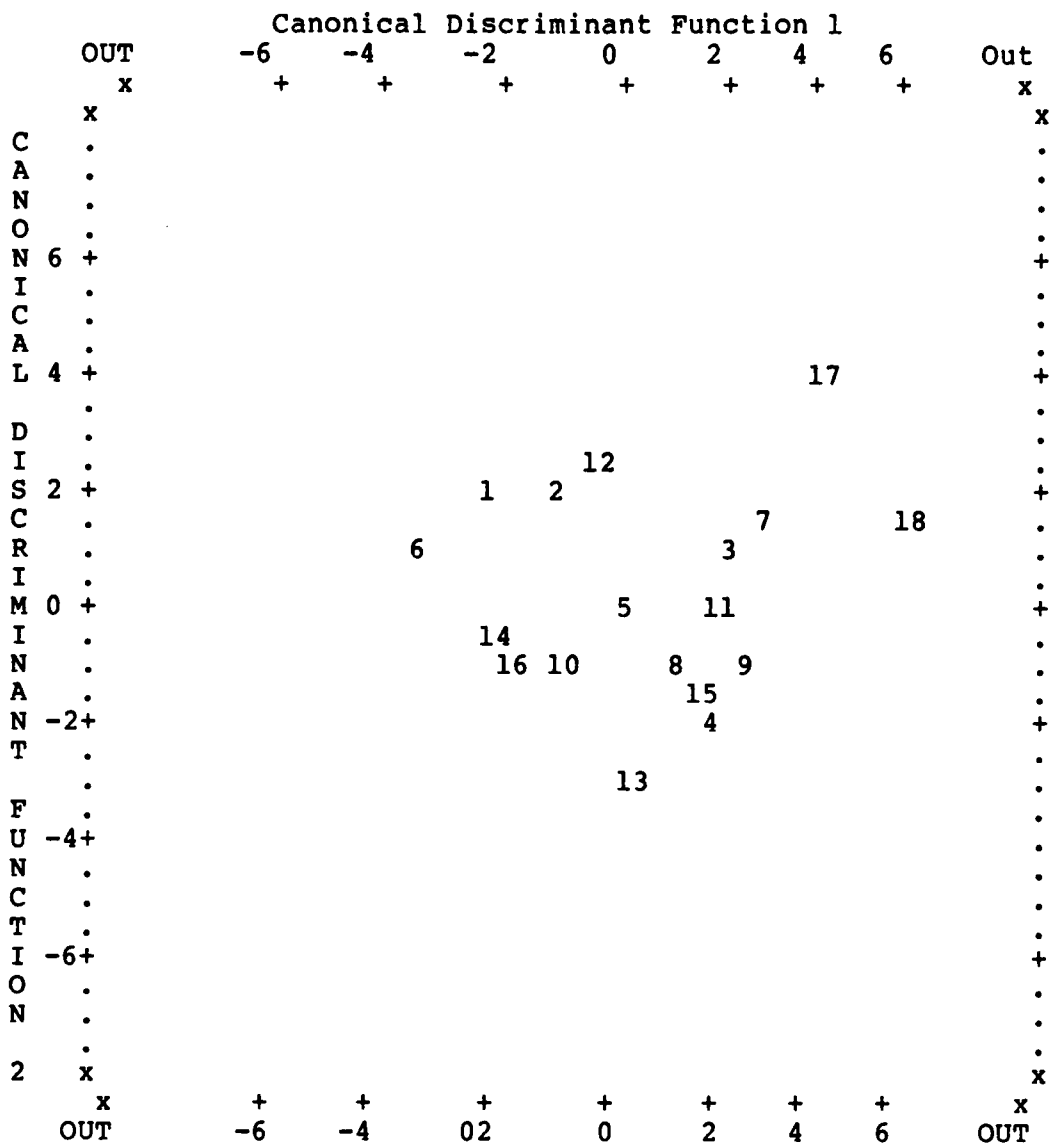


Fig. IV-1.

All-Groups Scatterplot; numbers indicate group centroids.

consistency in clusters across time if they occur between but not within merger groups. In other words, each cluster should be related to one and only one cluster in each of the other merger groups.

Results from paired F-tests did not consistently show the desired one-to-one relationship between clusters in different merger groups. However, given the nature of the F-test, the lack of consistent inter-group statistical relationships between clusters does not preclude existence of these desired relationships. Clusters with the same set of significant variables and characteristics may have been shown as being different because changes in variable values over time produced different cluster centroids (see Table IV-5).⁶ These changes resulted in cluster centroid movement over time while the characteristics of the cluster, acquiring or acquired firm size for instance, remained constant. A more valid evaluation of similarity between groups was done using the variance ratio listings for all variables in each cluster analysis. This variable is the ratio of between-cluster variance to within-cluster variance. It shows how much of the total variance associated with a variable is between clusters instead of within them. It is desirable to have as much variance

⁶This is important because the mean values for assets and sales in logarithmic form, for example, changed significantly over time (between merger groups 1, 2, and 3) even after being adjusted for inflation (see Table IV-5).

Table IV-5

Mean Values for Assets and Sales Variables
Across Merger Series

Merger Group	Mean Values For		
	Log of Acquiring Firm Sales	Log of Acquired Firm Total Assets	Log of Acquiring Firm Total Assets
Merger Group			
1	5.707	3.555	5.501
2	6.081	3.732	5.870
3	6.459	3.562	6.214

outside or between clusters as possible, i.e., a relatively large variance ratio value. This results in clusters that are distinctly different from each other and have data within them that has similar values. The variance ratio data were used to determine which variables were most effective at explaining between-group variance for each cluster analysis, i.e., those variables which contributed the most toward cluster characteristics.

If this list of variables is consistent across cluster analysis runs, then there is some indication that cluster stability is present. Variance ratio data for each of the three cluster groups using inflation adjusted data, in Table IV-6, shows consistency in variables that were most effective at explaining between-group variances, i.e., variables which had large variance ratio values.

Table IV-6

Variance Ratio Data

Variable Name	Variance Ratio Values		
	Group 1	Group 2	Group 3
Acquiring Firm Debt/Tot. Assets before Merger	.107	.078	.103
Acquiring Firm Ind. Avg. Adver. before Merger	.036	.087	.111
Acquiring Firm Ind. Avg. Prof. Margin before Merger	.169	.220	.792
Acquiring Firm ROE before Merger	.131	.270	.163
Acquiring Firm Gross Margin before Merger	.101	.158	.147
Acquiring Firm Ind. R&D before Merger	.172	.150	.186
Acquired Firm Ind. Avg. Capital Spending	.569	.269	3.113 ¹
Acquired Firm Ind. Avg. Gross Margin	.271	.341	.543
Acquired Firm Long-Term Debt/Total Equity	.258	.273	.116 ¹
Acquired Firm ROE	.089	.085	.151
Acquired Firm Retained Earnings/Total Assets	.107	.199	2.523 ¹
Acquired Firm Sales/Total Assets	.306	.812	.262
Acquired Firm Operating Profit Margin	.290	.305	.296
1 Yr. % Change in Consumer Price Index	.129	.118	.280
1-Yr. % Change in GNP	.076	.075	.278
Log of Acquiring Firm Sales Before Merger	5.154	4.480	4.679
Log of Acquiring Firm Tot. Assets before Merger	5.820	4.342	6.538
Log of Acquired Firm Total Assets	3.734	4.426	2.819

¹These values were due to outliers, clusters with only one merger.

The use of cluster centroids for comparison purposes in the F-tests described above provides another reason for using variance ratio data. The distances between cluster centroids can be changed by non-linear rescaling of one or more of the variables analyzed--sales and assets data, for instance. This relative movement will in turn affect the results from paired F-tests between pairs of cluster centroids even though no data were actually changed. Variance ratio analysis, on the other hand, is not sensitive to the units associated with input data and will therefore show those variables most effective at explaining between group variance regardless of their magnitude.

G. Summary of Sub-Group Cluster Analysis

In this chapter, two important issues concerning clusters analysis were dealt with. First, there were two sources of dependency in the data which could make interpretation of results difficult: (1) many of the mergers occurred in close chronological proximity to each other, and (2) more than one merger was consummated by the same acquiring firm. Second, inflation during the time period analyzed could systematically influence interpretation of data. The "tests" done in this chapter were needed to establish whether cluster analysis over the whole period and all acquiring firms would be meaningful,

i.e., not dominated by period or acquiring firm dependencies.

The first source of data dependency, date of consummation, was investigated via analysis involving three independent sub-samples covering different time periods. Cluster characteristics were shown to be stable over time. Therefore, systematic differences in consummation dates between clusters would not be a problem.

Independence between sub-samples was achieved by including only one merger per firm in each sample. If intra-firm merger relationships, the second source of data dependency, were dominant, it would have been difficult to derive meaningful clusters from the sub-samples because there would have been no other relationships on which to base cluster characteristics. This, in fact, was not the case. Cluster characteristics based on those variables with the largest variance ratio values were consistent within and between sub-samples (see Table IV-6). This suggested that systematic intra-firm merger relationships would not be a problem in overall group cluster analysis.

Systematic effects of inflation were dealt with via use of the Consumer Price Index to express all appropriate variables in terms of constant dollars. Variables included were measures of sales and assets for acquiring and acquired firms. This adjustment eliminated the effects of inflation

and did not impede formation of meaningful clusters in all of the independent sub-samples.

H. Whole Group Cluster Analysis

1. Preliminary Discussion. Previous cluster analysis showed there was consistency in cluster characteristics over time when the first, second, and third mergers for acquiring firms were clustered as individual groups. The consistency was demonstrated via analysis of variance ratio data for each 66 merger sub-group. Therefore, in this phase of the study, all 295 mergers were run through the FASTCLUS clustering algorithm, which used the nearest centroid sorting technique to minimize the sum of squared distances from the cluster means. Data for clustering were composed of the 18 variables discussed earlier in this chapter (see Section A). The maximum number of clusters ranged from seven to 18. This wide range was chosen to ensure discovery of where cluster formation was impaired by too few clusters being formed. In other words, the point at which a decrease in clusters formed resulted in too large an increase in cluster variability.⁷

⁷This range of maximum clusters also provides for a comprehensive examination of outliers, clusters with only a few mergers in them (see Section 2 below for a complete discussion of outliers), to determine what number of homogeneous groups was best at minimizing them.

2. Discussion of Clustering Results. In order to interpret the results of clustering, a decision must first be made concerning outliers, i.e., clusters containing mergers with financial characteristics distinguishing them from all or all but a few of the other mergers analyzed. That is, what is the minimum number of mergers a cluster can have and still be considered a major cluster instead of an outlier? Answering this question is important because mergers in outlier clusters will not be used in subsequent analysis due to their uniqueness. This limit was set at less than 10 mergers. In making this decision, two factors were kept in mind. First of all, the smallest clusters should, at a minimum, be large enough to accommodate all of a given acquiring firm's mergers in case there are similarities dictating such a group. If this is not done, a group of this type could be rejected as an outlier even though it is important. The 10 merger limit accommodates over 95% of the acquiring firms in the sample. Second, the cluster minimum should not be so large that it results in a large portion of the sample being in outlier clusters. Using the 10 merger minimum results in less than 7% of the 295 mergers being in outlier clusters. Therefore, in this phase of the study, major clusters were defined as those with more than 10 mergers in them.

The number of major clusters, those with 10 or more mergers, varied as the maximum number of clusters that could

be formed was changed. When the maximum number of clusters was set at 12, for instance, five major clusters were developed. When the maximum number of clusters was set at 18, nine major groups were formed. The mergers in outlier clusters were almost exactly the same for both the 12 and 18 cluster runs. Therefore, the increase in major groups had to be the result of larger groups in the 12 cluster run being broken up when 18 clusters were formed.

Distributional changes were determined by tracing each merger's movement between clusters when 12 and 18 cluster maximums were used. This showed which clusters stayed together and which clusters split when the maximum changed from 12 to 18. The results were of interest because they suggested that there were some differences between firm mergers that could not be adequately resolved using only 12 clusters. The movement of mergers between cluster runs is shown in Table IV-7 below where each cell entry shows the number of mergers in each of the 18 clusters (rows 1-18) that came from a particular 12 cluster group (columns 1-12).

This matrix shows that Clusters 2 and 12 stayed together, for the most part, in the 18 cluster run. Cluster 6 also stayed together for the most part, but did produce more outliers. Clusters 1 and 8 split to form three and two major clusters, respectively. For cluster 8, only two of the six clusters it formed were major.

The increase in major clusters formed suggests that there were differences between mergers that can only be studied when 18 clusters were used. Therefore, all subsequent clustering will be done with 18 rather than 12 clusters.

Table IV-7

Merger Movement Matrix

		Cluster Number for 12-Cluster Run												
Cluster # for 18 Cluster Run	1	2	3	4	5	6	7	8	9	10	11	12	Row Total	
1	22											2	24	
2					2								2	
3						3							3	
4			2										2	
5										1			1	
6						34		6				1	41	
7	3							7					10	
8	25												25	
9											1		25	
10										3			3	
11							1	4				50	55	
12								1					1	
13	14							39					53	
14										1			1	
15			22									6	28	
16				1			8	22					31	
17				3									3	
18			5				6						11	
Column Totals	64	27	2	4	2	51	1	79	1	4	1	59	295	

CHAPTER V

CLUSTER INTERPRETATION

A. Chapter Description

In the previous chapter, clusters were formed using all mergers in the data base. No attempt was made to describe the cluster characteristics in financial or non-financial terms. They were determined by statistical procedures which did not provide cluster descriptions. This is important because these descriptions provide needed information for a meaningful summary of cluster characteristics.

In this chapter verbal descriptions of cluster characteristics will be developed. Describing clusters based on their dominant data characteristics will not be entirely consistent from person to person because subjective judgments are involved. Attempting to describe clusters is of value, however, because it provides a means of comparing cluster characteristics to previously researched merger motives.¹

¹As mentioned earlier, these motives should be present and detectable if they are consistent with data gathered to research them here and in previous studies. It is also important to note that subjectivity in cluster interpretation will not affect subsequent analysis. Performance analysis done in Chapter VI in no way depends upon the validity of cluster interpretation.

B. Data Used for Cluster Interpretation

Initial evaluation of cluster characteristics was done with 18 variables derived from factor analysis (see Table V-1). These variables are listed below for reader convenience.

In Chapter IV, more major clusters (clusters with more than 10 mergers in them) were formed when 18 rather than 12 clusters were developed. In this chapter, verbal descriptions of major clusters formed using an 18 cluster maximum are represented. Developing these descriptions turned out to be difficult because the relatively small number of variables used, 18, did not provide for a detailed analysis using differences between cluster and overall mean variable values. This was due to the fact that only four or five of the 18 variables were useful in describing clusters based on univariate F- and T-tests described later in this chapter. It was difficult to subjectively distinguish cluster characteristics based on such a small number of variables.

In order to eliminate this problem, additional variables were used. More data from factor analysis were chosen based on factor loadings which were highest excluding variables already selected. This accomplished three objectives: (1) data items gathered for the acquiring and the acquired firms were more closely matched, (2)

Table V-1

Variables Derived from Factor Analysis

Acquiring Firm	Acquired Firm
Size Data: Income Statement sales before merger	
Size Data: Balance Sheet total assets before merger	Size Data: Balance Sheet total assets before merger
Profitability Data acquiring firm return on equity before merger acquiring firm gross profit margin before merger	Profitability Data return on equity before merger acquired firm operating profit margin before merger
Leverage Data debt to total assets before merger	Leverage Data long-term debt to total equity prior to merger
Industry Average Data advertising cost/dollar of sales before merger gross profit margin prior to merger R & D costs/dollar of sales before merger	Industry Average Data capital spending/dollar of sales before merger gross profit margin before merger
	Other Acquired Firm Data retained earnings to total assets before merger sales to total assets before merger

Economic Indicators

One-Year Growth in the Consumer Price Index

One-Year Growth in Gross National Product

verification of conclusions based on the original 18 variables was obtained, and (3) "before" and "after" merger comparisons on some variables were made possible. This selection process added 16 variables to the list of 18 seen above. All variables are shown in the Appendix (Exhibit 8). Data for this expanded list of variables were used to form homogeneous groups for analysis. This step was also used to determine if the new data would change the results obtained earlier for 18 clusters using only the 18 original variables. The cluster analysis results were similar to previous runs using 18 clusters. The number of mergers in outliers (clusters with less than 10 mergers) remained in the 3% to 6% range and contained only 20 of the 295 mergers analyzed. The number of major clusters (clusters with more than 10 mergers in them) changed by only two, from nine to seven, with no group containing more than 24% of all mergers. The variance ratio data were also consistent with previous results showing total assets and sales variables for acquiring and acquired firms being most effective at forming homogeneous groups. Therefore, all further analysis was done with the augmented 34 variable data base and seven major clusters (containing 275 of the 295 mergers) formed when an 18 cluster maximum was specified. Mergers in the 11 outlier clusters were not used in further analysis. Exhibit 9 in the Appendix shows how many mergers were in each of the seven major clusters.

C. Procedures Used to Determine Cluster Characteristics

Two-tailed T-test procedures were used to evaluate differences between sample and cluster means for all variables in Exhibit 8. Results from this analysis, shown in Table V-2, were used to aid cluster description development by identifying variables that best showed cluster characteristics. In this table, the numbers for each variable in cluster columns show the level of significance for that variable in each cluster.

