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# DETERMINANTS OF FINANCIAL PERFORMANCE: A META-ANALYSIS*

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A meta-analysis of results from 320 published studies relates environmental, strategic and organizational factors to financial performance. Some factors (e.g., concentration and growth) have been studied widely and have a relatively consistent positive impact on performance. Other widely-studied factors (e.g., size) have few consistent effects. Many factors (particularly organizational variables) are understudied. We suggest implications for research and management practice.
(META-ANALYSIS, FINANCIAL PERFORMANCE)

## 1. Introduction

Much of what we know about the determinants of industry, firm and business financial performance is in the form of measures of individual relationships in models linking various hypothesized causal variables to various performance measures. The causal variables usually describe some combination of elements of environment, firm strategy and organizational characteristics. This work is found in several disciplines including economics, management, business policy, finance, accounting, management science, international business, sociology and marketing.

Reviews of the financial performance literature, while often quite rich and comprehensive, have tended to be qualitative in nature (e.g., Arlow and Gannon 1982, Lenz 1981, Dalton et al. 1980, Ramanujam and Venkatraman 1984, White and Hamermesh 1981, Vernon 1972). Quantitative comparison of results from different studies is difficult, principally because model specifications and operationalizations of explanatory and dependent variables differ widely. Estimation techniques, ranging from simple cross tables to complex "causal" models, also differ widely over studies. There is no tradition of systematic replication to help quantify specific effects of particular causal variables in a wide number of situations. Researchers are, of course, influenced by existing work—particularly in terms of model specification; this results in various streams of literature in which a series of results tends to be highly intercorrelated.

Although studies of performance are found in many research traditions, they share the basic approach of "natural experimentation." Because it is generally infeasible to establish true experimental controls in studying financial performance, authors typically estimate the impact of a particular factor on performance, using statistical techniques to hold other causal factors constant. Most statistical tests of the effects of individual explanatory variables continue to be against the null hypothesis of "no effect," even though this null should often be replaced by comparison of results with the work of others in a "compare and contrast" framework.

Meta-analysis provides one approach to information summary that quantifies a comparison of results from diverse studies which are not directly comparable in terms of research technology or model specification. This paper summarizes a meta-analysis of statistical results in the literature on industry, firm and business financial performance. We review 320 empirical studies published between 1921 and 1987.

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## 2. Study Selection

To identify studies for review, we started with references in the literature reviews cited above. References in the reviews were searched and the process repeated until no new studies were found. Searches were also made of three computerized data bases: ABI/Inform, Dissertation Abstracts On-line and a national economics working paper series.

Inclusion in the review set required presence of: (1) a dependent variable measuring financial performance; (2) nonfinancial explanatory factors. Financial performance variables include widely-used measures embracing levels, growth and variability in profit (typically related to assets, investment or owner's equity) as well as such measures as market value, assets, equity, cash flow, sales and market/book value. Nonfinancial explanatory variables include environmental, strategic, and formal and informal organizational factors. Some variables serve as both explanatory and performance characteristics; for example, some studies use sales growth as a performance measure, others use it as an explanatory measure.

Studies dealing only with interrelationships among different financial performance characteristics (including many studies from finance) are excluded from the meta-analysis. Similarly excluded are studies documenting relationships among sets of environmental, strategic and/or organizational variables, but not considering financial performance. Also excluded are studies that focus on nonfinancial performance measures such as organizational stability, productivity, employee turnover, employee satisfaction, employee work performance and contribution to society (Kirchoff 1977, Venkatraman and Ramanujam 1986).

Of the 320 studies identified, 165 were found in the economics and industrial organization literature, and 155 in the management literature, broadly defined. The studies appeared in 65 journals, 2 proceedings, 19 books, 17 dissertations and 5 working papers and studies in books. Study sources are shown in Table 1; a complete reference list is available on request from the authors.

### *Empirical Methodology Used in the Literature*

Virtually all studies of financial performance acknowledge the existence of joint causal factors; various multivariate tools (particularly regression analysis) have provided the most common way to establish "control" of covarying causes by statistical means. The statistical techniques used in this selection of literature include:

*Regression* (includes OLS, 2SLS, 3SLS, GLS, simultaneous equations and GLM, stepwise, logit and switching regressions): 189 articles.

*Descriptive statistics* (includes tables of means, *t*-tests, tests of proportions, Chi-square): 78 articles.