Further support for use of these variables in cluster descriptions can be obtained from univariate F-tests for equality of cluster means. The data in Table V-3 show that 21 of the 34 variables in Table V-2 had significant F-statistics. These results verify that cluster means based on these variables would be different from overall group means. This shows that these variables would be useful in comparing and contrasting cluster characteristics. Only four of the 13 variables in Table V-3 that did not have significant F-statistics were used to help describe clusters in Chapter V and only two of these four were used in more than one cluster description. Although they were useful in describing some clusters, their overall discriminating ability was relatively low, resulting in insignificant F-statistics. The information in Tables V-2 and V-3 also supports the choice of additional data for cluster

Table V-2
Merger Cluster Characteristic Base on Significant Differences
Between Means for Cluster And TOTAL GROUP LESS CLUSTER

Acquiring Firm	Cluster Number							Cluster Number						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Size Data: Income Statement														
Log of sales bef. mer.	.01	.01	.01	.01	.01	.10	.01							
Log of sales aft. mer.	.01	.01	.01	.01	.01	.10	.01							
SIZE DATA: BALANCE SHEET														
Log, tot. ass. pre-mer.	.01	.01	.01	.01	.01	--	.01	Log Tot. Ass. pre-merger	.01--	--	--	--	.01	--
Log, tot. ass. post-mer.	.01	.01	.01	.01	.01	--	.01							
Bef./Aft. merg. tot. assets ratio	--	.0	1.01	.01	--	--	.01							
PROFITABILITY DATA														
Gross profit post-mer.	.05--	--	.05	--	--	--	--	Oper. Marg. pre-merger	--	--	--	--	--	--
Gross profit pre-mer.	--	--	.05	.10	--	--	--	ROE pre-merger	--	--	--	--	--	--
ROE pre-mer.	--	.05	.05	.10	--	--	--							
ROE post-mer.	--	--	--	--	--	--	--							
ROI post-mer.	.01--	.01	.01	--	--	.10	.10							
ROI pre-mer.	.01	.05	.10	.05	--	.01	--							
Bef./aft. sales ratio	--	.01	.01	.01	--	--	.01							
Bef./aft. ROI ratio	--	--	--	--	--	--	--							
LEVERAGE DATA														
Debt to Eq. post-merger	.01--	.01	.01	.05	.01	.01		Debt to Eq. pre-merger	.10	.01	.01	--	--	--
Debt to Eq. pre-merger	.01	.01	.01	.10	.01	.01								
Debt/Tot. Ass. pre-mer.	.01	.01	.01	.01	.05	.01								
Debt/Tot. Ass. post-mer.	.05--	.01	.01	.01	.05	.01								
Pre/Post Merger Debt to Total Assets Ratio	--	.01	.10	--	.05	--	.10							
IND. AVG. PERF. DATA														
Adv./% sales post-mer.	--	--	--	--	.10	--	--	Cap. Spend/% of sales pre-merger	--	--	.05	.01	.10	--
Adv./% sales pre-merger	.05--	.01	.01	--	--	--	--	Gr. Prof. Mar. pre-mer.	.05--	--	--	--	.10	.01
R & D/% of sales before merger	.05	.10	--	.10	--	.01	--	R & D costs/% of sales	--	.01	.01	.10	.05	.10
Gross Prof. pre-merger	--	--	--	--	--	--	--							
Other Measures of Performance														
								Ret. Earn./Tot. Assets pre-merger	.01	.10	--	--	--	--
								Sales/Tot. assets pre-merger	.01--	--	--	--	.01	.05
DATA RELATED TO THE ECONOMY														
One-Yr. Growth in CPI	--	--	.05	.01	--	--	.05							
One-Yr. Growth in GNP	--	.10	--	.01	.01	--	--							

Table V-3
Univariate F-Ratios and Significance
Levels for Data Used in Cluster Descriptions

Acquiring Firm	F-Ratio	Significance Level	Acquired Firm	F-Ratio	Significance
SIZE DATA: INCOME STATEMENT					
Log of sales before merger	150.4	.0000			
Log of sales after merger	174.6	.0000			
SIZE DATA: BALANCE SHEET					
Log of tot. ass. before merger	217.1	.0000	SIZE DATA: BALANCE SHEET		
Log of tot. ass. after merger	232.1	.0000	Log of tot. ass. before merger	76.26	.0000
Def./Aft. merg. tot. assets Ratio	770.3	.0000			
PROFITABILITY DATA					
Gross profit after merger	.8894	.4959	PROFITABILITY DATA		
Gross profit before merger	.6059	.7255	Oper. Margin before merger	.9012	.4486
ROE before merger	.9833	.4370	ROE before merger	1.071	.2891
ROE after merger	3.191	.0049			
ROI before merger	3.484	.0025			
ROI after merger	1.131	.1962			
Def./Aft. merger sales ratio	5.087	.0001			
Def.Aft. merger ROI ratio	.8719	.5013			
LEVERAGE DATA					
Debt to equity after merger	9.104	.0000	LEVERAGE DATA		
Debt to equity before merger	6.849	.0000	Debt to equity before merger	2.148	.0487
Debt/Tot. assets before merger	5.898	.0000			
Debt/Tot. assets after merger	6.681	.0000			
Def.Aft. merger debt to total assets ratio	2.680	.0184			
IND. AVG. PERP. DATA					
Advt./% of sales after merger	1.544	.1642	IND. AVG. PERP. DATA		
Advt./% of sales before merger	1.431	.1305	Cap. spend./% of sales before merger	1.755	.1090
Cap. spend./% of sales before merger	3.552	.0022	Gross prod. mar. bef. merger	1.252	.3845
R&D/% of sales before merger	3.765	.0012	Research and development Costs/% of Sales	2.707	.0145
Gross profit before merger	1.408	.2014			
Other Measures of Performances					
			Ret. Earn./tot. assets before merger	2.499	.0203
			Sales/Tot. Assets before merger	4.192	.0005
DATA RELATED TO THE ECONOMY					
One-Year Growth in CPI	2.407	0.280			
One-Year Growth in GNP	1.862	.0879			

analysis. Thirteen of the 16 additional variables chosen were significant in univariate F-tests.

In Table V-2, calculations were made without considering acquiring or acquired firm distributions across industries identified using standard industrial classification codes. As a result of this, there may have been confounding of financial variables with other industry-related characteristics which were more relevant. SIC code contingency tables (Exhibit 10 in the Appendix) were developed to investigate this possibility. Table entries show the number of mergers involving acquiring or acquired firms in a given SIC code industry within each cluster followed by a dash and the percentage this number is of all mergers in the cluster. The numbers in parentheses under the cluster numbers show how many mergers were in each cluster.

The tables in Exhibit 10 show that with two exceptions, no cluster has more than 24% of its mergers in one two-digit SIC code industry and that the exceptions, Clusters 2 and 4, contain only 11% of the mergers analyzed--35 out of 295 mergers. Overall, industry-specific influences do not appear to be important in defining merger clusters.

Differences in the distribution of Federal Trade Commission mergers between the total sample and any cluster are also of interest. Data from Exhibit 11 in the Appendix

show that, relative to the total sample, no cluster had an unusual distribution of merger types.

Exhibit 12 in the Appendix shows that most acquiring firms did not have mergers concentrated in specific acquired firm industries. All three-merger firms acquired in at least two different industries. Only one firm with four mergers acquired in less than three different industries. Only five firms with more than four mergers had half of them in one acquired firm SIC industry. The one four-merger firm and the five firms with more than four mergers consummated less than 13% of the mergers studied.²

D. Cluster Descriptions

1. Introduction. In this section, verbal descriptions of clusters are developed and compared to previously researched merger motives. The seven major clusters formed using an 18-cluster maximum and 34 variables were analyzed (see Section B of this Chapter for more information on these clusters). Each cluster description has two parts. Part 1 is a verbal description of cluster characteristics based on relevant variables. Part 2 is a table of all relevant variables and their significance levels as seen in Table V-

²These results, as well as those concerning distributions of Federal Trade Commission merger types are consistent with anti-trust constraints during the time period studied. Several acquisitions in the same industry, for example, may have been viewed as an anti-competitive accumulation of market share for the acquiring firm.

2. The plus and minus signs after variable names indicate whether the cluster mean value was above (+) or below (-) the group mean value.

2. Cluster 1 Description. The data in Table V-4 show both the acquiring and the acquired firms in Cluster 1 were larger than average based on the natural log of total assets for acquiring and acquired firms as a measure of firm size. The acquiring firm also had higher than average debt levels (see acquiring firm debt to equity before and after merger in Table V-4). This suggests that these mergers were motivated by growth maximization because growth maximizers should be larger than average firms and would logically choose larger firms to acquire in order to most effectively increase acquiring firm sales and total assets. This contention was supported when performance data for Cluster 1 were analyzed. It showed both acquiring and acquired firms were average or less than average performers when performance was measured via return on equity for the acquired firm and return on total assets before and after merger for the acquiring firm. These results do not support motives such as profit maximization because acquired firms were not exceptionally profitable, and managerial synergy, if one assumes that the acquiring firm should at least be an average performer. The ratio of total assets for the acquiring firms after and before merger also supports the

Table V-4

Relevant Variables for Cluster 1 Description

Acquiring Firm		Acquired Firm	
Variable	Signifi- cance Level	Variable	Signifi- cance Level
The Log of Total Assets before Merger(+)	.01	The Log of Total Assets before Merger(+)	.01
Return on Assets before Merger(-)	.01	Return on Equity before Merger	---
Return on Assets after Merger(-)	.01	Retained Earnings to Total Assets before Merger(-)	.01
Ratio of after to before Merger Total Assets	---	Sales to Total Assets before Merger(-)	.01
Debt to Equity before and after Merger(+)	.01	Gross Profit Margin before Merger(+)	.05
		Debt to Equity before Merger(+)	.10

Note: Dash lines indicate absolute significance level values greater than .10.

growth maximization theory. The acquiring firms in this cluster had above average growth in assets, but this growth rate was not significant at the .10 level in comparison to the overall group growth rate. They were therefore able to maintain an average growth rate in spite of poor performance, via their acquisition programs.³

3. Cluster 2 Description. The second cluster contained acquired firms below average in leverage (see acquired firm debt to equity in Table V-5). The acquired firms were also average-to-above-average in terms of retained earnings to total assets and sales to total assets (Table V-5). The acquired firms therefore financed a higher than average amount of assets acquisitions with retained earnings and were able to generate higher than average sales per dollar of assets. A somewhat lower than average return on equity (Table V-5) is also consistent with this scenario; these firms used more equity (in the form of

³Managerial synergy may still have been a motive if one considers the possibility that managers had a different, more favorable, view of their capabilities than the market and therefore pursued as merger targets firms which seem to be poorly managed. The acquired firms in this sample also financed less of their asset acquisitions with retained earnings (see acquired firm retained earnings to total assets in Table V-4), were more highly levered (see acquired firm debt to total equity in Table V-4), and were less active (see acquired firm sales to total assets in Table V-4). This suggests poor management of resources in these firms and adds some support to managerial synergy as a secondary motive in this cluster.

Table V-5

Relevant Variables for Cluster 2 Description

Acquiring Firm		Acquired Firm	
Variable	Signifi- cance Level	Variable	Signifi- cance Level
Return on Assets before Merger (-)	.05	Debt to Equity before Merger (-)	.01
Return on Assets after Merger	---	Retained Earnings to Total Assets before Merger (+)	.10
Return on Equity before Merger (-)	.05	Sales to Total Assets before Merger	---
Return on Equity after Merger	---	Return on Equity before Merger	---
Ratio of after to before Merger debt to Total Assets (-)	.01	Industry Average R & D before Merger (-)	.01
Ratio of after to before merger total assets (-)	.01		
Industry Average R & D (+)	.10		
<u>Economic Factors</u>			
GNP (-)	.10		

Note: Dash lines indicate absolute significance level values greater than .10.

retained earnings) than average to generate sales and income resulting in slightly lower than average return on total equity and debt to equity. These acquired firm characteristics suggest that acquiring firms in this cluster had financial synergy and/or profit improvement/maximization as merger motives. They were able to improve performance, as measured by acquiring firm return on investment before and after merger and/or return on total equity before and after merger (see Table V-5). They were also able to improve debt levels when measured by the ratio of after to before merger debt to total assets (see the ratio of acquiring firm debt to total assets after and before merger in Table V-5). Another secondary motive associated with this cluster would be economies of scale. Over the entire sample, the average acquired firm represented about 7.2% of the acquiring firm's assets prior to merger. In Cluster 2, the acquired firm represented, on average, less than 1% of the acquiring firm's total assets prior to merger. As a result of this, growth in total assets, as measured by the ratio of after to before merger acquiring firm total assets (see Table V-5), was lower for these acquiring firms. This suggests that the acquired firms were able to benefit from the much larger acquiring firm's access to capital markets, or other factors, such as more extensive research and development (see acquiring and acquired firm industry

average research and development in Table V-5). This synergistic relationship should have resulted in performance improvements for the acquiring firm after merger. This was the case as shown in return on total assets and total equity for the acquiring firms before and after merger (see acquiring firm return on investment before and after merger and acquiring firm return on total equity before and after merger in Table V-5). The acquiring firms went from below to about average when performance was measured with these variables. The economic environment for mergers in this cluster was also important because one-year growth in GNP (see Table V-5) was below the group average, suggesting a stagnant or contracting economy. Therefore, these cluster characteristics suggest that during adverse economic periods, firms acquire to improve or maintain performance rather than for other reasons. Another important aspect of this cluster is that nine of its mergers were consummated by International Telephone and Telegraph. The other five mergers were spread between Gulf Oil Company, Tenneco, and Westinghouse Electric.

4. Cluster 3 Description. The third cluster is similar to Cluster 2. The acquired firms in clusters two and three had average-to-above-average retained earnings to total assets ratios (see Table V-6) and Table V-5) and well below average debt to total equity levels (see acquired firm

Table V-6

Relevant Variables for Cluster 3 Description

Acquiring Firm		Acquired Firm	
Variable	Signifi- cance Level	Variable	Signifi- cance Level
Debt to Total Assets before Merger (-)	.01	Retained Earnings to Total Assets	---
Debt to Total Assets after Merger (-)	.01	Debt to Total Equity (-)	.01
Debt to Equity before Merger (-)	.01	Capital Spending/\$ of Sales before Merger (-)	.05
Debt to Equity after Merger (-)	.01	R & D Costs/\$ of Sales before Merger (-)	.01
Return on Total Assets before Merger (+)	.10		
Return on Total Assets after Merger (+)	.01		
The Log of Total Assets before Merger (-)	.01		
The Log of Total Assets after Merger (-)	.01		
Capital Spending/\$ of Sales before Merger (-)	.01		

Economic Factors

One-Year Growth in CPI (-) .05
 One-Year Growth in GNP ---

Note: dash lines indicate absolute significance level
 values greater than .10.

debt to total equity in Tables V-5 and V-6). In Cluster 3, however, the acquired firm values were further from the group means. The acquiring firms were also similar in that the firms from both clusters had below average before and after merger debt levels (see acquiring firm debt to total assets before and after merger and acquiring firm debt to equity before and after merger in Table V-5). They were also able to improve their performance after merger when measured in terms of return on total assets (see acquiring firm return on investment before and after merger in Tables V-5 and V-6).

There were two important differences between these clusters. First, the economic conditions were different. In Cluster 2, growth in the Consumer Price Index (see CPI in Table V-5) was not different from the group average, while growth in the Gross National Product was below the group average (see GNP in Table V-5). In Cluster 3, growth in the GNP (see GNP Table V-6) was about average, and growth in the CPI was below average (see CPI in Table V-6). This suggests that the state of the economy in cluster three was either steady or slightly expansionary in comparison to cluster two. In this environment, one would expect smaller firms which may not have been able to obtain the necessary capital during more inflationary times (higher growth in CPI) to participate in mergers. This was the case in Cluster 3.

The acquiring firms were smaller than average in this cluster. Therefore, these mergers were motivated, at least in part, by more favorable economic conditions which made acquisition capital easier to obtain. A secondary motive was profit improvement because acquiring firm performance, when measured in terms of return on total assets, was above average after merger, but not prior to merger (see acquiring firm return on investment before and after merger in Table V-6). Both the acquiring firm and acquired firms in this cluster were in industries with less capital spending per dollar of sales (see Table V-6). The acquired firm's industry average research and development costs per dollar of sales were also below average (see Table V-6). This suggests that, in this sample, less capital intensive firms were more merger active during favorable periods.

5. Cluster 4 Description Economic conditions were a significant factor in Cluster Four as well. In this group, growth in GNP (see one-year growth in GNP in Table V-7) was higher and growth in the CPI (see one-year growth in the CPI in Table V-7) was lower than group averages. This suggests a more expansionary economic environment than in Cluster 3. The acquired firms were slightly less profitable and more highly levered (see acquired firm return on equity and acquired firm debt to equity in Table V-7). They also financed less of their assets acquisitions with retained

Table V-7

Relevant Variables for Cluster 4 Description

<u>Acquiring Firm</u>		<u>Acquired Firm</u>	
Variable	Signifi- cance Level	Variable	Signifi- cance Level
The Log of Sales before and after Merger (-)	.01	Retained Earnings to Total Equity before Merger	---
The Log of Total Assets before and and after Merger (-)	.01	Debt to Equity before Merger	---
Debt to Total Assets before and after Merger (+)	.01	Return on Equity	---
Debt to Equity before and after Merger (+)	.01	Ind. Avg. Cap. Spend./\$ of Sales (-)	.01
Return on Assets before Merger (-)	.05		
Return on Assets after Merger (-)	.01		
Ratio of after-to- before merger sales (+)	.01		
Ratio of after-to- before Merger Total Assets (+)	.01		
Ind. Avg. Cap. Spend./\$ of sales before merger (-)	.01		

Economic Factors

One-Year Growth in GNP (+)	.01
One-Year Growth in CPI (-)	.01

Note: Dash lines indicate absolute significance level values greater than .10.

earnings (see acquired firm retained earnings to total assets in Table V-7). The acquiring firms were smaller (see the natural log of acquiring firm sales and total assets before and after merger in Table V-7), more highly levered (see acquiring firm debt to total assets before and after merger and acquiring firm debt to equity before and after merger in Table V-7), and less profitable also (see acquiring firm return on investment before and after merger in Table V-7). In short, acquiring firms that were average performers bought similar businesses. This is consistent with the economic disturbance theory discussed earlier [23]. In an expanding economy, capital will be easier to obtain or be available at a lower cost. This makes the cost of capital lower and the required return on investments such as mergers lower. An expanding economy also gives investors a more positive outlook on the future which results in lowering of risk premiums due to more favorable economic forecasts. Another aspect of the economic disturbance theory, rapid firm expansion, was shown in this cluster by sales and total assets ratios which were higher than average (see Table V-7). The acquiring and acquired firms in this cluster, like those in Cluster 3, were in industries with lower than average capital spending per dollar of sales. This suggests that "defensive diversification" may also have been a motive for mergers in this cluster [56].

6. Cluster 5 Description Cluster five showed a unique combination of acquiring firm and economic factors. The acquiring firms in this cluster were slightly below average performers, as were the acquired firms, when performance was measured in terms of return on total assets and return on equity (see acquiring firm return on investment before and after merger and acquired firm return on equity in Table V-8). The acquiring firms were also smaller than average in this cluster with lower than average leverage ratios (see the natural log of acquiring firm total assets before and after merger, acquiring firm debt to total assets before and after merger, and acquiring firm debt to equity before and after merger in Table V-8). Growth in GNP (see one-year growth in the GNP in Table V-8) for this cluster was also an important factor because it was below average. Cluster 5 also showed a unique relationship between advertising and research and development variables. Data in Table V-8 show acquiring firm industry advertising to be above average, while acquired firm industry research and development was below average.

In summary, the cluster was characterized by smaller than average, consumer oriented acquiring firms with lower than average debt levels operating in a relatively stagnant economic environment. Furthermore, these acquiring firms purchased businesses which were different from the overall

Table V-8

Relevant Variables for Cluster 5 Description

Acquiring Firm		Acquired Firm	
Variable	Signifi- cance Level	Variable	Signifi- cance Level
The Log of Total Assets before Merger (-)	.01	Return on Equity before Merger	---
The Log of Total Assets after Merger (-)	.01	Ind. Avg. R&D before Merger (-)	.05
The Log of Sales before Merger (-)	.01		
The Log of Sales after Merger (-)	.01		
Return on Total Assets before Merger	---		
Return on Total Assets after Merger	---		
Debt to Equity before Merger (-)	.05		
Debt to Equity after Merger (-)	.10		
Debt to Total Assets before Merger (-)	.05		
Debt to Total Assets after Merger (-)	.10		
Ratio of after-to before Merger Debt to Total Assets (+)	.05		
Ind. Avg. Adver./ \$ of Sales before Merger (+)	.10		

Economic Factors

GNP (-) .01

Note: Dash lines indicate absolute significance level
values greater than .10.

group in only one area, industry research and development. This combination of factors is not readily translatable into one or more of the merger motives cited in this study.

7. Cluster 6 Description The characteristics of Cluster 6 were more amenable to merger motive interpretation. The acquired firms in this cluster were slightly below average when performance was measured in terms of profitability (see acquired firm net income to total equity before merger in Table V-9) and significantly below average when performance was measured in terms of activity (see acquired firm sales to total assets in Table V-9). Their debt levels were also close to the overall group average (see acquired firm debt to equity in Table V-9). The outstanding feature of this cluster was revealed when the acquiring firms were compared to the acquired firms. The acquiring firms were more profitable than average (see acquiring firm return on investment before merger in Table V-9), unlike the acquired firms (see acquired firm return on equity Table V-9). The acquiring firms were also much larger than average in relation to the acquired firms. On average, the acquired firms represented about 7% of the acquiring firms' assets. In this cluster, acquired firms were only about 1.7% of acquiring firms' assets.

Managerial synergy is consistent with these characteristics, and the fact that acquiring firms in this cluster were more profitable than average both before and

Table V-9

Relevant Variables for Cluster 6 Description

Acquiring Firm		Acquired Firm	
Variable	Signifi- cance Level	Variable	Signifi- cance Level
ROI before Merger (+)	.01	ROE before Merger	---
ROI after Merger(+)	.10	Sales to Total Assets before Merger (-)	.01
Debt to total Assets before Merger (-)	.10	Debt to Equity before Merger	---
Debt to Total Assets after Merger (-)	.01	Total Assets before Merger (+)	.01
Debt to Equity before Merger (-)	.10		
Debt to Equity after Merger (-)	.05		
Ratio of Debt to Total Assets after and before merger (+)	.05		

Note: Dash lines indicate absolute significance level values greater than .10.

after merger (see acquiring firm return on total assets before and after merger in Table V-9) and had lower than average debt levels (see acquiring firm debt to total assets before and after merger and acquiring firm debt to equity before and after merger in Table V-9). The relatively larger, more profitable acquiring firms targeted the acquired firms as being businesses whose performance could be improved via the application of superior management techniques. Other motives consistent with the data are economies of scale, due to the relatively large difference in acquiring and acquiring firm size; financial synergy, because of the increase in significance for debt to total assets after merger for the acquiring firms (see the ratio of debt to total assets after and before merger in Table V-9); and growth maximization, because the acquired firms were larger than average in this cluster (see acquired firm total assets in Table V-9).

8. Cluster 7 Description In terms of acquiring firm size and debt levels, the characteristics of Cluster 7 were similar to those for Cluster 1. The firms acquired and the economic conditions under which the mergers were consummated were different, however. In Cluster 1 the acquired firms were larger than average (see the natural log of acquired firm total assets in Table V-4, p. 88) had higher than average debt levels (see acquiring firms debt to total assets in Table V-4), and average to lower than average

Table V-10

Relevant Variables for Cluster 7 Description

Acquiring Firm		Acquired Firm	
Variable	Signifi- cance Level	Variable	Signifi- cance Level
Log of Total Assets before & after Merger (+)	.01	Log of Total Assets before Merger	---
Log of Sales before & after Merger (+)	.01	Sales to Total Assets before Merger (+)	.05
Debt to Total Assets before & after Merger (+)	.01	Debt to Equity before Merger	---
Debt to Equity before & after Merger (+)	.01		
Ratio of Debt to Total Assets after & before Merger (-)	.01		
Ratio of Sales before & after Merger (-)	.01		
Ratio of Total Assets after & before Merger (-)	.01		
<u>Economic Indicators</u>			
One-Year Growth in GNP (+)		.05	
One-Year Growth in CPI		---	

Note: Dash lines indicate absolute significance level values greater than .10.

profitability and activity levels (see acquired firm return on total equity and acquired firm sales to total assets in Table V-4, p.88 for Cluster 1). The acquired firms in Cluster 7 were slightly below average in size (see acquired firm total assets before merger in Table V-10), had slightly lower than average debt levels (see acquired firm debt to equity in Table V-10), and were more active than average (see acquired firm sales to total assets in Table V-10). The economic conditions in Cluster 1, as measured by growth in real GNP and the CPI, were about average for the overall group (see one-year growth in GNP and CPI for Cluster 1 in Table V-4). In Cluster 7, growth in the CPI, a proxy for inflation, was higher than average (see one-year growth in CPI in Table V-10), suggesting less favorable economic conditions for mergers in this cluster. One may then conclude that acquiring firms of the type in Clusters 1 and 7 seek different types of merger targets under different economic conditions. When the economic conditions become less favorable, these acquiring firms seek smaller, more profitable businesses to acquire in order to maintain or improve profitability. One would therefore expect these firms to be less growth oriented during this period because smaller than average firms were acquired. This conclusion was born out in the after-to-before merger total assets ratios for acquiring firms in Clusters 1 and 7 (see the ratio of after-to-before merger total assets and the ratio

of after-to-before merger sales in Tables V-4 (p. 88) and V-10 for Clusters 1 and 7). In Cluster 1, the ratio is not statistically different from the overall group. In Cluster 7, this ratio is below the overall group average.

9. Macro-Economic Factors and Merger Activity The data found in Table V-2 (p. 83) can be used to do more than formulate cluster descriptions. It can also be used to show the impact of macro-economic factors on the clusters developed. It shows that in Clusters 1, 3, 4, and 6, inflation, as measured by one-year growth in the Consumer Price Index, was either at or below the group average and that one-year growth in Gross National Product was either at or above the group average. This suggests periods of moderate to high economic growth. Merger activity should also be higher during the time period over which these mergers were consummated because raising capital would be easier in this economic environment. Data from Exhibit 13 in the Appendix support this contention. They show that Clusters 1, 3, 4, and 6 are four of the five clusters that show higher levels of merger activity for one or more years between 1966 and 1970.

E. Summary

The descriptions above are important for two reasons. First, they show that characteristics based on data gathered

could be used to describe each cluster and distinguish it from others. The descriptions therefore lend support to verification of differences between clusters discussed in Chapter IV and show the differences in a more intuitively appealing manner. Second, the descriptions show that, in all but one of the clusters, characteristics were consistent with one or more previously researched merger motives. This point is particularly important because it directly addresses one of the objectives to which this study is dedicated. The descriptions also show the advantage of using analytical techniques that allow for multi-motive rather than only single-motive merger research. Table V-11 illustrates this point. It shows that 4 of the 6 clusters with meaningful interpretations have more than one motive associated with them. This is due to the fact that merger motives are not mutually exclusive. In Cluster 2, for example, profit improvement could be the result of financial synergy or scale economies realized via merger. Through financial synergy, the acquiring firm would be able to use more debt in its capital structure instead of equity. This would provide additional profit due to the tax shelter provided by debt. Scale economies would also result in more profit for the acquiring firm because operating costs relative to sales decline as the firm approaches its optimum operating level. Acquiring firms can also improve profitability by simply buying firms more profitable than

Table V-11

Cluster Interpretations Based on Previously
Researched Merger Motives

Cluster	Interpretation
#1	Growth Maximization
#2	Financial Synergy/ Profit Improvement/ Scale Economies
#3	Favorable Economic Environment/ Profit Maximization
#4	Economic Disturbance Theory/ Defensive Diversification
#5	No Meaningful Description
#6	Managerial Synergy/Scale Economies/Financial Synergy
#7	Profit Improvement

themselves. In Cluster 3, a favorable economic environment results in lower capital costs for acquiring firms. Lower interest rates make the cost of debt financed mergers lower and improve acquiring firm profits. In Cluster 6, managerial synergy, the desire to replace current acquired firm manatement may be related to potential scale economies for the acquired firm which cannot be realized without financial and managerial resources from the acquiring firm. Capital structure changes due to financial synergies realized by superior acquiring firm managers may also result from acquisitions of this type.

As a result of these relationships, one can name the clusters developed as follows: (1) Cluster 1--growth maximization, (2) Cluster 2--profit improvement via financial synergy, (3) Cluster 3--profit improvement via lower capital costs, (4) Cluster 4--mergers due to improper acquired firm valuation, (5) Cluster 6--profit improvement via better management, and (6) Cluster 7--profit improvement via purchase of more profitable firms.

CHAPTER VI

STATISTICAL TESTS OF FIRM MERGER DISTRIBUTIONS AND
ACQUIRING FIRM PERFORMANCE COMPARISONSA. Methodology

In this phase of the study, each firm's distribution of mergers across the seven homogeneous groups was evaluated to determine how probable each observed distribution was. A computer program was written to generate every possible distribution of each firm's mergers across the seven homogeneous groups. The probability of each firm's actual merger distribution was then calculated and compared to probabilities of other possible distributions. This was done using the formula for a hypergeometric probability distribution (28).¹

¹Given a sample space containing a finite number T of elements, suppose that the elements are divided into K mutually exclusive and exhaustive classes, with T_1 in class 1, T_2 in class 2. . . , T_k in class K . A sample of N observations is drawn at random without replacement and is found to contain n_1 of class 1, n_2 of class 2. . . , n_k of class K . Then the probability of occurrence of such a sample is given by

$$\frac{\binom{T_1}{n_1} \binom{T_2}{n_2} \cdots \binom{T_k}{n_k}}{\binom{T}{N}}$$

where $n_1 + n_2 + \cdots + n_k = N$ and $T_1 + T_2 + \cdots + T_k = T$ [28]. In this application, k goes from one to seven with $T_1 = 29$, $T_2 = 14$, $T_3 = 59$, $T_4 = 21$, $T_5 = 25$, $T_6 = 55$, and $T_7 = 72$.

Both the multinomial and hypergeometric probability distributions adequately describe the sampling process which leads to all possible firm merger distributions. Assumptions for these distributions differ in one important way. The multinomial distribution is based on an assumption of sampling with replacement or from an infinitely large population so that the basic probabilities do not change over the trials made. In this study, mergers were not replaced after assignment to a cluster and the sample of mergers for each firm was not infinite. Therefore, the hypergeometric formula was used to generate probabilities.

With this formula, one can calculate the probability of observing a given distribution of firm mergers based on a known distribution of all mergers across homogeneous groups or clusters. The distribution of all mergers (295 mergers less 20 mergers in outlier groups) across homogeneous groups was as follows:

1. Group One: 29 mergers;
2. Group Two: 14 mergers;
3. Group Three: 59 mergers;
4. Group Four: 21 mergers;
5. Group Five: 25 mergers;
6. Group Six: 55 mergers;
7. Group Seven: 72 mergers.

Two examples of hypergeometric calculations appear in the Appendix. Exhibit 5 is a simplified example to illustrate

the basic procedure used. Exhibit 6 is a more comprehensive example involving more mergers and more homogeneous groups. A detailed cumulative probability calculation is also in Exhibit 6.

B. Merger Distribution Results

Only firms with four or more mergers during the time period studied were included. Thirty-one firms met this criterion. This was done to focus analysis on those firms most likely to have significant intra-firm merger relationships and to increase the power of statistical tests used. Increased discriminating power using the hypergeometric formula can be shown using data from Exhibit 6 in the Appendix. In this exhibit, there were 35 ways to distribute four mergers over four homogeneous groups. If the number of mergers is reduced to three, there are only 22 ways to distribute them over four homogeneous groups. For a fixed number of acquiring firms, the likelihood of observing the same probability for more than one firm is increased because there are fewer possible outcomes and the same number of firms. This decline in discriminating power was more prominent in this study because there were more firms with three mergers (35) than with four or more mergers (31). Therefore, the three-merger sub-group of acquiring firms had more companies and fewer possible outcomes than the four or more merger sub-sample. The reduction in acquiring firms was accomplished without sacrificing

adequate sample size in terms of acquiring firms and/or mergers consummated. These firms, the number of mergers they participated in during the time period studied, the distribution of mergers over homogeneous groups, and the probability of observing the distribution or one more likely are seen in Table VI-1. Twelve of the 31 firms with four or more mergers were found to have cumulative probabilities of .05 or less. They are the firms marked by asterisks in Table VI-1. This distribution of probabilities was compared to a random homogeneous distribution of probabilities using a Chi Square test. The hypotheses tested was that the distribution of probabilities observed was not different from random. The critical Chi Square value (for a significance level of .01) was 7.81. The value observed was 73.866. Therefore, it is extremely unlikely that this distribution occurred by chance. This is due in no small part to the fact that 12 probabilities less than or equal to .05 were observed when less than two ($31/20$ based on 20 5% subdivisions of the probabilities) would occur by chance alone. The unusually large number of companies with improbable merger patterns is an important characteristic of merger active firms which could only be shown in a study of this type and has not been investigated before.

At this point, it was important to verify that eliminating three merger firms had no impact on the distribution of cumulative probabilities derived using the

Table VI-1

Firms Used in and Results from Hypergeometric Probability Analysis

Company Name	# of Mergers	Merger Distribution							Prob-ability
		1	2	3	4	5	6	7	
American Can	4	0	0	0	0	0	0	0	.2061
Amsted Ind.	4	0	0	2	0	2	0	0	.0872
Ashland Oil	5	0	0	1	0	1	2	0	.9619
*Atlantic Richfield	4	3	0	0	0	0	1	0	.0200
*A-T-P Inc.	4	0	0	2	2	0	0	0	.0454
*Bangor Punta	4	0	0	1	2	1	0	0	.0337
Beatrice Foods	5	0	0	0	0	0	0	5	.0975
Boise Cascade	5	0	0	0	0	1	1	3	.5902
Coca-Cola Co.	5	0	0	1	0	0	1	3	.9122
*Coca-Cola W.	4	0	0	0	0	4	0	0	.0002
Consolidated Foods	6	0	0	3	0	0	1	3	.9999
Diamond Shamrock	4	0	0	1	0	1	2	0	.4660
Emerson Electric	6	0	0	4	0	1	1	0	.1013
General Mills	5	0	0	3	0	0	0	2	.5960
Georgia Pacific	5	0	0	0	0	0	3	2	.5079
*Gulf & Western	12	7	0	0	1	1	0	3	.0002
Ingersoll Rand	5	0	0	3	0	0	0	2	.5960
*ITT	15	1	9	0	0	0	0	5	.0000
*Lear Siegler	4	0	0	0	0	3	1	0	.0099
Litton Indus.	6	0	0	1	0	0	2	3	.9040
Occidental Pet.	4	2	0	0	0	1	0	1	.1429
*Rockwell	5	4	0	0	0	0	0	1	.0043
Singer	4	1	0	0	0	0	1	2	.7956
St. Regis	4	0	0	1	0	0	2	1	.9062
*Teledyne	7	0	0	1	4	0	2	0	.0032
*Tenneco	9	4	1	0	0	0	0	4	.0081
*Testron	8	0	0	2	0	0	6	0	.0252
TRW	6	0	0	0	0	0	2	4	.4479
U.S. Plywood	7	3	0	2	0	0	0	2	.2051
*White Consol.	4	0	0	0	4	0	0	0	.0003
W. R. Grace	4	0	0	0	0	0	0	4	.2062
Total Sample	174	25	10	20	13	16	20	54	

hypergeometric formula. A Chi Square test was run on the cumulative probability distributions for two groups: those firms with three merger and those with four or more mergers. For this test, the probabilities were subdivided into twenty 5% intervals. Each probability was given a classification number based on these intervals. Test results using the classification data showed that the two distributions were not significantly different. Therefore, eliminating the three merger firms increased discriminating power using the hypergeometric probability formula without an unacceptable reduction in sample size or a change in the distribution of cumulative probabilities.