*Correlation* (includes standard, multiple, partial, rank order, and path analysis): 46 articles.

*Analysis of variance*: 43 articles.

*Other multivariate methods* (discriminant, cluster and factor analysis, canonical correlation): 38 articles.

*Other* (primarily nonparametric): 7 articles.

Unsurprisingly, controlled experimentation was not used in any study. Only a handful of studies made an explicit attempt to model interactions among the causal factors; this is needed if the goal of the analysis is to determine optimal allocation of resources among controllable variables.

### *Levels of Analysis*

Of the 320 studies, 73 analyzed performance at the industry level, 205 at the firm level and 42 at the business level. Of the 205 firm-level studies, 163 used firms operating in

TABLE 1
*Sources for Meta-Analysis Studies*

| | | | |
|---|---|---|---|
| Academy of Management Journal | 38 | Journal of Industrial Economics | 23 |
| The Accounting Review | 4 | Journal of International Business Studies | 4 |
| Administrative Science Quarterly | 3 | The Journal of Law and Economics | 1 |
| Akron Business and Economic Review | 2 | The Journal of Management Studies | 3 |
| American Economic Review | 8 | Journal of Marketing | 3 |
| The American Journal of Economics and | | Journal of Marketing Research | 1 |
| Sociology | 1 | Journal of Political Economy | 9 |
| American Sociological Review | 1 | Journal of the American Statistical Association | 1 |
| The Antitrust Bulletin | 1 | The Journal of the Royal Statistical Society | 1 |
| Applied Economics | 3 | Long Range Planning | 3 |
| Bell Journal of Economics | 5 | Malayan Economic Review | 1 |
| The Bell Journal of Economics and | | Management Review | 2 |
| Management Science | 1 | Management Science | 5 |
| Business Horizons | 1 | Managerial and Decision Economics | 1 |
| California Management Review | 2 | Managerial Planning | 1 |
| Canadian Journal of Economics | 4 | Oxford Economic Papers | 1 |
| Decision Sciences | 1 | Proceedings of the Academy of Management | 4 |
| Economic Journal | 4 | Proceedings of the Annual Meeting of the | |
| Economica | 3 | American Institute for Decision Sciences | 1 |
| Engineering Economist | 1 | Quarterly Journal of Business and Economics | 3 |
| European Business | 1 | Quarterly Journal of Economics | 8 |
| European Economic Review | 3 | Quarterly Review of Economics and Business | 8 |
| Explorations in Economic Research | 1 | Rand Journal of Economics | 1 |
| Financial Management | 2 | Review of Business & Economic Research | 2 |
| Financial Review | 1 | The Review of Economics and Statistics | 28 |
| Harvard Business Review | 10 | Risk Management | 1 |
| Journal of Advertising Research | 1 | Savings and Loan News | 1 |
| Journal of Business | 5 | Sloan Management Review | 1 |
| Journal of Business Research | 1 | Southern Economic Journal | 11 |
| Journal of Business Strategy | 3 | Strategic Management Journal | 17 |
| Journal of Development Economics | 1 | Survey of Current Business | 3 |
| Journal of Economic Studies | 1 | Western Economic Journal | 3 |
| Journal of Economics and Business | 5 | | |
| The Journal of Finance | 5 | | |
| Journal of Financial and Quantitative Analysis | 2 | Books | 19 |
| Journal of Financial Economics | 1 | Dissertations | 17 |
| The Journal of Financial Research | 1 | Working Papers & Studies in Books | 5 |

multiple industries; 42 used single industry firms. Level of analysis is an important element of the meta-analysis.

## 3. Meta-Analysis Methodology

Meta-analysis is a research approach in which the results from many partially comparable empirical studies examining relationships between similar variables are systematically combined and integrated. (For early methodological development, see Thorndike 1933, Glass 1976, Hunter, Schmidt and Jackson 1982; for studies in management see Farley, Lehmann and Ryan 1981 and 1982, Churchill et. al. 1985 and Assmus, Farley and Lehmann 1984.) More recent meta-analyses have used analysis of variance (*ANOVA*) and analysis of covariance (*ANCOVA*) frameworks (Farley and Lehmann 1986) in situations similar to those found in the performance literature discussed in this paper, where

(1) comparisons are made of a great variety of research methods and environments, and

(2) there is little or no real replication in the literature.