C. Merger Behavior Descriptions

Verbal descriptions of several firms' merger behavior were developed using data from Table VI-1 and cluster descriptions from Chapter V. Additional data supporting these descriptions were also obtained from other sources.

Atlantic Richfield, Gulf and Western, Tenneco, and Rockwell have most of their mergers in Cluster 1, which had characteristics consistent with growth maximization--large acquiring firms with lower than average profits, and acquired firms that were large, more highly levered, and less profitable than average. There is support for this merger motive from other sources outside this study.

Even those who had been closely watching its comet-like course were startled this winter when Gulf & Western Industries announced its intention to acquire Armour & Co., a company whose sales last year were three times its own. . . . Gulf & Western was almost simultaneously involved in a flurry of other Brödingnagian deals. It swallowed up E. W. Bliss, Universal American, and Consolidated Cigar, whose combined sales exceed \$500 million a year, and disclosed plans to buy all or part of four other companies with revenues above \$350 million. Even without further acquisitions, Gulf & Western, whose annual turnover reached \$100 million only in 1964, expects to finish this year [1969] with sales of \$1.3 billion. It was a heart-warming day for skeptics who have recurrently contended that the conglomerates cannot sustain their fast growth rates, that they have undertaken management tasks beyond human capability, that they inflate their reported earnings by promotional tricks with their accounting. . . . Howard Stein, president of the Dreyfus Fund, warned, 'Whether the conglomerates have long-term staying power is something we should be concerned about.'²

Similar information pertaining to Tenneco can be found in a July 1967 Business Week article which states

In its 24 years, Tenneco's growth has been prodigious. In 1945, after construction of its first natural gas pipeline, from South Texas to West Virginia, it netted \$3.9 million on revenues of \$14.3 million; a decade later, in 1955, net was \$31 million on revenues of \$199.4 million. By 1965, the net had reached \$95.3 million on revenues of \$1 billion and last year it climbed to \$108.1 million on revenues of \$1.2 billion. Assets climbed even faster, spiraling from \$1.1 billion in 1957 to \$2.9 billion in 1966.³

²William S. Rukeyser, "Gulf & Western's Rambunctious Conservatism," Fortune, LXXVII (March 1969), p. 122.

³"Tenneco Lands Kern County," Business Week, No. 1977 (July 22, 1967), p. 96.

The article goes on to state that Tenneco's acquisition of Kern County Land

. . . may be large but there is no question that for Symonds [Tenneco's president] it is toothsome. In his view, Kern County Land fits neatly into a pattern he set for Tenneco long ago. 'We are a conglomerate,' he says. 'We are just as much a conglomerate as Olin Mathieson or FMC--a 50-50 partner with Tenneco in Petro-Tex Chemical Corp.--and we should be compared with them rather than other pipeline companies.'

The distribution of mergers for Automatic Sprinkler Company (ATO) was evenly divided between clusters two and three. These clusters were characterized by smaller than average acquiring firms purchasing average acquired firms in a favorable economic environment. As a result of this, the acquiring firms in this cluster took advantage of favorable economic conditions to finance acquisitions. Automatic Sprinkler fits this description rather well. Rukeyser wrote:

Automatic Sprinkler officials have sometimes complained about the failure of conservative bankers to grasp the concepts of a growth company. But in fact, until earnings slipped, neither the company's directors nor the money market placed any effective barriers in the way of management's expansion plans. On the contrary, executives were encouraged in their course by some of the most sophisticated elements of the financial community. By the end of 1967 major mutual funds had bought up some 20 percent of the shares.⁴

⁴William Simon Rukeyser, "Why Rain Fell on Automatic

Automatic Sprinkler was also consistent with the below-average size of acquiring firms in clusters three and four when it began its acquisition program in 1963. At that time, it generated sales of \$22.73 million with less than \$5 million of assets. The company grew rapidly and in 1969 sales had grown to \$325 million, primarily because of some 20 acquisitions. This period of rapid growth in assets and sales and inadequate evaluation of acquired firms prior to acquisition was consistent with Meuller's economic disturbance theory of mergers discussed in the Cluster 4 description and in Chapter II. Automatic Sprinkler's earnings history during this period verifies that this type of merger program can lead to poor acquiring firm performance due to unforeseen problems in sick acquired firms. In late 1967, Harry E. Figgie, Jr., Automatic Sprinkler's chairman and chief executive officer, was projecting earnings of at least \$1.70 per share for 1967 and \$2.75 per share for 1968; instead, the company was able to report only \$1.43 in 1967 and 10 cents in 1968. Its shares--down from a January 1968 peak of \$74--have recently (in 1969) traded below \$11 per share.

International Telephone and Telegraph had almost two-thirds of its mergers in Cluster 2, which had characteristics suggesting financial synergy and/or profit

Sprinkler," Fortune, LXXVIII (May 1, 1969), p. 122.

improvement as a merger motive. The acquiring firms had lower than average debt levels and were able to do a better than average job of improving profitability via acquisition. These acquiring and acquired firm characteristics are consistent with other information pertaining to ITT's merger strategy. An article from The Economist states,

By the end of this year [1969] ITT will have looked over 200 European companies, half of which themselves made the first approach. Serious interest has or will be taken in 70. But probably only 20 will be bought in the end. Mr. Geneen is now determined to generate more growth internally: to rebut criticisms from investment analysts that ITT has grown mainly or entirely by acquiring other companies. To be eligible, European companies will have to show handsome profit prospects. . . .⁵

White Consolidated and Teledyne, like ATO, had their mergers in Cluster 4, which was characterized by significant economic expansion, above average growth in GNP, and below average increases in the CPI during the time these mergers were consummated. The acquiring and acquired firms in this cluster, unlike Clusters 1 and 2, were average performers based on data collected. Textron's distribution was different from all of these. Three-fourths of its mergers were in Cluster 6, which had characteristics consistent with managerial synergy as a merger motive. The acquiring firms

⁵The Economist, Vol. 245, No. 6738 (October 14, 1972), p. 96.

in this cluster were much larger and more profitable than the acquired firms which had below average profitability levels.

D. Acquiring Firm Performance Analysis

Variations in merger patterns discussed in the previous section may have contributed to differences in firm performance during the time period analyzed. The data in Table VI-2 were used to investigate this possibility. These variables are consistent with the data described in Hypothesis Two in Section C of Chapter I. These data included: (1) mean market return, (2) mean return on total assets, (3) mean return on total equity, (4) the mean ratio of long-term debt to total assets, (5) the mean ratio of total debt to total assets, and (6) Treynor's Measure of Performance. The variables in Table VI-2 were arranged to correspond to this listing. Table VI-2 also includes measures of risk for market return, return on total assets, and return on total equity, which are discussed below.

Mean returns on equity and total assets were used as measures of profitability. Mean values for total debt and long-term debt to total assets were used as proxies for changes in risk based on changes in firm leverage. Although these data are useful in measuring firm performance, they cannot be adjusted to reflect differences in the dispersion

Table VI-2

Variables Used for Acquiring Firm Performance Analysis

The Geometric Mean Monthly Return

The Mean Value for Book Return on Total Assets

The Mean Value for Book Return on Total Equity

The Mean Value for Total Debt to Total Assets

The Mean Value for Long-Term Debt to Total Assets

Treynor's Measure of Performance

The Coefficient of Variation for Monthly Market Return

The Coefficient of Variation for Book Return on Total Assets

The Coefficient of Variation for Book Return on Total Equity

of values used to calculate means. Coefficients of variation were used to combine mean values with a measure of dispersion or total risk, the variance. Treynor's Measure of Performance for firms or groups of firms was also used so that performance could be evaluated in an efficient portfolio/systematic risk framework.⁶ Data for these variables were collected for five years, 1978 to 1982. This time period was chosen for two reasons. First, it is long enough to reduce the possibility of abnormal performance in one year producing bad data. Second, any systematic effects acquisitions had on firms during the period studied (1960-1978) should be reflected in these data. Table VI-3 shows values for Wilcoxon Rank Sums tests between various groups [28]. In Table VI-3, Group 0 is composed of all acquiring firms with three, four or more mergers. Group 1 is composed of all acquiring firms that did not have improbable or unusual distributions. Group 2 is composed of all acquiring firms with four or more mergers that did have statistically

⁶Treynor's Measure is:

$$T = \frac{r_p - R_f}{b_p}$$

T = Treynor's Measure of Performance

r_p = average rate of return on portfolio p

b_p = the beta coefficient for portfolio p

R_f = the riskless rate of return.

Table VI-3
Wilcoxon Rank Sum Tests Between Groups Based on Selected Variables

Groups Compared				Group Population				Groups Compared				Group Population			
0				35				0				35			
1				1				1				19			
Mean Ranks								Mean Ranks							
Variable	Group 0	Group 1	Sig. Level					Variable	Group 0	Group 1	Sig. Level				
Monthly Market Return	19.33	7.00	.2814					Treynor's Meas. of Perf.	30.00	24.21	.2057				
Monthly Mkt. Ret. Coef. of Var. 4.0	19.42		.1744					Tot. Debt/Ass. Co. of Var.	22.88	23.16	.9542				
Groups Compared				Group Population				LT Debt/Tot. Ass. Co. of Var. <td colspan="4">24.15</td>				24.15			
1				19				ROI Coef. of Var.				20.27			
2				1				ROE Coef. of Var.				20.23			
Mean Ranks								Mean Ranks							
Variable	Group 1	Group 2	Sig. Level					Variable	Group 0	Group 1	Sig. Level				
Monthly Market Return	10.58	9.00	.8623					Avg. Tot. Debt/Tot. Assets	23.35	22.53	.8451				
Monthly Mkt. Ret. Coef. of Var. 10.84	4.00		.2981					Avg. LT Debt/Tot. Assets	22.58	23.58	.8093				
Groups Compared				Group Population				Avg. ROI <td colspan="4">24.15</td>				24.15			
2				12				Avg. ROE				22.73			
3				1				Geometric Mean Return				25.99			
Mean Ranks								Mean Ranks							
Variable	Group 2	Group 3	Sig. Level					Variable	Group 0	Group 2	Sig. Level				
Monthly Market Return	6.91	2.00	.2456					Treynor's Meas. of Perf.	23.83	24.55	.8901				
Monthly Mkt. Ret. Coef. of Var. 6.73	4.00		.5623					Tot. Debt/Ass. Coef. of Var.	19.69	17.36	.5609				
Groups Compared				Group Population				LT Debt/Tot. Ass. Co. of Var. <td colspan="4">19.18</td>				19.18			
0				35				ROI Coef. of Var.				17.85			
1				19				ROE Coef. of Var.				17.31			
Mean Ranks								Mean Ranks							
Variable	Group 0	Group 1	Sig. Level					Variable	Group 0	Group 2	Sig. Level				
Monthly Market Return	30.86	22.58	.0696					Avt. Tot. Debt/Total Assets	18.54	20.09	.7024				
Monthly Mkt. Ret. Coef. of Var. 26.00	31.79		.2057					Avg. LT Debt/Total Assets	18.65	19.82	.7776				
Groups Compared				Group Population				Avg. ROI				18.85			
0				35				Avg. ROE				17.35			
1				19				Geometric Mean Return				23.01			
Mean Ranks								Mean Ranks							
Variable	Group 0	Group 1	Sig. Level					Variable	Group 0	Group 2	Sig. Level				
Monthly Market Return	30.86	22.58	.0696					Treynor's Meas. of Perf.	13.74	18.55	.1555				
Monthly Mkt. Ret. Coef. of Var. 26.00	31.79		.2057					Tot. Debt/Ass. Coef. of Var.	16.26	14.18	.5468				
Groups Compared				Group Population				LT Debt/Tot. Ass. Co. of Var.				15.42			
0				35				ROI Coef. of Var.				16.95			
2				12				ROE Coef. of Var.				21.86			
Mean Ranks								Mean Ranks							
Variable	Group 0	Group 2	Sig. Level					Variable	Group 1	Group 2	Sig. Level				
Monthly Market Return	24.03	23.919	.9900					Avt. Tot. Debt Tot. Assets	14.95	16.45	.6669				
Monthly Mkt. Ret. Coef. of Var. 24.92	21.00		.4142					Avg. LT Debt/Total Assets	15.32	15.82	.8973				
Groups Compared				Group Population				Avg. ROI				14.68			
1				19				Avg. ROE				14.26			
2				12				Geometric Mean Return				15.92			
Mean Ranks								Mean Ranks							
Variable	Group 1	Group 2	Sig. Level					Variable	Group 1	Group 2	Sig. Level				
Monthly Market Return	13.63	18.73	.1320					Treynor's Meas. of Perf.	13.74	18.55	.1555				
Monthly Mkt. Ret. Coef. of Var. 17.42	12.18		.1213					Tot. Debt/Ass. Coef. of Var.	16.26	14.18	.5468				

NOTE: Group 0 is composed of all firms with exactly three mergers. Group 1 is composed of firms with four or more mergers that did not have unlikely distributions among clusters. Group 2 is composed of firms with four or more mergers that did have unlikely distributions among clusters. Group 3 is the market portfolio represented by the Standard and Poors 500 Stocks.

NOTE: Group 0 is composed of all firms with exactly three mergers. Group 1 is composed of firms with four or more mergers that did not have unlikely distributions among clusters. Group 2 is composed of firms with four or more mergers that did have unlikely distributions among clusters. Group 3 is the market portfolio represented by the Standard and Poors 500 Stocks.

significant distributions. Group 3 is the market portfolio and is composed of the Standard and Poors 500 stocks.

Table VI-3 shows that none of the groups' mean performance levels were significantly different from the market (Group 3). This result is not unreasonable when the nature of the mergers studied is considered. Of the 275 mergers analyzed, 236 of them were classified as pure conglomerate, conglomerate-product extension, or conglomerate-market extension by the FTC (see Exhibit 11 in the Appendix). Previous research has suggested that firms active in conglomerate mergers benefit if they can maintain average performance levels by moving out of declining markets via conglomerate merger [56]. Performance for the firms in this study is consistent with these and other research findings [20, 36, 43] that show firms participating in conglomerate mergers do not show significantly better than average performance levels when compared to firms that are not conglomerate or when compared to the overall market.

A more interesting result is that the performance levels for firms with unlikely distributions of mergers (Group 2) were also insignificantly different from other groups (Group 0 and Group 1) and the market (Group 3). A reasonable explanation for this is related to the dominance of conglomerate mergers in the sample. During the time period studied (1960 to 1978), there was an exogenous force in the marketplace restricting firms' merger activities.

The Anti-Trust Department of the federal government made it clear that merger types other than conglomerate would be viewed as anti-competitive [52]. Therefore, motives for acquisitions had to be consistent with mergers that would be classified as conglomerate. This constraint may have made it more difficult for merger active firms to perform in a superior manner during this period regardless of motives to merge.

A source of systematic variation that could also have affected performance analysis is the concentration of one or more SIC codes within a given firm's merger series; i.e., did firms have acquisitions which tended to be "lumped" into the same SIC industries? This issue was addressed using data from Exhibit 12 in the Appendix, which cross-tabulated acquiring firm and acquired firm SIC codes. It shows that of the original 66 acquiring firms, less than 10% had more than half of their mergers in one or two SIC codes. Furthermore, only two of the 12 firms with unlikely merger distributions showed similar concentrations. Performance comparison results were, therefore, unaffected by significant concentrations of acquired firm SIC codes in acquiring firms' merger series.

CHAPTER VII

SUMMARY AND CONCLUSIONS

A. Study Overview

The purpose of this study is to: (1) collect and analyze information which can be used to establish and evaluate longitudinal intra-firm merger relationships, and (2) evaluate the impact of these relationships on firms' financial performance via relevant measures of risk and return. Conclusions based on results from this study can be used to more effectively deal with the following issues not adequately addressed in previous merger research:

1. Do firms consistently participate in a type or types of mergers with identifiable motivational characteristics?

2. Do discernible merger patterns influence the financial performance of firms when compared to firms without these merger patterns?

B. Hypotheses Tested and Methodological Overview

The hypotheses tested were:

1. Firms exhibit a statistically detectable pattern of participation in one or more types of mergers with

characteristics consistent with previously researched merger motives.

2. Observable merger patterns had a measurable impact on the financial condition of firms studied when measured by: (a) geometric mean market return; (b) mean return on total assets; (c) mean return on equity; (d) the mean ratio of long-term debt to total assets; (e) the mean ratio of total debt to total assets; and (f) Treynor's Measure of Performance.

In order to test these hypotheses, data were collected on a series of mergers for each of 66 merger active firms. This information includes both financial and non-financial data which were selected to be consistent with previous motivational research and with other factors which influence the decision to merge, such as the economic environments for the acquiring and acquired firms prior to merger. The data were factor analyzed to select a sub-set of near-orthogonal variables to be used in subsequent analysis. These variables were then used to cluster analyze mergers for firms in the data base. Although factor and/or cluster analysis has been used in previous research [11, 15, 16, 20, 24, 29], it has not, to the author's knowledge, been used on the type of data base discussed above. The result is an unprecedented longitudinal study of merger motives.

Hypergeometric statistical tests were then used to determine if the distribution of each firm's mergers over

the homogeneous groups formed was non-random. Firms with and without improbable merger patterns were analyzed to test the performance hypothesis discussed earlier.

C. Major Conclusions and Summaries Based on Test of Hypotheses

1. Hypothesis 1. Firms exhibit a statistically detectable pattern of participation in one or more types of mergers with identifiable characteristics during the time period studied.