The meta-analysis reported here uses 2 methods. First, counts of relationships help establish the general shape of the literature—particularly in terms of what has been studied

a great deal and what has not. The second approach uses ANCOVA to quantify systematic differences in results due to study design factors for a subset of the most frequently studied relationships.

*Counting Methodology*

This simple, robust method involves identifying the sign of each empirical relationship relating an explanatory variable to financial performance. For each financial performance model identified, each individual result is cataloged in terms of its independent variable, dependent variable, sign of the relationship between them and a variety of technical data concerning measurement and research methodology. (Nonsigned results including nonlinear tests such as cluster analysis, simple tabular listings where a linear progression was not discernable, and tests where the measures were used as moderating variables are also cataloged to provide complete documentation, but are not used in this analysis.) Counts of the signed relationships are then totaled using an extensive computerized data base developed for this purpose.

Binomial sign tests are used to identify significant positive or negative relationships between explanatory variables and financial performance. When there is enough data, the analysis is performed at both industry and firm/business levels of analysis.

The counting methodology is extremely flexible since it requires only qualitative assessment of relationships. Tabular analysis, correlations and regression estimates can be easily combined. Its main disadvantage is that the outcome is also qualitative—the existence of a relationship is established but its size cannot be estimated. Further, the counting method depends on the robustness of the relationship, particularly with regard to specification of the models within which the effect was estimated and with regard to the research environment (Assmus, Farley and Lehmann 1984). Results drawn from a wide array of different model and variable specifications and research environments help buttress the counting methodology; results from a narrow range of specifications and environments weaken conclusions.

*ANCOVA Methodology*

When a number of comparable quantitative estimates for a particular relationship are available, it is often possible to estimate how much measurement, model and variable specification, estimation method and research environment affect the results. This is achieved by viewing a particular set of quantitative measures (e.g., regression coefficients relating causal variables to performance) as if they were generated by a natural (if accidental) experimental design; the effects of specific study characteristics can then be estimated using ANCOVA.

Since a fairly large number of regression coefficients linking selected explanatory variables to financial performance is reported in the literature, this form of meta-analysis is feasible. We use 8 sets of regression coefficients as dependent variables in 8 separate ANCOVAs. Each of the ANCOVAs documents the relationship of one of the following variables to financial performance: industry concentration, market share, growth, advertising, research and development (R&D), size (log and 1/log) and capital investment intensity. Financial performance measures comprise all types of profit return measures (e.g., on assets, equity); other performance measures are either not compatible or infrequently found.

The goal of this form of meta-analysis is to explain the variation in regression coefficients across models. Elements of the "natural" experimental design used to analyze systematic differences in these sets of regression coefficients are divided into 7 categories:

- model specification
- estimation method
- aggregation

- return measure specification
- research environment
- time of study
- design variables specific to each ANCOVA.

One requirement for comparison of regression coefficients is that similar units of measure must be used. All financial return variables from the original studies used here were measured in percentage or fraction form; many of the explanatory variables were measured similarly—concentration ratios, market share (%), growth rate (%), advertising/sales ratios, R&D/sales ratios and ratios of capital investment to a size measure. When needed, units of measure for both independent and dependent variables were adjusted to make their respective regression coefficients directly comparable in percentage terms across studies. Size was recorded in 2 kinds of compatible units in the studies (log of dollar size and 1/log of dollar size), making the coefficients for each of these 2 explanatory variables directly comparable in absolute terms. Covariates used in the ANCOVAs are measured in physical units comparable over studies (e.g., actual counts for sample sizes; actual number of years for time of return measure).

Because sample sizes varied, a separate ANCOVA was performed for each explanatory variable, 8 sets of regression coefficients in total. It is important to remember that we are dealing with 2 kinds of models: the first, the set of models in the original studies—these produced the individual regression coefficients used as dependent variables for the meta-analysis; second, the 8 ANCOVAs (1 per explanatory variable) which form the core of the meta-analysis.

*Experimental Design.* Design variables in the ANCOVAs are constructed (Draper and Smith 1966, pp. 243–262) so that the sum of the ANCOVA coefficients over a particular effect is 0. (For example, 3 different categories of estimation method exhaust the observed methods; the coefficients for these categories sum to 0 for each ANCOVA.) Dummy values not belonging to an exhaustive set of effects are coded as +1 or −1 (present or absent). Most design factors are common to all ANCOVAs; some are idiosyncratic to particular sets of coefficients. In addition, several covariates are constructed as described earlier.

The "natural" experimental design is, of course, determined by the research history of the field. Experience has shown that this type of meta-analysis can face 2 classes of problems (Farley and Lehmann 1986), both of which occur in this case:

(1) Many design variables occur infrequently in the literature; this can lead to instability in associated ANCOVA coefficients. This effect has greater impact on ANCOVAs with relatively few observations (e.g., R&D) than on those with many observations (e.g., concentration). Following a practice developed earlier (Assmus, Farley and Lehmann 1984), we eliminated design variables involving fewer than 10 observations to help reduce this instability.

(2) In practice, the experimental design matrix in a meta-analysis is always unbalanced. Even when infrequent occurrences are removed, it is sometimes singular or so nearly singular that the inversion required to produce the ANCOVA estimates is unstable or, in the extreme, infeasible. In the 8 ANCOVAs, there were only 2 cases of absolute singularity among the 227 design variables (R&D ANCOVA—consumer goods market/industry and firm (single industry) level of analysis are a redundant pair; SIZE (1/log) ANCOVA—measurement of size was absolutely collinear with a combination of 4 model specification and aggregation variables). After correcting for these singularities, the design matrix still showed symptoms of excessive collinearity in 3 ANCOVAs: market share, R&D and size (log). In these cases, the ANCOVAs were performed stepwise and as a result lost design variables—market share (4), R&D (4), size (log) (3); interpretation of the ANCOVA coefficients thus requires special caution. It is important to recognize that these collinearities are not a deficiency of the meta-analysis; rather they reflect empirical nesting of results in the literature itself.

## 4. Results

*Counting Methodology*

The summary counts of signed relationships between explanatory variables and performance measures is presented in Table 2, ordered by number of studies in which relationships occur. To prevent single studies from dominating results, we required that an explanatory variable appear in at least 10 different studies for it to be reported in Table 2. (Table 3 reports counts for all relationships—signed and nonsigned—including less frequently studied variables; many of the studies provide multiple tests (various models, causal factors, industries, etc.), so there are more individual relationships reported than there are articles.) The relationships were gathered into 25 groupings representing aggregate constructs found in the performance literature. When enough results are available, relationships are analyzed at aggregate, industry and firm/business levels.

The sheer number of tests of particular individual relationships is surprising, given the apparent relative lack of generalizations available in the field. There are over 1000 tests each for industry concentration, and growth in sales and assets. There are over 500 tests each for advertising, size and capital investment intensity. Across the 25 aggregate constructs, 16 have significantly more positive relationships to performance, 4 have significantly more negative relationships; 5 have a relatively balanced number of positive and negative relationships. In no case are all reported relationships the same sign for an explanatory variable.

Findings from the most frequently studied relationships include:

- *Industry concentration* was addressed in almost 100 studies; over 1100 tests show a clear directional effect. The oft-cited positive relationship between industry concentration and firm performance is supported.
- *Growth,* analyzed in 88 studies, is consistently related to higher financial performance. Growth in assets and sales individually show positive relationships to performance at both industry and firm/business levels of analysis.
- *Market share* is positively associated with financial performance.
- *Size* of firm or business appears unrelated to financial performance. There is some evidence supporting a positive performance relationship when size is measured as industry-level sales.
- *Capital investment intensity* shows a positive relationship to financial performance at the industry level. At the firm/business level, higher investment is related to lower performance. Studies using industry as the unit of analysis capture inter-industry differences. We return to this difference, which is an important exception to general consistency of industry and firm/business-level results, when we discuss the ANCOVA results.
- Certain strategic factors matter. *Advertising intensity* is positively related to performance at both industry and firm levels. R&D spending is positively related to financial performance at the firm/business level.

Separate tests are performed at the industry and firm/business levels for 10 of the 25 most frequently studied explanatory variables. In 5 cases, the direction of relationships is the same at each level of analysis: growth in sales and assets (positive), capacity utilization (positive), imports (negative), exports (negative) and consumer vs. industrial sales (not significant). For 3 variables, the relationships are positive at one level of analysis and negative at another: capital investment intensity (positive at industry, negative at firm/business), advertising (positive at industry and firm, negative at business) and vertical integration (negative at industry, positive at firm/business). For 2 other variables the relationships are nondirectional at one level of analysis and directional at the other: size (sales) (positive at industry), diversification (negative at firm/business).