2. Major Conclusions.

a. Important cluster characteristics developed using cluster analysis were consistent over time. Without this consistency, study results based on cluster analysis of all mergers would not have been statistically meaningful.

b. These clusters did not depend on date of consummation for the merger.

c. They were also independent of industry classifications for the acquiring and the acquired firms in each cluster.

d. The acquiring firms did not concentrate their acquisitions in one industry over time.

e. The characteristics of mergers, as described by the clusters formed, varied over time for almost all firms. Only one firm, White Consolidated, had all its mergers in only one cluster.

f. Cluster descriptions were almost always consistent with more than one motive.

g. The dominant type of merger in all clusters studied was conglomerate as defined by the Federal Trade Commission.

h. Cluster characteristics were consistent with the dominance of conglomerate mergers in the sample. Four of the six clusters with meaningful descriptions had characteristics consistent with conglomerate mergers.

i. The probability of obtaining the observed number of acquiring firms with unusual merger distributions by chance alone is extremely low.

3. Summary of Test Procedure. Using factor analyzed data, any number of homogeneous groups can be formed via cluster analysis. In order to adequately test hypothesis one, however, the nature and quality of clusters formed had to be evaluated. The first step in this evaluation process was establishing the optimum number of homogeneous groups to be formed. This could only be done by identifying the number of clusters that best satisfied two divergent requirements. The first requirement was that the number of mergers in very small homogeneous groups should be minimized. These clusters, called outliers in this study, contained mergers with characteristics very different from the rest of the data base. For this reason, they were eliminated from further study. The elimination process should account for the smallest number of mergers

possible. If this was the only requirement to be met, the cluster analysis procedure could have been constrained to form only one or two large, ill-defined clusters. These homogeneous groups would have contained all of the mergers and there would be no outliers. The second requirement to be met was that clusters formed should be distinct and describable in meaningful financial and non-financial terms. Two large clusters would have been very difficult to describe because they would tend to mask important differences between smaller sub-groups of mergers. Therefore, more clusters were necessary, even though this meant there would be more outlier clusters developed. In this study, the optimum number of clusters was 18, which yielded seven clusters containing 275 of the 295 mergers analyzed and 11 outlier clusters containing the other 20 mergers.

After the optimum number of clusters had been determined, their quality was evaluated. This was necessary because the cluster analysis algorithm can be constrained to produce any number of homogenous groups. Therefore, one must determine if the number selected has produced clusters that are different from each other. In addition, the structure of the clusters must be reasonably consistent over time because mergers studied cover a 19-year period. If cluster structure was unstable over time, all mergers could not be clustered as one group because structure instability

would introduce systematic sources of error in cluster interpretation which could not be dealt with properly. In this study, a combination of variance ratio data from cluster analysis computer output and pair-wise univariate F-tests involving cluster centroids was used to verify the quality of clusters formed. Interpretation of these data, found in Chapter IV, showed that there were differences between clusters formed. Cluster structure (the distinguishing characteristics of each cluster) was also shown to be reasonably stable over time allowing for overall group clustering which produced the 18 clusters discussed earlier.

Since cluster structure is a function of acquiring and acquired firm data, stable cluster structure suggests some stability in acquiring and acquired firm characteristics (based on data gathered) over time. This is important because previous research findings using acquired firm data only have not been consistent on this point. The Harris, Stewart, and Carlton study [25] discussed in Chapter II showed inconsistency in relevant acquired firm characteristics when they were used to predict acquisition targets. The authors concluded that firm profitability, for example, may be an important predictor in one time period but not another. In the Stevens study [53], which the Harris, et al. study [25] was patterned after, tests were performed to show that a similar predictive model was stable

over time and could be used to monitor non-acquired firms to determine when they were most likely to be acquired. This study supports the Harris conclusions because it shows that for a given firm, relevant merger characteristics will almost certainly change over the time period analyzed. This conclusion follows from the fact that 65 out of 66 acquiring firms had their mergers in two or more clusters. Each cluster was described using different acquiring/acquired firm characteristics and/or different macro-economic environments. Therefore, a series of mergers for an acquiring firm can show significant changes in the characteristics of one or both of the parties involved in a merger. This does not preclude the existence of motivational trends in firm merger behavior (as this study shows), but it does make forecasting future merger targets for individual firms more difficult without a prior knowledge of what factors for the acquiring and acquired firms are important at a given point in time.

Several important characteristics of clusters formed aside from stable cluster structure should also be emphasized. First, the cluster characteristics did not depend on the date of consummation. Exhibit 13 in the Appendix shows that each of the seven major clusters has a small concentration of mergers in the period 1966 to 1969, during which 117 of the 295 mergers studied were consummated. The remaining 70% were spread rather evenly

over the remaining 15 years studied. More than 10 mergers were consummated in 10 of these years. Only one year has less than five mergers. These facts suggest that decreasing the length of time studied would significantly reduce the amount of data for analysis.¹ The facts also show that there was no systematic concentration of merger activity over time. If present, this would suggest that the date of consummation is a factor in describing merger patterns over time that may or may not be associated with other events inside and/or outside the firm.

Another potential source of systematic bias in the study is concentration of acquiring and/or acquired firm Standard Industrial Classification codes within one or more clusters. If these concentrations are present, they represent a source of systematic variation which was not accounted for in the study. This systematic variation would require narrowing the scope of the study to those industries where concentrations occurred (and greatly reducing external validity) or reselecting data for analysis to be certain that firms are chosen at random from industries where concentrations occurred. Examination of data in Exhibit 10

¹Another problem with reducing the number of years studied is that it may result in one of the firms with exactly three mergers losing some of, but not all, its mergers. Since the minimum number of mergers for the study is three, this would eliminate the acquiring firm completely and further reduce data for analysis.

from the Appendix suggests that neither of these procedures is necessary. Only three of the seven major clusters studied have between 20% and 25% of their acquiring or acquired firms in one Standard Industrial Classification code. Only one cluster has more than 40% of its acquiring firms in one Standard Industrial Classification code. No acquired firm concentrations in any of the clusters exceed 25%.

Since almost all of the acquiring firms had mergers in more than one cluster, one cannot determine if they concentrated their mergers in one industry by looking at clusters individually. Exhibit 12 in the Appendix shows that the acquiring firms did not systematically concentrate acquisitions in one Standard Industrial Classification code. Of the 66 acquiring firms studied, only White Consolidated had all of its acquired firms in only one Standard Industrial Classification code. Of the remaining 65 firms, only seven firms had acquisitions in less than three different industries. Of the remaining 58, 14, or a little more than 25% were in four or more industries. This shows that the study results were not biased due to SIC code concentrations by acquiring firms. This is important because the time period studied, 1960-1978, is long enough to pick up such concentrations if they exist. These results also show, in another way, the conglomerate nature of the mergers studied. In addition to predominantly participating

in conglomerate mergers, the acquiring firms often times had merger series involving two or more unrelated industries as indicated by the first digit of the SIC codes. This strengthens study results because it shows that they do not depend upon mergers in the same or even similar industries by the acquiring firms. Therefore, merger motives described in the seven major clusters are evident in data from a cross-section of acquired firm industries.

Two more important conclusions can be drawn from this study. First, although several of the firms analyzed showed unusual merger motive patterns, only one of them had all of its mergers in one cluster. Thus, detectable merger motive patterns over time do not imply that acquiring firms always participate in the same type of merger. Factors pertaining to the acquiring and acquired firms and the macro-economic environment must be evaluated to associate motives with acquiring firms at any point in time. This information can then be used to assist in identifying target firms which are consistent with these motives. This point is particularly important because almost all of the clusters described in this study had more than one merger motive associated with them. Therefore, using procedures similar to those in this study, one can evaluate the multi-motive aspect of acquisitions also.

Second, the dominance of conglomerate-type mergers in the data base is consistent with merger motives for clusters

described in Chapter V. Motives associated with conglomerate mergers in previous research are profit improvement/maximization and financial/managerial synergy [21, 22, 36, 37, 43]. Table V-4 (p. 88) in Chapter V shows that four of the six clusters which had meaningful descriptions involved one or more of these motives.

In order to describe motivational patterns in firm mergers based on clusters formed, the characteristics of these clusters must first be developed. These characteristics were developed by determining with which previously researched merger motive(s) each cluster was most consistent. Paired T-tests of differences between cluster and group means for all variables were used to help show the relationships between clusters and motives. Economic descriptions of clusters were based in part on those variables with mean values that were different from group means. Two conclusions were drawn from this exercise. First, there were no instances where variables used resulted in conflicting cluster descriptions. Second, with one exception, cluster descriptions were consistent with researched merger motives discussed in Chapter II.

Hypothesis 1 was tested by determining the distribution of each acquiring firm's mergers over described clusters. The formula for a hypergeometric probability distribution was then used to determine if any of the acquiring firms had an improbable distribution of mergers. Data in Chapter VI

(Table VI-1, p. 124) shows that 14 of the firms analyzed had distributions that had a 10% or less probability of occurring by chance and that 12 of these firms' distributions had less than a 5% probability of occurring by chance. These results show that many of the sampled firms did have unusual or improbable distributions of mergers over clusters formed. Furthermore, characteristics of these clusters could be used to associate these distributions with consistent patterns in merger motives over time. A Chi-square test was used to determine the likelihood of observing such a large percentage of firms with probabilities of .05 or less. For this test, the critical Chi-square value was 7.81. The observed value was more than 73. Therefore, having 38% of the firms analyzed show distributions with probabilities of .05 or less is extremely unlikely. As a result of these findings, Hypothesis 2 cannot be rejected.

4. Hypothesis 2. Observable merger patterns had a measurable impact on the financial condition of firms studied when measured by (a) geometric mean market return; (b) mean return on total assets; (c) mean return on equity; (d) the mean ratio of long-term debt to total assets; (e) the mean ratio of total debt to total assets; and (f) Treynor's Measure of Performance.

5. Major Conclusions. a. Mean performance variations between firms with and without unusual merger distribution were not significant.

b. Mean performance variations between firms with and without unusual merger distributions and the market were not significant.

6. Summary of Test Procedure. In order to test Hypothesis 2, mean values for selected performance variables listed in Hypothesis 2 were calculated for an eight-year period, 1975 to 1982. This time period was chosen for two reasons. First, it was long enough to minimize the effect of one or two anomalous time periods on data used. Second, any systematic differences in firm performance due to merger patterns would be present in this time period because all mergers studied have been consummated.

Table VI-3 (p. 124) shows the results of Wilcoxon Rank Sums comparisons between group means based on these data. In Table VI-3, group 0 is composed of all acquiring firms with exactly three mergers. Group 1 is composed of all acquiring firms with four or more mergers that did not have improbable distributions. Group 2 is composed of all acquiring firms with four or more mergers that did have unusual distributions. Group 3 is the market portfolio and is composed of the Standard and Poors 500 stocks.

Table VI-3 shows that none of the groups' mean performance levels were significantly different from the

market. Of the 275 mergers analyzed, 222 of them were classified as pure conglomerate, conglomerate-market extension, or conglomerate-product extension by the Federal Trade Commission (Exhibit 13 in the Appendix). Previous research has shown that firms active in conglomerate mergers benefit if they can maintain average performance levels by moving out of declining markets via conglomerate merger [56]. Performance for the firms in this study was consistent with these research findings and others that show firms participating in conglomerate mergers do not show significantly better than average performance levels when compared to firms that are not conglomerate or when compared to the overall market [20, 36, 43].

Performance levels for firms with improbable distributions of mergers (Group 2) were also insignificantly different from other groups and the market. A reasonable explanation for this relationship is related to the dominance of conglomerate mergers in the sample. During the time period studied (1960 to 1978), mergers not classified as conglomerate were viewed as anti-competitive by the federal government. Results from Wilcoxon Rank Sums comparisons of mean performance data discussed earlier suggest that this restriction made it difficult for merger active firms to perform in a superior manner during this period regardless of their motives to merge. Based on these findings, Hypothesis 2 can be rejected. In other words,

based on analysis done with data in this study, there were no statistically significant performance differences between groups tested.

D. Conclusions Concerning Study Value

The contribution of this study to what is known about merger active firms lies in three areas. First, it shows that some firms did have unusual or unlikely patterns in mergers consummated over the time period studied, when these patterns were described in terms of data related to merger motive research.² The study not only shows that the patterns exist, it also shows that they could be readily (if not unambiguously) interpreted in terms of previously researched merger motives. This conclusion is important because it means that this study is consistent with several previously researched merger motives and shows that they are valid for longitudinal as well as cross-sectional samples of mergers.³

²It is important to note that these patterns may or may not be due to managerial decisions made in the process of developing strategic plans. Study results do not depend upon whether merger patterns result from implicit or explicit decisions made by acquiring firm management. Some type of questionnaire survey would be needed to determine the relationship between merger patterns observed and firm strategic planning. This is discussed further in Section F.

³Previously researched motives include: (1) growth maximization, (2) profit maximization/improvement, (3) financial synergy, (4) economies of scale, and (5) the macro-economic environment as a factor in the decision to merge.

It is important to note that these multi-period or strategic merger patterns were implicit rather than explicit in nature, i.e., their existence did not depend on explicit strategic plans dealing with future mergers. Therefore, one can say that for a number of firms in this study, strategic merger patterns were shown to exist regardless of changes in stated firm strategies and/or firm management over time. For the financial practitioner, this study represents a systematic means of classifying acquiring firms based on implicit merger motives. This information can be used to determine more accurately future acquisitions for merger active firms based on acquiring firms' motives established using procedures in this study.

Second, this study emphasizes the potential for multiple merger motives for individual firms. In Chapter V, where clusters were described in terms of merger motives, most clusters had several motives that were related and consistent with cluster characteristics. This point is important because, in previous research [2, 3, 5, 6, 7], merger motives have been dealt with individually. This approach eliminated the possibility of establishing a set of related merger motives which contributed simultaneously to observed acquiring firm behavior. In other words, there may have been other related merger motives contributing to observed acquiring firm behavior that were not accounted for in single-motive studies.

Third, this study provides an additional evaluation method for merger motive research. In previous research, potential systematic relationships between time and merger motives studied were not dealt with specifically [2, 3, 5, 6]. Procedures used in this study allow these dependencies, if they exist, to be studied and thus represent an additional means of verification in merger motive research. In other words, one can determine whether one or more motives are detectable longitudinally as well as cross-sectionally with respect to time. If longitudinal studies do not show consistency, further division of the study sample based on time is necessary.

Procedures employed in this study are also useful in the private sector. Since the merger patterns analyzed are implicit in nature, one can compare them to stated corporate strategies pertaining to mergers and acquisitions. By doing so, systematic differences between what was stated and what was done can be determined. These differences can then be analyzed to determine their impact on firm merger patterns and financial performance. Suppose, for example, that the managers of a firm with below average profits contend that previous mergers were consummated to take advantage of managerial and/or financial synergies. Suppose further that, using techniques in this study, financial analysts were able to show that previous mergers were motivated by growth maximization instead. This discrepancy would be

valuable in explaining sub-par firm performance in spite of "synergistic" mergers.

Procedures used in this study would also be valuable in evaluating merger patterns in industries instead of individual firms. The question to be addressed would be: Do industries exert some form of systematic influence on constituent firm mergers over time? In order to answer this question, one has only to determine industry classifications for firms with unusual merger patterns. If a particular industry appears in this group frequently, there would be some support for answering yes to this question. By examining the characteristics of merger patterns in industries, one would also be able to determine the nature of industry influence on firm merger patterns over time.

Examination of firm and/or industry merger patterns would also assist in determining if and when systematic changes in merger patterns occurred. This would help separate isolated variations in merger patterns from structural long-term changes that would have more impact on firms and/or industries. This type of examination would help analysts separate isolated conglomerate mergers from the point at which a firm began to participate consistently in conglomerate mergers and change its strategic merger pattern.

E. Study Limitations

Four aspects of this study will be discussed in this section. The first of these deals with sample size and the data collected. As mentioned earlier, the sample studied is composed of 295 mergers consummated between 1960 and 1978. During this period, the FTC collected data on over 1,000 mergers. All but 295 of these mergers were eliminated from this study for one or more of the following reasons. First, information had to be available for the acquiring firms on the Compustat Tapes. Many of the acquiring firms were not on the tapes because they had been acquired themselves subsequent to their own acquisitions. When this happens, all data for the firm are eliminated from the tapes. The research tape contains some of this deleted information, but proved to be of little use in collecting information on the firms of interest. Second, the acquiring firms had to have stock price and dividend information on the CRSP Tapes to use for performance evaluation. Some firms that were on the Compustat Tapes were not on the CRSP Tapes. Third, all acquiring firms had to have at least three mergers for which there were data in the Federal Trade Commission's listing of large mining and manufacturing mergers between 1960 and 1978. This decreased sample size also limited analysis to large mergers only.

The timeliness of data gathered must also be considered. Although the time period studied, 1960 to 1978,

was a very active and important one in terms of mergers, years subsequent to this period are also important. Recently, many mergers have involved record size acquired firms and/or a battle between several potential acquiring firms prior to consummation of the merger. These factors could have an effect on results from replications of this study.

The dominance of conglomerate mergers in the sample studied is also important because it represents a source of systematic influence on study results. The impact of this systematic influence could be evaluated with a sufficiently large sample of non-conglomerate mergers. Developing this sample would be difficult using 1960 to 1978 data, however, because so many of the mergers were conglomerate. This is another situation in which more recent data would be of use because it would provide more non-conglomerate mergers to study.

The statistical procedures used in this study, factor and cluster analysis for example, do not handle discrete variables with only a few values very well. They tend to dominate differences in continuous variables that have no value limits. Another analytical method that more effectively deals with these variables would be useful in future research.

F. Implications for Further Research

Opportunities for further research are related to information in Sections D and E above. First, a survey of present and former managers from firms with unusual merger patterns would provide information on stated goals and objectives to be accomplished via merger. The information could be compared to implicit observed merger patterns in order to determine how closely they agreed. Differences between stated and observed merger behavior, if they exist, would help researchers in finance and management arrive at a better understanding of the merger phenomenon. It would also help practitioners in the field translate management statements concerning merger activity into likely future actions.

Second, restricting the scope of the study to "very active" acquiring firms would be of interest. This might be done by requiring each firm to have participated in more than three major mergers, five or six for instance, in less than 19 years. A more limited study of this type would be valuable because these firms are often some of the largest, most influential businesses in the United States. In this study, for example, the list would include International Telephone and Telegraph, Litton Industries, Gulf and Western, Beatrice Foods, and Tenneco Corporation.

Other statistical techniques that would accommodate discrete as well as continuous variables would also be

useful. Other interesting aspects of firm merger activity could be studied. Variable values could be assigned based on such factors as the political party in the White House when the merger was consummated, or the presence of recent major legal developments concerning mergers, or the presence of recent accounting rules changes concerning mergers.

The use of more recent data would also be valuable for two reasons. First, it would decrease the dominance of conglomerate mergers in data studied. This would help determine the impact of conglomerate merger dominance on performance analysis results in this study. Second, it would make analysis of more recent trends in mergers possible. Multi-billion dollar mergers have become much more common in recent years. More timely data would make analyzing this trend possible.

Modifications and/or additions to the performance analysis done in this study would also be valuable. First, the analysis could be done on various subsets of the 19-year time period studied. This would establish consistency in study results or determine anomolous sub-periods that require further examination. The choice of variables for performance measurement should also be evaluated. The variables used in this study do not exhaust all logical choices for measurement of risk and return. Different choices based on logical reasoning and/or other research would help verify or modify this study's performance comparison results.

REFERENCES

REFERENCES

1. Altman, Edward I. "Financial Ratios Discriminant Analysis and the Predictability of Corporate Bankruptcy," The Journal of Finance, Vol. 23, No. 4 (September 1968), pp. 589-609.
2. Amihud, Takov and Baruch Lev. "Risk Reduction as a Managerial Motive for Conglomerate Merger," Bell Journal of Economics (Autumn 1981), pp. 605-617.
3. Asquith, Paul and Han E. Kim. "The Impact of Merger Bids on the Participating Firms' Security Holders," The Journal of Finance, Vol. 37, No. 5 (December 1982), pp. 1209-1228.
4. Ansoff, I., Brandenburg, Portner, and Radosevich. "Acquisition Behavior of U. S. Manufacturing Firms, 1946-1965," Nashville Tennessee, 1971.
5. Archer, S. H., and S. G. Farber "Firm Size and the Cost of Externally Secured Equity Capital," The Journal of Finance, Vol. 21, No. 1 (March 1966), pp. 69-83.
6. Bain, J. S. "Monopoly and Oligopoly by Mergers," American Economic Review, Papers and Proceedings, Vol. 40, No. 2 (May 1950), pp. 64-66.
7. Bain, J. S. "Advantages of the Large Firm: Production, Distribution, and Sales Promotion," Journal of Marketing, Vol. 20, No. 4 (April 1956), pp. 336-346.
8. Bain, J. S. Industrial Organizations. Wiley, 1959.
9. Binder, Dennis. "An Empirical Analysis of Contested Tender Offers: 1960-1969, Part II." S. J. D. Thesis, Law School, University of Michigan, 1973.
10. Choi, Desoung and G. Philippatos. "Merging Firm Homogeneity and Post-Event Stock Price Behavior in Large Mergers: 1950-1975." The University of Tennessee-Knoxville, September 1981.
11. Choi, Desoung and G. Philippatos. "Synergism or Diversification: Is Merger Desirable?" The Journal of Financial Research (Fall 1983).
12. Chung, Kwang S. and J. Fred Weston. "Divestitures and Mergers in a Strategic Long-Range Planning Framework," Chapter 13, Mergers and Acquisitions. Lexington, Massachusetts: D. C. Heath, 1982.

13. Dalton, J. A., Esposito, L. "The Impact of Liquidity on Merger Activity," The Quarterly Review of Economics and Business, Vol. 13 (Spring 1973), pp. 15-26.
14. Dodd, Peter and Richard Rubak. "Tender Offers and Stockholder Returns; An Empirical Analysis," Journal of Financial Economics, Vol. 4, No. 4 (December 1977), pp. 351-373.
15. Elert, James C. "Mergers, Antitrust Law Enforcement and Stockholder Returns," The Journal of Finance, Vol. 31, No. 2 (May 1976), pp. 715-732.
16. Elton, Edwin J. and Martin J. Gruber, "Improved Forecasting through the Design of Homogeneous Groups," Journal of Business, Vol. 44, No. 4 (October 1971), pp. 432-450.
17. Elton, Edward J. and Martin J. Gruber. "Homogeneous Groups and the Testing of Economic Hypotheses," Journal of Financial and Quantitative Analysis, Vol. 4, No. 5 (January 1970), pp. 581-602.
18. Fama, Eugene F. "Agency Problems and the Theory of the Firm," The Journal of Political Economy, 1980.
19. Federal Trade Commission, Bureau of Economic, Economic Report on Corporate Mergers. Washington, D.C., 1969, pp. 260-261.
20. Federal Trade Commission, Bureau of Economics, Economic Report on Conglomerate Merger Performance: An Empirical Analysis of Nine Corporations. Washington, D.C., 1972.
21. Galai, Dan and Ronald Masulis. "The Option Pricing Model and the Risk Factor of Stock," Journal of Financial Economics, 3 (January/March 1976), pp. 53-81.
22. Gordon, M. J. and Joseph Yagil. "Pure Conglomerate Mergers: Theory and Evidence," working paper, University of Toronto, 1981.
23. Gort, Michael. "An Economic Disturbance Theory of Mergers," Quarterly Journal of Economics, Vol. 83, No. 4 (November 1969), pp. 624-642.
24. Halptern, Paul. "Corporate Acquisitions: A Theory of Special Cases? A Review of Event Studies Applied to Acquisitions," The Journal of Finance, Vol. 38, No. 2 (May 1983), pp. 297-316.

25. Harris, Robert S., John F. Steward, Willard T. Carlton. "The Financial Characteristics of Acquired Firms," working paper number 80-21, the University of North Carolina, Chapel Hill, September 1980.
26. Haugen, Robert A. and Senbet, L. W. "The Insignificance of Bankruptcy Costs to the Theory of Optimal Capital Structure," The Journal of Finance, Vol. 33, No. 2 (May 1978), pp. 384-393.
27. Hayes, S. and R. Raussig. "Tactics of Cash Takeover Bids," Harvard Business Review, Vol. 45, No. 2 (March-April 1976), pp. 135-148.
28. Hayes, William L. Statistics for the Social Sciences. New York: Holt, Rinehart, and Winston, 1973, pp. 431-456.
29. Hindley, Brian. "Separation of Ownership and Control in the Modern Corporation," Journal of Law and Economics, No. 1 (April 1970), pp. 185-221.
30. Jensen, Michael and Richard Ruback. "The Market for Corporate Control: The Scientific Evidence," Journal of Financial Economics, 11 (1983), pp. 5-50.
31. Jensen, Robert E. "A Cluster Analysis Study of Financial Performance of Selected Business Firms," The Accounting Review, Vol. 7 (January 1977), pp. 36-57.
32. Kim, Han E. and John J. McConnell, Journal of Finance, pp. 349-363.
33. Langetieg, Terence C. "An Application of a Three-Factor Performance Index to Measure Stockholder Gains from Merger," Journal of Financial Economics, Vol. 5, No. 2 (1978), pp. 365-383.
34. Langetieg, Terence C., Robert A. Haugen and Dean W. Wichern. "Merger and Stockholder Risk," Journal of Financial and Quantitative Analysis, Vol. 15, No. 3 (September 1980), pp. 689-709.
35. Lev, Baruch and Gershan Mandelker, "The Microeconomic Consequences of Corporate Mergers," Journal of Business, Vol. 45, No. 1 (January 1972), pp. 85-104.
36. Levy, Hain and Marshall Sarnet. "Diversification, Portfolio Analysis and the Uneasy Case for Conglomerate Mergers," The Journal of Finance, Vol. 25, No. 4 (September 1970), pp. 795-803.

37. Lewellen, W. G. "Pure Financial Rationale for Conglomerate Merger," The Journal of Finance, Vol. 26, No. 2 (May 1971), pp. 521-537.
38. Libby, Robert. "The Financial Characteristics of Merger-Active Firms." The Pennsylvania State University, 1977.
39. Mandelker, Gershon. "Risk and Return: The Case of Merging Firms," Journal of Financial Economics, Vol. 1, No. 3 (August 1974), pp.303-335.
40. Manne, Henry. "Mergers and the Market for Corporate Control," Journal of Political Economy, Vol. 73, No. 2 (April 1965), pp. 110-120.
41. Mead, Walter J. "Instantaneous Merger Profit as a Conglomerate Merger Motive," Western Economic Journal, Vol. 7 (December 1969), pp. 295-306.
42. Melicher, Dennis G. and James F. Nielsen, "Financial Factors that Affect Acquisition Prices," Review of Business and Economic Research, Vol. 8, No. 2 (Winter 1977-1978), p. 95.
43. Melicher, Ronald W. and David F. Rush. "Evidence on the Acquisition Related Performance of Conglomerate Firms," The Journal of Finance, Vol. 29, No. 1 (March 1974), pp. 141-149.
44. Mueller, Dennis C. "A Theory of Conglomerate Mergers," Quarterly Journal of Economics, Vol. 83, No. 3 (August 1969), pp. 643-659.
45. Palmer, J. "The Profit Performance Effect on the Separation of Ownership from Control in Large U. S. Industrial Corporations," Bell Journal of Economics and Management Science, Vol. 4, No. 1 (Spring 1973), pp. 293-303.
46. Reid, Samuel R. Mergers, Managers, and the Economy. New York, 1968, pp. 317-327.
47. Robinson, E. A. G. The Structure of Competitive Industry (rev. ed.). Chicago, 1959.
48. Shick, R. and Frank Jen. "Merger Benefits to Shareholders of Acquiring Firms," Financial Management Journal, Vol. 3, No. 4 (Winter 1974), pp. 45-53.

49. Shrieves, Ronald E. and Mary M. Pashley, "Evidence on the Association between Mergers and Capital Structure," Financial Management Journal, Vol. 13, No. 3 (Autumn 1984).
50. Shrieves, Ronald E. and Mary M. Pashley. "Evidence on the Importance of Inflationary-Tax-Loss-Avoidance as a Merger Rationale," presented at the 1982 Eastern Finance Association Hearings.
51. Shrieves, Ronald L. and Donald S. Stevens. "Bankruptcy Avoidance as a Merger Motive," The Journal of Financial and Quantitative Analysis, Vol. 14, No. 3 (September 1979), p. 501.
52. Steiner, Peter D. Mergers: Motives, Effects, Policies. Ann Arbor: University of Michigan Press, 1975.
53. Stevens, Donald L. "Financial Characteristics of Merged Firms: A Multivariate Analysis," Journal of Financial and Quantitative Analysis, Vol. 8 (March 1978), pp. 149-158.
54. Tatsuoaka, Maurice M. Multivariate Analysis: Techniques for Educational and Psychological Research. New York: John Wiley and Sons, 1971.
55. Tinic, Seha M. and Richard R. West. Investing in Securities: An Efficient Markets Approach. Reading, Mass.: Addison-Wesley Publishing Co., 1979.
56. Weston, J. Fred and Surenda K. Mansinghka. "Tests of the Efficiency Performance of Conglomerate Firms," The Journal of Finance, Vol. 26 (September 1971).

APPENDIX

EXHIBIT ONE

Acquiring Firms and
Firms They Acquired

- | | | |
|---|--|---|
| (1) American Sprinkler Company
Captech Inc.
Balfield Ind.
Interstate Engineering
Mid-Continent Inc. | (12) Celanese Corp.
Champlin Oil
Deuce & Ray
Stein Hall & Co. | (24) Emhart Corporation
Emhart Mfg. Co.
Plymouth Cordage
U.S.M. Corporation |
| (2) Allegheny Ludlum Steel
Standard-Thompson
Jacobsen Mfg. Co.
Truex Temper Corp. | (13) City Investing Company
Guerdon Industries
Hayes International
Rheem Mfg.
World Color Press | (25) Ethyl Corporation
Capitol Products
Oxford Paper
V.C.A. Corporation |
| (3) American Brands Inc.
Acme Visible Recording
Acushnet Co.
Andrew Jergens Co. | (14) Coca Cola Bottling of New York
Franzia Brothers
Igloo Corporation
Coca-Cola Bottling
Philadelphia
The Jeannette Corp | (26) FMC Corporation
American Viscose Corp.
Link Belt
Wayne Mfg. Co. |
| (4) Amerace Corporation
Anchor Coupling
Elastic Stop Nut
Svan Rubber Co. | (15) Coca Cola Bottling
Duncan Foods
Minute Maid Corp.
Presto Products
Taylor Wine Co. | (27) General Cinema
Pepsi-Cola of D.C.
American Pepsi Cola
American Beverage |
| (5) American Can Co.
Butterick Co.
Metal & Thermit Co.
American Printing Corp.
U. S. Reduction Company
Wilson Pharm. & Chem. Co. | (16) Colgate-Palmolive
Helena Rubinstein
The Kendall Company
Riviana Foods, Inc. | (28) General Mills Inc.
David Crystal Indus.
General Interiors
Gorton Corp.
Tom Houston Peanuts
Morton Foods |
| (6) Amstead Industries Inc.
Henry Pratt Co.
Glamorgan Pipe Company
Hydromation Filters Inc.
Macwhyte Co. | (17) Colt Industries
Central Transforms
Crucible Steel Co.
Menasco Manu. Co. | (29) General Signal
Leeds & Northrup
New York Air Brake
Sola Basic Industries |
| (7) Atlantic Richfield Co.
Archer Daniels Chem.
Catalin Corp.
Empire State Inc.
Levingston Shipbuilding
United Carbon Co.
Argo Oil Corp.
Richfield Oil Co.
Anaconda Co.
Sinclair Oil Co. | (18) Consolidated Foods Co
Booth Fisheries
Chef Pierre Inc.
Conso Products Inc
Electrolux Corp.
Fuller Brush Co.
Robert Bruce Inc.
Val D'or Ind. Inc. | (30) Genesco Inc.
Utica Plagg Corp.
Majestic Specialties
Susan Thomas Inc. |
| (8) Bangor Punta Corp.
Cotton Oil Prod. Co.
Smith & Wesson
Piper Aircraft Corp. | (19) Diamond Shamrock
Bessemer Limestone
Nopco Chemicals
Shamrock Oil & Gas
Pickands Mather | (31) Georgia Pacific
Bestwall Gypsum
Crosset Company
Kalamazoo Paper
Puget Sound Pulp |
| (9) Beatrice Foods Co.
Culligan International
Peter Eckrich Inc.
Barnes Inter. Ind.
E. R. Moore Co.
Samsonite Corp.
Tropicana Products | (20) Dresser Industries
Harbinson Walker
Manning Maxwell
Symington Wayne | (32) Gould Inc.
Century Electric
Statham Instruments
Clevite Corporation |
| (10) Boise Cascade
Colum River Paper
Divco-Wayne Corp.
Minnesota & Ontario Paper
R. C. Can Co.
Union Lumber Co. | (21) Eaton Corp.
Cutler-Hammer Inc.
Samuel Moore & Co.
Yale & Towne Manu. | (33) W.R. Grace & Co.
Cleary Petroleum
Cosden Petroleum
DuBois Chemical
Malleys Inc.
Walnut Grove Products |
| (11) Brunswick Corp.
Circle Seal Corp.
Osite Corp.
Vapor Corp. | (22) Eltra Corporation
Burrus Mills
North American Refractory
Electric Autolite | (34) Gulf & Western Corp.
Shattuck Denn Mining
Symons Corp.
E. W. Bliss Co.
The Brown Co.
Consolidated Cigars
Elco Corp.
Rayser-Roth Corp.
Marquette Co.
Miller Mfg.
New Jersey Zinc
North and Judd Mfg.
Simmons Co.
Simon & Schuster
S. Puerto Rico Sugar Co..
Universal American |
| | (23) Emerson Electric
Ridge Tool
White-Rodgers Comp
A. B. Chance Comps
Rosemont Incorpor
Ther-O-Disc Incorp
Edwin L. Wiegand | |