Many identified relationships parallel both received wisdom on performance and a number of specific hypotheses about what factors affect performance. Perhaps the most

TABLE 2

*Counts of Signs of Measures of Frequently Studied Financial Performance Relationships*

| Independent Variable: | Number of studies | pos. relation-ships | neg. relation-ships | Signif-icant? |
|---|---|---|---|---|
| **Industry Concentration** | **99** | **779** | **353** | + |
| **Growth in Sales & Assets** | **88** | **925** | **144** | + |
| Growth in Sales | 77 | 825 | 134 | + |
| Industry Growth | 59 | 624 | 115 | + |
| Firm/Business Growth | 22 | 201 | 19 | + |
| Growth in Assets | 11 | 100 | 7 | + |
| Industry Growth | 3 | 34 | 5 | + |
| Firm/Business Growth | 8 | 66 | 2 | + |
| Growth (unspecified units) | 1 | 0 | 3 | * |
| Industry Growth | 1 | 0 | 3 | * |
| **Capital Investment** | **80** | **633** | **231** | + |
| Industry | 51 | 574 | 65 | + |
| Firm/Business | 29 | 59 | 166 | − |
| **Size** | **69** | **415** | **382** | **ns** |
| Size (Assets) | 53 | 324 | 313 | ns |
| Industry Size | 5 | 10 | 14 | ns |
| Firm Size | 48 | 314 | 299 | ns |
| Size (Sales) | 17 | 84 | 57 | + |
| Industry Size | 5 | 30 | 5 | + |
| Firm/Business Size | 12 | 54 | 52 | ns |
| Size (Number of Employees) | 7 | 7 | 12 | ns |
| Firm Size | 7 | 7 | 12 | ns |
| **Advertising** | **68** | **614** | **86** | + |
| Industry | 43 | 446 | 33 | + |
| Firm | 20 | 154 | 26 | + |
| Business | 8 | 14 | 27 | − |
| **Market Share** | **42** | **317** | **75** | + |
| **Geographic Dispersion of Production (Regional vs. National)** | **34** | **289** | **56** | + |
| Industry | 32 | 288 | 50 | + |
| Firm/Business | 2 | 1 | 6 | * |
| **Research & Development** | **29** | **159** | **77** | + |
| Industry | 2 | 3 | 3 | * |
| Firm/Business | 32 | 156 | 74 | + |
| **Debt** | **24** | **59** | **90** | − |
| Industry | 1 | 2 | 0 | * |
| Firm | 23 | 57 | 90 | − |
| **Imports** | **24** | **60** | **118** | − |
| Industry | 19 | 57 | 99 | − |
| Firm/Business | 5 | 3 | 19 | − |
| **Diversification** | **21** | **107** | **174** | − |
| Industry | 5 | 25 | 25 | ns |
| Firm/Business | 17 | 82 | 149 | − |
| **Industry Minimum Efficient Scale** | **21** | **204** | **62** | + |
| **Quality of Business Product & Services** | **20** | **104** | **8** | + |
| **Price (Relative)** | **19** | **57** | **47** | **ns** |
| Industry | 1 | 0 | 1 | * |
| Firm/Business | 18 | 57 | 46 | ns |
| **Capacity Utilization** | **17** | **96** | **12** | + |
| Industry | 3 | 18 | 0 | + |
| Firm/Business | 15 | 78 | 12 | + |
| **Industry Barriers to Entry** | **16** | **89** | **13** | + |
| **Vertical Integration (Backward & Forward)** | **15** | **69** | **35** | + |
| Industry | 2 | 1 | 11 | − |
| Firm/Business | 14 | 68 | 24 | + |
| **Firm/Business Marketing Expense** | **15** | **34** | **34** | **ns** |
| **Economies of Scale** | **14** | **94** | **35** | + |
| Industry | 13 | 93 | 34 | + |
| Firm/Business | 1 | 1 | 1 | * |
| **Exports** | **14** | **20** | **56** | − |
| Industry | 10 | 17 | 38 | − |
| Firm/Business | 4 | 3 | 18 | − |
| **Firm Social Responsibility** | **13** | **66** | **17** | + |
| **Consumer vs. Industrial Sales** | **11** | **70** | **42** | + |
| Industry | 7 | 41 | 26 | ns |
| Firm/Business | 4 | 29 | 16 | ns |
| **Firm Variability in Return** | **11** | **81** | **10** | + |
| **Firm/Business Inventory** | **11** | **33** | **50** | **ns** |
| **Firm Control (Owner vs. Management)** | **10** | **65** | **56** | **ns** |