- (35) Gulf Oil Corp.
Devanee Indus. Inc.
Spencer Chemical
Universal Cons. Oil
- (36) International Telephone
and Telegraph
Bell & Gosset Co.
Cannon Electric
Continental Baking
General Controls
Giffillan Corp.
Grinnell Corp.
Gwaltney Inc.
Hancock Industries, Inc.
H. M. Harper Co.
Hibbie Mfg. Co.
John J. I. Nesbitt Inc.
Pennsylvania Glass
Rayonier Inc.
Howard M. Sams
O. M. Scott and Sons
Eason Oil Co.
- (37) Ingersoll Rand
Millers Falls Co.
Pendleton Tool Indus.
Terry Corp. of Colorado
Torrington Co.
S & S Corp.
- (38) Jim Walker Corp.
Celotex Co.
Georgia Marble Co.
South Coast Corporation
U. S. Pipe & Foundry
- (39) Walter Kidde & Co.
Dura Corp.
Lighting Corp. of America
Sargent & Co.
- (40) Lear Siegler
American Metal Products
Royal Industries Inc.
Jack & Heintz Inc.
Lear Inc.
- (41) Libbey-Owens-Ford
Aeroquip Corp.
Pioneer Plastics
Woodell Industries
- (42) Litton Industries
Fitchburg Paper
Bewitt Robinson
Jefferson Electric
Landis Tool Co.
New Britain Machine Co.
Royal McBee
U.T.D. Corp.
Penestra Inc.
- (43) Mead Corporation
Stanley Furniture
Westab
Woodward Corp.
- (44) MCR Corporation
Quantor Corp.
Combined Paper Mills
Electronic Communication
- (45) National Dist. & Chem.
Emery Ind. Inc.
Bridgeport Brass
Federal Chemical Co.
- (46) North American Rockwell
Rockwell Standard
Miehle-Goss-Dext
Molded Fiber Glass
Rockwell Manu. Co.
Collins Radio
- (47) Northwest Industries
Coca-Cola of Los Angeles
Coca-Cola of Mid America
Microdot
- (48) Occidental Petroleum
Hooker Chemicals
Island Creek Coal
Jefferson Lake Sulphur
Maust Coal & Coke
- (49) Rapid American
Briggs Manu. Co.
Glen Alden
Leeds Travelwear
- (50) Raytheon
D. C. Heath
Lexitron
Seismograph Services
- (51) Revlon
U. S. Vitamin
Barnes-Mind
Coburn Optical Inc
- (52) S.C.M. Corporation
Allied Paper Corp.
Glidden Co.
Proctor Siler
- (53) Singer Company
Friden Inc.
General Precision
Johnson-Carper
Layne & Bowler Inc
- (54) St. Regis Paper Co.
Creamery Package
Howard Paper Mills
Michigan Carton Co
Southland Paper
- (55) TRW Inc.
ESL Inc.
Globe Industries
Gregory Industries
IRC Inc.
United-Carr Inc.
United-Greenfield
- (56) Teledyne Inc.
Brown Engineering
Continental Divide
Firth Sterling
Landis Machine Co.
Packard-Bell Electronics
Ryan Aeronautics
Vasco Metals
- (57) Tenneco Corp.
California Ink Co.
Cary Chemicals Inc
Delhi Taylor Oil
Heyden Newport Co.
Wilcox Oil Co.
General Foam Corp.
Newport News Ship Building
Nixon Baldwin Chemicals
Kern County Land
Monroe Automobile Equipment
- (58) Textron Corp.
Bell Air Defense Equip.
Bostitch Inc.
Fafnir Bearing Co.
Jones & Lamson Machine
Parkersburg Corp.
W. A. Shaeffer Pen Co.
Talon, Inc.
Spencer Kellogg Co.
- (59) Champion International
Cascades Plywood
Champion Papers
McCloud River Lumber
Drexel Enterprises
Roberts Consolidated
Trend Industries
Boerner-Waldorf
- (60) Union Oil of California
Texas National Petroleum
Molycorp Inc.
Pure Oil Co.
- (61) Warner Lambert
American Chicle Co.
American Optical
Parke Davis & Co.
Entenmanns Inc.
Deseret Pharmaceuticals
- (62) Westinghouse Electric Co.
Longines-Wittnauer
Seven-Up Bottling of LA
Thermo King Corp.
- (63) Weyerhaeuser Co.
Dierks Forests Inc.
Hamilton Paper Co.
Moddis Plywood
- (64) White Consolidated Indus.
Blaw-Knox Co.
Bullard Co.
Supp Corp.
Scott & Williams
Whitting Machine Works
- (65) Combustion Engineering
National Tank Co.
Mississippi Glass
Gray Tool Co.
- (66) Ashland Oil Co.
United Carbon Co.
Catalin Corp.
Archer Daniels Chemicals
Empire State Corp.
Livingston Shipbuilding

EXHIBIT TWO

Input Data for Factor Analysis

The raw data for factor analysis consisted of 57 financial and non-financial variables for each of 295 mergers consummated by 66 acquiring firms between 1960 and 1978. The data gathered are consistent with previous merger motive research and data availability.

<u>Acquiring Firm</u>		<u>Acquired firm</u>	
<u>Size Data</u>		<u>Size Data</u>	
<u>Balance Sheet</u>	<u>Income Statement</u>	<u>Balance Sheet</u>	<u>Income Statement</u>
total assets before merger	CGS before merger	current assets before merger	gross profit before merger
current assets before merger	net income prior to merger	current liabls. before merger	net income before merger
current liabls. before merger	oper. profit before merger	total assets prior to merger	oper. profit before merger
total equity prior to merger	sales prior to merger	total equity prior to merger	ret. earn. before merger
other liabls. prior to merger			sales prior to merger
<u>Profitability Data</u>	<u>Leverage Data</u>	<u>Profitability data</u>	<u>Leverage Data</u>
earnings/share before merger	debt/equity before merger	ROE before merger	long-term debt to
gross prof. marg. before merger	tot. debt/tot. assets before merger	op. profit/tot. assets before merger	equity before merger
ROE prior to merger	long-term debt before merger	ROI prior to merger	long-term debt before merger
	ROI prior to merger		
<u>Mkt. Measures of Perf.</u>	<u>Ind. Avg. Perf. Data</u>	<u>Mkt. Measures of Perf.</u>	<u>Ind. Avg. Perf. Data</u>
price earnings ratio before merger	adver. costs per dollar of sales before merger	market price of equity before merger	adver. costs per dollar of sales before merger
preferred stock price before merger	cap. spending per dollar of sales before merger	price earnings ratio before merger	cap. spending per dollar of sales before merger
common stock price before merger	gross profit margin before merger		gross profit margin before merger
	research and development per dollar of sales before merger		research and development per dollar of sales before merger
	sales before merger		sales before merger
<u>Other Data</u>			
advertising before merger	retained earnings to total assets before merger		
cap. spending per dollar of sales before merger	sales to total assets before merger		
deferred taxes before merger	working capital to total assets before merger		
invest tax credit before merger			
minority interest before merger			
research and development per dollar of sales before merger			
<u>Economic Indicators</u>			
the Consumer Price Index for the year before merger			
the five-year average growth in the Consumer Price Index			
the Gross National Product in constant dollars for the			
the five-year average growth in Gross National Product			

EXHIBIT THREE

Merger Data Base

Description

Note: "FTC" in the Source column refers to Federal Trade Commission data on large mergers in mining and manufacturing. "COM" refers to data from Compustat Industrial Tapes. "MIN" refers to data from Moody's Ind. Manual. "GOV" in Source Column refers to Depart. of Commerce Data on Gross National Product and Inflation.

Acquiring Firm			Acquired Firm		
Data Description	Source	Calculation	Data Description	Source	Calculation
Size Data: Income Statement			Size Data: Income		
sales before merger	COM	None	sales before merger	MIN	None
cost of goods sold pre-merger	COM	None	gross profit before merger	---	None
operating profit pre-merger	COM	None	operating profit before merger	---	Sales-cost of goods sold
net income before merger	COM	None	net income before merger	MIN	gross profit - sell & ad. exp.
			retained earnings pre-merger	MIN	None
Size Data: Balance Sheet			Size Data: Balance Sheet		
current assets before merger	COM	None	current assets before merger	MIN	None
current liabs. before merger	COM	None	current liabs. before merger	MIN	None
other liabs. before merger	COM	None	total equity before merger	MIN	None
total equity before merger	COM	None	total assets before merger	MIN	None
total assets before merger	COM	None			
Profitability Data			Profitability Data		
gross profit margin pre-merger	---	sales-cost of goods sold	oper. profit to tot. assets	---	oper. profit/total assets
return on assets before merger	---	net inc./total assets	return on equity	---	net inc./total equity
return on equity before merger	---	net inc./total equity			
earnings/share before merger	COM	None			
Leverage Data			Leverage Data		
long-term debt before merger	COM	None	Long-term debt before merger	MIN	None
long-term debt to equity before merger	---	long-term debt/total equity	long-term debt tot. equity	---	long-term debt/total equity
total debt to total assets before merger	---	total debt/total assets			
Mkt. Measures of Performance			Mkt. Measures of Performance		
common stock price pre-merger	COM	None	mkt. price of equity before merger	---	(share price)X (shs. outstndg.)
pref. stock price pre-merger	COM	None	price earnings ratio before merger	---	share price/earnings/share
price earnings ratio pre-merger	COM	None			
Ind. Avg. Performance Data			Ind. Avg. Performance Data		
sales before merger	---	tot. ind. sales/ no. of firms	sales before merger	---	tot. ind. sales/ tot. # of firms
avg. gross profit margin before merger	---	gross prof./ no. of firms	average gross profit margin	---	tot. gr. profit/ tot. # of firms
avg. capital spending per dollar of sales before merger	---	tot. cap. spend. tot. ind. sales	average capital spending/ \$ of sales before merger	---	tot. cap. spend/ tot. ind. sales
avg. research and development exp. per dollar of sales before merger	---	tot. R&D exp./ tot. ind. sales	avg. adver. expends. per \$ of sales before merger	---	tot. advt. exp./ tot. ind. sales
avg. adver. expenditures/ \$ of sales before merger	---	tot. adver. exp. tot. ind. sales	avg. research and development expend. per dollar of sales before merger	---	tot. R&D expend/ tot. ind. sales

<u>Acquired Firm</u>			<u>Acquiring Firm</u>		
<u>Data Description</u>	<u>Source</u>	<u>Calculation</u>	<u>Data Description</u>	<u>Source</u>	<u>Calculation</u>
Other Data			Other Data		
ret. earn. to tot. assets	---	ret. earnings/ tot. assets	advertising before merger	COM	None
sales to total assets	---	sales/tot. as- sets	capital spending pre-merger	COM	None
working cap. to tot. assets	---	(cur. assets- cur. liabs)/ tot. assets.	deferred taxes before merger	COM	None
			investment tax credit before merger	COM	None
			Economic Indicators		
			growth in CPI year prior to merger	GOV	None
			5-year average growth in CPI	---	5-year com- pound tag growth in PI
			growth in GNP year prior to merger	GOV	None
			5-year average growth in GNP	---	5-year com- pound tag growth in CPI

EXHIBIT FOUR

FACTOR LOADINGS FROM FACTOR ANALYSIS

Factor Number	Variable	Factor Loadings
1	Acquiring Firm Total Assets before Merger	.98
	Acquiring Firm Sales before Merger	.93
2	Acquired Firm Total Assets before Merger	.85
3	One Year Growth in GNP	.75
	One Year Growth in CPI	.79
4	Acquiring Firm Industry Average Advertising Per Dollar of Sales Prior to Merger	.74
5	Acquired Firm Retained Earnings to Total Assets before Merger	.85
	Acquired Firm Sales to Total Assets before Merger	.83
6	Acquiring Firm Debt to Total Assets before Merger	.74
7	Acquired Firm Long-Term Debt to Total Equity before Merger	.80
	Acquired Firm Return Equity before Merger	.78
8	Acquiring Firm Industry Average Gross Profit Margin before Merger	.60
	Acquired Firm Industry Average Capital Spending per Sales Dollar Prior to Merger	.59
	Acquired Firm Industry Average Gross Profit Margin Prior to Merger	.58

Variables Added Based on Different Extraction Methods (see Footnote 6)

Acquiring Firm Return on Equity before Merger	.59
Acquiring Firm Gross Margin before Merger	.64
Acquiring Firm Industry R & D before Merger	.54
Acquired Firm Operating Profit Margin before Merger	.62

Note: Factor loadings for the last 4 variables were obtained from additional factor analysis and do not relate to any of the 8 factors listed.

EXHIBIT FIVE

A Simple Example of the Statistical Test for Firm Merger
Strategy Significance

A. Assumptions and Procedural Explanation

There are two homogeneous groups of mergers formed via the combination of factor and cluster analysis described in the Statement of Hypotheses and Methodological Overview section. Thirty-three percent of the sample mergers are in Group 1, and 67 percent of the mergers are in Group 2. The sample analyzed is representative of the population so that for binomial analysis, $P_1 = .333$, and $P_2 = .67$.

A firm sampled has a total of six mergers distributed among the homogeneous groups. Four mergers are in Group 1 and two mergers are in Group 2. In order to determine if this distribution is statistically significant, its probability of occurrence must be added to the probabilities of occurrence for all other distributions less likely than the one actually observed. This sum must be equal to or less than the chosen significance level.

B. Numerical Analysis

The complete listing of possible distributions between homogeneous groups is as follows:

Group 1	Group 2	Probability of Distribution
6	0	.0013
5	1	.0157
**4	2	.0799
3	3	.2126
*2	4	.3292
1	5	.2673
0	6	.0905

where * indicates the expected outcome given P_1 and P_2 , and ** indicates what actually occurred. The last column shows the probability of each distribution. The cumulative probability of the actual distribution of one even more unlikely occurring is, therefore,

.0969 (.0013+.0157+.0799). The cumulative probability value rises dramatically if one of the three most likely distributions occurs (3,3;2,4; or 1,5). If the expected outcome occurs, a distribution of (2,4), the cumulative probability goes to 1.00 or 100% because all distributions are less likely than this one. If a (3,3) distribution occurs, the cumulative probability is .4035. For a (1,5) distribution, the cumulative probability is .7327.

Therefore, this calculation is very sensitive to how likely the observed event is relative to all other possible outcomes.

EXHIBIT SIX

A More Realistic Example of the Statistical Test for Firm
Merger Strategy Significance

A. Assumptions and Procedural Explanation

There are four homogeneous groups of mergers formed via the combination of factor and cluster analysis described in the Statement of Hypotheses and Methodological Overview section. There are 100 mergers in the data to be analyzed, with 10 percent in Group 1, 20 percent in Group 2, 30 percent in Group 3, and 40 percent in Group 4.

A firm sampled has a total of four mergers distributed among the homogeneous groups. Two mergers are in Group 2 and two in Group 3. In order to determine if this distribution is statistically significant, its probability of occurrence must be added to the probabilities of occurrence for all other distributions less likely than the one actually observed. This sum must be equal to or less than the chosen significance level.

B. Numerical Analysis

The complete listing of possible distributions between homogeneous groups and probabilities of occurrence is as follows:

Table A-1
Geometric Probability Listing

<u>Group Number</u>					<u>Group Number</u>				
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Probability</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Probability</u>
4	0	0	0	.0000536	0	2	0	2	.0377943
3	1	0	0	.006121	0	1	3	0	.0207078
3	0	1	0	.009181	0	1	2	1	.0887478
3	0	0	1	.0012241	0	1	1	2	.1193505
2	2	0	0	.0021804	0	1	0	3	.0503924
2	1	1	0	.0068856	0	0	4	0	.0069889
2	1	0	1	.0091808	0	0	3	1	.0414156
2	0	1	1	.0137712	0	0	1	3	.0755886
2	0	0	2	.0089513	0	0	0	4	.0233065
1	3	0	0	.0029073	0	4	0	0	.0012356
1	2	1	0	.0145363	1	0	2	1	.0443739
1	1	2	0	.0193817	1	0	1	2	.0596752
1	1	2	0	.0221869	1	0	0	3	.0251962
1	1	1	1	.0612054	0	3	1	0	.0087218
1	1	0	2	.0397836	0	3	0	1	.0116390
1	0	3	0	.0103539	*0	2	2	0	.0210776

Where * indicates the observed distribution.

The cumulative probability of the actual distribution or one more unlikely occurring is, therefore, .1663088, which can be calculated as follows:

Table A-2

Cumulative Probability Calculation

$$\text{Let } \binom{X}{Y} = \frac{(X!)}{(Y!) (X-Y)!}$$

Then:

$$\begin{aligned}
 .0091808 &= \frac{\binom{10}{2} \binom{20}{1} \binom{30}{0} \binom{40}{1}}{\binom{100}{4}} \\
 +.0000536 &= \frac{\binom{10}{4} \binom{20}{0} \binom{30}{0} \binom{40}{0}}{\binom{100}{4}} \\
 +.006121 &= \frac{\binom{10}{3} \binom{20}{1} \binom{30}{0} \binom{40}{0}}{\binom{100}{4}} \\
 +.009181 &= \frac{\binom{10}{3} \binom{20}{0} \binom{30}{1} \binom{40}{0}}{\binom{100}{4}} \\
 +.0012241 &= \frac{\binom{10}{3} \binom{20}{0} \binom{30}{0} \binom{40}{1}}{\binom{100}{4}} \\
 +.0021804 &= \frac{\binom{10}{2} \binom{20}{2} \binom{30}{0} \binom{40}{0}}{\binom{100}{4}} \\
 +.0068856 &= \frac{\binom{10}{2} \binom{20}{1} \binom{30}{1} \binom{40}{0}}{\binom{100}{4}} \\
 +.0049921 &= \frac{\binom{10}{2} \binom{20}{0} \binom{30}{2} \binom{40}{0}}{\binom{100}{4}} \\
 +.0069889 &= \frac{\binom{10}{0} \binom{20}{0} \binom{30}{4} \binom{40}{0}}{\binom{100}{4}} \\
 +.0137712 &= \frac{\binom{10}{2} \binom{20}{0} \binom{30}{1} \binom{40}{1}}{\binom{100}{4}} \\
 +.0012356 &= \frac{\binom{10}{0} \binom{20}{4} \binom{30}{0} \binom{40}{0}}{\binom{100}{4}} \\
 +.00890513 &= \frac{\binom{10}{2} \binom{20}{0} \binom{30}{0} \binom{40}{2}}{\binom{100}{4}} \\
 +.0029073 &= \frac{\binom{10}{1} \binom{20}{3} \binom{30}{0} \binom{40}{0}}{\binom{100}{4}} \\
 +.0145363 &= \frac{\binom{10}{1} \binom{20}{2} \binom{30}{1} \binom{40}{0}}{\binom{100}{4}} \\
 +.0193817 &= \frac{\binom{10}{1} \binom{20}{2} \binom{30}{0} \binom{40}{1}}{\binom{100}{4}} \\
 +.0103539 &= \frac{\binom{10}{1} \binom{20}{0} \binom{30}{3} \binom{40}{0}}{\binom{100}{4}} \\
 +.0087218 &= \frac{\binom{10}{0} \binom{20}{3} \binom{30}{1} \binom{40}{0}}{\binom{100}{4}} \\
 +.0116290 &= \frac{\binom{10}{0} \binom{20}{3} \binom{30}{0} \binom{40}{1}}{\binom{100}{4}} \\
 +.0210776 &= \frac{\binom{10}{0} \binom{20}{2} \binom{30}{2} \binom{40}{0}}{\binom{100}{4}} \\
 +.0207078 &= \frac{\binom{10}{0} \binom{20}{1} \binom{30}{3} \binom{40}{0}}{\binom{100}{4}} \\
 &= .1663088
 \end{aligned}$$

The cumulative probability value rises dramatically if a somewhat more likely distribution such as (1,1,1,1) is observed. Its probability is .0612054, making the cumulative probability .718508. Cumulative probabilities are even higher for more likely distributions such as (0,1,2,1), (0,1,1,2), (0,0,2,2) and (0,0,1,3). Therefore, this calculation is sensitive to how likely the observed event is relative to all other possible outcomes. As a result of this, cumulative probabilities very close to 1.0 can be obtained if one of the more likely distributions is observed.