**+: significantly more positive than negative relationships reported, based on sign test; alpha = .05.**
**−: significantly more negative than positive relationships reported, based on sign test; alpha = .05.**
**ns: count of positive vs. negative relationships reported not significantly different; alpha = .05.**
***: insufficient relationships reported to draw conclusions.**

TABLE 3

*Counts of Tests of Measures of Financial Performance Relationships*

| Independent Variable: | Number of studies | signed relationships | other[1] |
|---|---|---|---|
| Concentration (I)[2] | 105 | 1132 | 61 |
| Growth in Sales & Assets (I, F, B) | 91 | 1069 | 30 |
| Growth (misc)[3] (I, F, B) | 13 | 111 | 30 |
| Capital Investment (I, F, B) | 82 | 864 | 13 |
| Capital Investment (misc) (F, B) | 11 | 78 | 10 |
| Size (I, F, B) | 75 | 797 | 97 |
| Size (misc) (I, F, B) | 15 | 97 | 93 |
| Advertising (I, F, B) | 72 | 700 | 25 |
| Market Share (F, B) | 46 | 392 | 23 |
| Geographic Dispersion of Production (Regional vs. National) (I, F, B) | 34 | 345 | 0 |
| Research & Development (I, F, B) | 33 | 236 | 39 |
| Debt (F, B) | 27 | 149 | 3 |
| Debt (misc) (F) | 1 | 5 | 0 |
| Costs (misc) (I) | 26 | 142 | 6 |
| Imports (I, F, B) | 25 | 178 | 1 |
| Imports (misc) (F, B) | 1 | 2 | 0 |
| Competition (misc) (I) | 23 | 291 | 9 |
| Product & Services (misc) (I, F, B) | 23 | 109 | 41 |
| Quality of Product & Services (B) | 22 | 112 | 11 |
| Price (Relative) (I, F, B) | 22 | 104 | 13 |
| Diversification (I, F, B) | 21 | 281 | 7 |
| Minimum Efficient Scale (I) | 21 | 266 | 0 |
| Vertical Integration (Backward & Forward) (I, F, B) | 19 | 104 | 78 |
| Capacity Utilization (I, F, B) | 17 | 108 | 12 |
| Type of Business/Industry (misc) | 17 | 93 | 124 |
| Industry Barriers to Entry (I) | 16 | 102 | 0 |
| Marketing Expense (F, B) | 15 | 69 | 5 |
| Exports (I, F, B) | 15 | 15 | 76 |
| Exports (misc) (F) | 1 | 1 | 0 |
| Planning (misc) (F) | 14 | 300 | 165 |
| Economies of Scale (I, F, B) | 14 | 129 | 0 |
| Buyer Characteristics (misc) (I) | 14 | 124 | 1 |
| Social Responsibility (F) | 14 | 83 | 4 |
| Organizational Form (misc) (F) | 12 | 153 | 75 |
| Owner vs. Management Control (F) | 12 | 121 | 11 |
| Owner vs. Management Control (misc) (F) | 1 | 10 | 0 |
| Consumer vs. Industrial Sales (I, F, B) | 12 | 112 | 1 |
| Customer Type (misc) (I) | 12 | 112 | 0 |
| Inventory (F, B) | 12 | 83 | 16 |
| New Product Sales (B) | 12 | 42 | 24 |
| Environment (misc) (I) | 11 | 93 | 1 |
| Variability in Return (F) | 11 | 91 | 0 |
| Banks and Savings & Loan Structure (misc) | 10 | 159 | 74 |
| Employee Compensation (F, B) | 10 | 59 | 2 |
| Sales Force Expenditures (B) | 10 | 58 | 18 |
| Return on Investment (I, F, B) | 10 | 55 | 8 |
| Risk (I, F) | 10 | 38 | 1 |
| Decision Centralization (F, B) | 10 | 37 | 14 |
| Mergers & Acquisitions (misc) (I, F) | 9 | 93 | 4 |
| Plant & Equipment Newness (F, B) | 9 | 54 | 10 |