EXHIBIT SEVEN

Cluster Analysis Using Normalized Sales and
Assets Variables

Normalization was done via division of each variable by its overall mean value in each sample group of mergers. The three sample groups analyzed consisted of the first, second, and third mergers for each of the 66 acquiring firms in the data base. Three sample groups were used because this was the largest number which would guarantee that even for firms with the minimum number of mergers (3), no acquiring firm would be used more than once. This was necessary in order to have group independence, which is required in cluster analysis.*

Normalization eliminated the effect of inflation between the merger groups because each firm's sales and/or assets were expressed as a fraction of the group's mean value for each variable. Since inflation increased each variable value and the overall mean values, the effects of inflation were cancelled out via normalization. Normalizing

*This selection process also allowed for analysis of cluster stability over time because the first three mergers occurred over different time periods for different firms. Therefore, each sample's mergers were from different time periods. If there were merger commonalities due to the consummation date, clusters from each sample group should be different, i.e., clusters with the same characteristics should not be generated consistently.

the sales and assets variables also decreased the magnitude differential problem discussed above. This procedure also eliminated any overall trends in the size of sales and assets variables between merger groups due to factors other than inflation. This is true because the normalized variables show only within-merger group size differences relative to the group mean. Between-group size differences of all types are eliminated. Normalization may therefore result in the removal of valuable information from the data being analyzed.

Cluster analysis using normalized variables was run on each of the three 66-merger samples. Acquiring firm sales prior to merger, acquiring firm total assets prior to merger, and acquired firm total assets prior to merger were normalized via division by their respective group mean values. Table A-3 summarizes clusterings for the maximum number of clusters set at 12 and eight. The FASTCLUS clustering algorithm was used on each merger group with a maximum number of clusters produced being 12.**

**FASTCLUS is designed for disjoint clustering of very large data sets (100 to 100,000 observations). It combines an effective method of finding initial clusters with a standard iterative algorithm for minimizing the sum of squared distances from the cluster means. For more information see the Statistical Procedures Manual for SAS.

Table A-3

Merger Distributions with Normalized Variables

Merger Series	<u>Twelve Clusters</u>		<u>Eight Clusters</u>	
	Cluster Number	Number of Mergers in Cluster	Cluster Number	Number of Mergers in Cluster
1	1	28	1	3
	2	13	2	1
	3	1	3	36
	4	1	4	16
	5	2	5	1
	6	1	6	1
	7	1	7	2
	8	3	8	6
	9	12		
	10	2		
	11	1		
	12	1		
2	1	7	1	1
	2	1	2	5
	3	1	3	1
	4	1	4	2
	5	27	5	11
	6	1	6	2
	7	19	7	1
	8	2	8	43
	9	1		
	10	1		
	11	4		
	12	1		
3	1	3	1	1
	2	5	2	15
	3	3	3	1
	4	28	4	42
	5	1	5	3
	6	1	6	1
	7	1	7	2
	8	1	8	1
	9	1		
	10	1		
	11	20		
	12	1		

Table A-2 (p. 164) shows that 12 was a more reasonable choice for the maximum number of clusters because eight clusters resulted in a significant loss in major clusters (clusters with 10% or more of the mergers in them). The distribution of mergers between clusters was also very uneven when eight clusters were specified. One cluster typically contained more than half of the 66 mergers. The number of merger clusters used (12) was significantly higher than analysis where natural log transformations of assets and sales variables adjusted for inflation were used (for a discussion of this analysis, see Section E in Chapter IV). In these computer runs, there were fewer outliers (clusters with only one or two mergers), and fewer clusters (8) produced four major homogeneous groups with about 89% of all mergers in them. Cluster analysis using normalized variables produced only three or four major clusters per merger group that contained less than 80% of the 66 mergers in them. These results suggest that the variables' ability to arrange mergers into groups with distinct similarities declined when normalized variables were used. It is not clear at this point, however, whether this decline is due to

the method used to adjust for inflation or elimination of size changes for any reason other than inflation of these.

In order to verify grouping ability, the clusters and their group classifications were used as input for stepwise multiple discriminant analysis (MDA). In this procedure, input data were used to differentiate between mergers and arrange them into groups which were then compared to actual group assignments. If the clusters are, in fact, distinctly different, a high percentage of them should be classified correctly using MDA. F-statistics and significances between pairs of original groups were also generated and were used to support conclusions based on the percentage of correct classifications. These data should show very low probabilities for F-statistic values generated, indicating significant differences between pairs of clusters. Multiple discriminant analysis was therefore being used to examine cluster relationships, both within and between the three samples analyzed. It should show that clusters within a sample were very different from each other, indicating high within-sample cluster quality. It should also show cluster similarities between groups. In other words, one should be able to associate one cluster in each sample with one and only one cluster in each of the other samples analyzed. This would show that there is cluster stability over time (for a discussion of the term "cluster stability," see Section C in Chapter III).

What the data showed, however, was that 46% of the pairs of clusters in the three 66 merger samples were not significantly different. This implies that the quality of clustering within the three sample groups was not very good because the clusters formed were not significantly different from each other. The results also showed that it was difficult to associate a cluster from one sample group with one cluster in each of the other groups. Cluster 2 in the first group, for instance, was not significantly different from Cluster 8 or Cluster 10 or Cluster 11 in the third group. Some decision concerning the "degree" of similarity would have to be made here. This suggests that the clustering between sample groups did not show stability over time. In other words, a set of distinctly different clusters was not consistently generated in the three sample groups analyzed.

EXHIBIT EIGHT

Augmented Data Set for Cluster Analysis

<u>Acquiring Firm</u>	<u>Acquired Firm</u>
FIRM SIZE DATA: INCOME STATEMENT	
log of sales before merger	
log of sales after merger*	
SIZE DATA: BALANCE SHEET	SIZE DATA: BALANCE SHEET
log of total assets after merger*	total assets before merger
log of total assets before merger	
ratio of after merger to before merger total assets*	
PROFITABILITY DATA	PROFITABILITY DATA
gross profit margin after merger*	operating margin before merger
gross profit margin before merger	ROE before merger
ROE after merger*	
ROE before merger*	
ROA after merger	
ROA before merger*	
ratio of after merger to before merger ROI*	
ratio of after merger to before merger sales	
DATA RELATED TO LEVERAGE	DATA RELATED TO LEVERAGE
debt to equity ratio after merger*	long-term debt to equity before merger
debt to equity ratio before merger*	
debt to total assets before merger	
ratio of after merger to before merger debt to total assets*	

Exhibit 8, cont.

INDUSTRY AVERAGE
 PERFORMANCE DATA
 advertising expense/\$
 of sales after merger*
 advertising expense/\$
 of sales before merger
 capital spending/\$ of
 sales before merger*
 gross profit before merger
 R&D costs/\$ of sales
 before merger

INDUSTRY AVERAGE
 PERFORMANCE DATA
 capital spending/\$ of sales
 before merger
 gross profit margin before
 merger
 R&D costs/\$ of sales*

OTHER MEASURES OF PERFORMANCE
 retained earnings to total
 assets before merger
 sales to total assets before
 merger

DATA RELATED TO THE ECONOMY

One-year growth in the Consumer Price Index
 One-year growth in Gross National Product

*These are the additional variables.

EXHIBIT NINE

Major Cluster Merger Distribution

<u>Cluster Number</u>	<u>Number of Mergers</u>
1	29
2	14
3	59
4	21
5	25
6	55
7	72
Total	275

EXHIBIT TEN

Acquiring And Acquired Firm Within Cluster Industry Distributions (b)

SIC Code	Acquiring Firm							Acquired Firm						
	Cluster Number							Cluster Number						
	1 (29)	2 (14)	3 (59)	4 (21)	5 (25)	6 (55)	7 (72)	1 (29)	2 (14)	3 (59)	4 (21)	5 (25)	6 (55)	7 (72)
10								2-6.9						
12								1-3.5					1-1.8	1-1.4
13	2-6.9	1-7.1			1-4.0			1-3.5	2-14.3	1-1.7			2-3.6	4-5.6
14									1-1.7	1-1.7		1.00		
20		5-8.5			4-16	2-3.6	13-10.1	1-3.5	2-14.3	6-10.1	1-9.5	5-20.0		
21							3-4.2	1-3.5						
22			1-1.7	1-4.8			1-1.4	1-3.5	2-3.4		1-4.0	2-3.6	3-4.2	
23								1-3.45						
24	3-10.3		4-6.8		1-4.0	5-9.1	4-5.6	1-3.45	2-3.4		1-4.0	2-3.6	3-4.2	
25									2-3.4				2-2.8	
26			3-5.1			4-7.3	5-6.9		2-3.4			1-1.8	1-1.4	
27								2-6.9					5-6.9	
28	2-13.8		5-8.5		2-8.0	12-21.8	4-5.6	4-13.8	5-8.5	1-4.8	1-4.0	6-10.9	5-6.9	
29	3-10.3	2-14.3	1-1.7			4-7.17	5-6.9		1-1.7	1-4.8			3-4.2	
30					2-8.0									
31			3-5.1					1-6.9	3-21.4	5-8.5	1-4.8	8-14.6	4-5.6	
32			2-3.4			1-1.8		3-10.3				2-3.6		
33	4-13.8		5-8.5		1-8.0	1-3.6	1-1.4		1-1.7		1-4.		5-6.9	
34			2-3.4		2-8.0	1-1.8	5-6.9		2-3.4		2-8.	3-5.5	1-1.4	
35			7-11.7	9-42.9	1-4.0	3-5.5	9-12.5		1-7.1	3-14.3	1-4.	4-7.3	1-1.4	
36	2-6.9	10-71.4	12-20.2	5-23.8	6-24.	9-16.38	10-13.9		3-21.4	9-15.2	7-28.	3-2.6	6-8.3	
37	5-17.25		3-5.07			9-16.38	6-8.34	4-13.8	9-15.2	5-23.8	1-4.	12-23.7	11-15.3	
38								3-10.3	3-3.07	5-23.8	3-1.	3-5.5	7-9.7	
39			2-3.4			1-1.8		4-13.8	1-7.1	2-3.4	3-14.3	1-4.	2-3.6	3-4.2
49	3-10.3						2-2.8		1-7.1	8-13.5	1-4.	1-1.8	1-1.4	
50	2-6.9		3-5.08		4-19.	2-8.	1-1.82						2-3.6	
65						1-1.8	4-5.5							
67	3-10.3	1-7.1												
78						1-4.8	2-8.							

EXHIBIT ELEVEN

Inter-Cluster Frequency Distribution of FTC
Merger Classifications

	FTC Merger Type				
	1	2	3	4	5
Cluster Number					
1	1	1	5	0	11
2	1	1	5	0	7
3	0	1	15	0	5
4	6	5	34	0	14
5	5	1	13	1	5
6	6	5	28	2	14
7	12	4	33	0	23
TOTAL	33	20	137	6	79

Note: Merger types are as follows: (1) horizontal, (2) vertical, (3) conglomerate-product extension, (4) conglomerate-market extension and (5) consolidation of two essentially unrelated firms.

EXHIBIT TWELVE
Acquired Firm SIC Codes
By Acquiring Firm

Acquiring Firm	Acquired Firm SIC Code	Frequency	Acquiring Firm	Acquired Firm SIC Code	Frequency	Acquiring Firm	Acquired Firm SIC Code	Frequency
American Brands	25	1	American Can Co.	28	2	Amsted Indus.	34	1
	69	1		27	1		35	1
	84	1		34	1		49	1
Atlantic Richfield	13	1	Brunswick Corp.	22	1	Coca-Cola Co.	20	3
	21	1		34	1		26	1
	29	2		49	1		34	1
Colt Industries	33	1	Eaton Corp.	3	1	General Signal	35	1
	36	1		62	1		37	1
	72	1		79	1		38	1
Ingersoll-Rand	34	1	IT&T	14	1	Nat. Dist. & Chem.	28	2
	35	4		20	2		33	1
				26	1			1
Union Oil of CA	10	1		27	1	Westinghouse	20	1
	13	1		28	1		35	1
	29	1		31	1		38	1
				33	1			
City Investing	27	1		34	3	White Consol.	35	5
	34	1		36	2			
	37	2		38	1	General Mills	20	3
				42	1		23	1
Beatrice Foods	20	2		45	1		25	1
	23	1						
	25	1	Libby-Owens Ford	26	1	TRW	35	1
	34	1		35	1		36	3
	35	1		79	1		37	1
							62	1
Colgate-Palmolive	20	1	Allegheny Ludlum	34	1			
	22	1		35	1	Rockwell Inter.	35	1
	84	1		38	1		36	1
				28	1		66	1
Combustion Eng.	32	1	Calanese Corp.	28	1			
	34	1		29	1	FMC Corp.	28	1
	53	1					35	1
				26	1		71	1
Dresser Ind.	32	1	NCR Corp.	36	1			
	38	1		57	1	Head Corp.	25	1
	35	1					26	1
SCM Corp.	26	1	Genesco Inc.	22	1			
	38	1		23	2		33	1
	33	1						
	36	1	Champion Intl.	22	1	Gulf Oil	28	2
				24	1		31	1
Northwest Ind.	45	1		26	3			
	66	2		34	1	Emerson Electric	34	1
							35	1
Consolidated Foods	20	2	Goold Inc.	36	1		36	1
	22	3		37	1		38	2
	28	1		82	1		81	1
Textron Inc.	20	1	Georgia Pacific	26	3	St. Regis Paper	26	3
	35	4					36	1
	36	1		32	1			
	29	2	Eltra Corp.	20	1	Ashland Oil Co.	28	3
							31	1
Warner Lambert	20	2					37	1
	28	1		32	1			
	38	1		36	1	Diamond Shamrock	12	1
	84	1					28	1
			Batheon	13	1		29	1
				27	1		32	1
W R Grace & Co	20	2		57	1			
	38	1	Amerace Corp.			Revlon	28	2
	29	1					38	1
Litton Industries	26	1	Tenneco	34	2			
	35	6		30	1	Lear Siegler	34	1
	34	1					35	1
				13	1		36	2
Singer Co.	25	1		28	3			
	35	2		30	1			
	36	1		31	1	Coca-Cola of NY	20	1
				37	2		32	1
				71	1		42	1
				79	1		86	1

Acquiring Firm	SIC Code	Frequency	Acquiring Firm	Acquired Firm	Frequency	Acquiring Firm	Acquired Firm	Frequency
				SIC Code			SIC Code	
Gulf & Western	20	1	Walter Kidd & Co.	36	1	Occidental Petroleum	12	1
	21	1		37	1		14	2
	22	1		42	1		28	1
	24	1	Rapid American	23	1	Weyerhaeuser Co.	24	2
	25	1		31	1		26	1
	26	1		32	1	General Cinema	20	1
	33	1	Jim Walter Corp.	14	1		86	1
	34	1		20	1	Bangor Punta Corp.	20	1
	35	2		26	1		34	1
	36	1		33	1		35	1
Boise Cascade	4	1		26	1		37	1
	53	1	Ethyl Corp.	34	1	Teledyne Inc.	33	2
	73	1		49	1		35	2
	24	1		22	1		36	3
Automatic Sprinkler	26	3	Am. Hardware Co.	35	2			
	36	1						
	38	1						

EXHIBIT THIRTEEN

Merger Consummation Dates by Cluster

Year	Cluster Number							Total
	1	2	3	4	5	6	7	
1960				2		3		5
1961				2	3	3	1	9
1962		1		3	5	2		11
1963	1	1		2	1	5	4	14
1964	1			7	3	2	3	16
1965	1		1	2	1	4	1	10
1966	1		5	9	1	2	3	21
1967	3		8	5	2	5	4	27
1968	10	2	6	7	1	11	8	45
1969	2	1	1	7		3	10	24
1970		2		1		1	7	11
1971		2					1	3
1972	1	2		1	2	1	3	10
1973	2				2	1	4	9
1974				1		2	4	7
1975	1			4	1	2	3	11
1976	1			2		2	5	10
1977	3	3		1	1	4	4	16
1978	1			3	2	2	7	16
Total	29	14	21	59	25	55	72	275

VITA

Granville M. Sawyer was born on September 12, 1949 in Austin, Texas. He attended Pearl High School in Nashville, Tennessee. Upon graduation, he entered the University of Tennessee at Knoxville as a Mechanical Engineering major. While matriculating at the University of Tennessee, he was involved in the cooperative education program and worked at the Fisher Body division of General Motors in Detroit, Michigan from 1968 to 1971.

After graduation in 1972, he entered the MBA program at Carnegie Mellon University in Pittsburgh, Pennsylvania. He received his Masters Degree in Industrial Administration in 1974 and began work as a Financial Analyst at Gulf Oil Company in Houston, Texas. After three years at Gulf, he moved to New York and began work as a Senior Financial Analyst at International Paper Company.

After two years at International Paper, he began work on his doctorate degree at the University of Tennessee in Knoxville. In January 1983, he left Knoxville and began teaching full-time at Drexel University in Philadelphia, Pennsylvania, while completing his dissertation. He is now an assistant professor of finance at that institution.