| Innovation (I, F, B) | 9 | 46 | 39 |
| Demand Characteristics (misc) (I) | 9 | 23 | 8 |
| Banks and Savings & Loan Strategy (misc) | 8 | 132 | 108 |
| International Involvement (misc) (I, F, B) | 8 | 40 | 13 |
| International Involvement (F, B) | 4 | 34 | 102 |
| Rumelt Classification Scheme (misc) (F) | 7 | 243 | 122 |
| Variability in Stock Price (F) | 7 | 60 | 0 |
| Employment (misc) (I, F) | 7 | 58 | 0 |
| Executives (misc) (F) | 7 | 46 | 6 |
| Receivables/Sales (F, B) | 7 | 45 | 5 |
| Banks and Savings & Loan Environment (misc) | 6 | 99 | 45 |
| Customer Characteristics (misc) (F, B) | 6 | 68 | 2 |
| Promotion Expenses (B) | 6 | 54 | 2 |
| Value Added, Growth in (I) | 6 | 45 | 0 |
| Unionization (I, F, B) | 6 | 43 | 2 |
| Return on Equity (I, F, B) | 6 | 29 | 0 |
| Productivity, Employee (F) | 6 | 26 | 4 |
| Financial Strategy (misc) (F, B) | 6 | 18 | 2 |
| Dividends (F) | 5 | 40 | 1 |
| Employment Concentration Ratio (I) | 5 | 35 | 0 |
| Supplier Characteristics (misc) (I) | 5 | 30 | 1 |
| Goals & Objectives (misc) (F, B) | 5 | 23 | 6 |
| Product Customization (F, B) | 5 | 21 | 4 |
| Market Share Growth (F, B) | 5 | 18 | 1 |
| Time Effect (misc) (I, F, B) | 5 | 13 | 12 |
| Volatility of Environment (F) | 4 | 28 | 2 |
| Divisionalization (F) | 4 | 10 | 7 |
| Decision Making Support (F, B) | 4 | 6 | 16 |
| Structure (misc) (F) | 4 | 5 | 4 |
| Tariffs (I) | 4 | 5 | 2 |
| Patents (F, B) | 3 | 54 | 0 |
| Plants, Number of (F) | 3 | 34 | 1 |
| Costs (B) | 3 | 30 | 0 |
| Ownership (misc) (F) | 3 | 27 | 1 |
| Board of Directors (misc) (F) | 3 | 30 | 0 |
| Profits (F) | 3 | 24 | 0 |
| Miles & Snow Typology (Defenders, Prospectors, Analyzers & Reactors) (misc) (F) | 3 | 16 | 14 |
| Efficiency (F, B) | 3 | 11 | 0 |
| Formalization of Procedure (F) | 3 | 7 | 12 |
| Capital Budgeting System (F, B) | 3 | 5 | 3 |
| Auxiliary Services, Importance of (I, F, B) | 3 | 5 | 3 |
| Inflation | 3 | 5 | 1 |
| Control (misc) (F, B) | 3 | 4 | 2 |
| Value Added (I) | 3 | 2 | 3 |
| Geographic Location (misc) (F, B) | 3 | 0 | 12 |
| Distinctive Competency (F) | 2 | 378 | 0 |
| Comprehensiveness of Strategic Decision Process (F) | 2 | 35 | 16 |
| Order Size (misc) (F) | 2 | 31 | 1 |
| Boston Consulting Group Matrix Sales (misc) (F, B) | 2 | 24 | 4 |
| "Other Marketing" Expenses (B) | 2 | 18 | 0 |
| Accounting Techniques (misc) (F, B) | 2 | 18 | 0 |
| Distribution (misc) (B) | 2 | 18 | 0 |
| Production Cycle, Length of (F) | 2 | 17 | 2 |
| Excellent vs. Non-Excellent Companies (Peters & Waterman) (F) | 2 | 17 | 0 |
| Production Capacity (F, B) | 2 | 11 | 4 |
| Age of Firm (F) | 2 | 11 | 0 |
| Standardization (F) | 2 | 10 | 0 |

TABLE 3 (*cont'd*)

| Independent Variable: | Number of studies | signed relationships | other[1] |
|---|---|---|---|
| Specialization (F) | 2 | 9 | 0 |
| Specialization (misc) (F) | 2 | 4 | 5 |
| Stockholder Return, Growth in (F) | 2 | 6 | 0 |
| Complexity (misc) (F) | 2 | 5 | 0 |
| Lerner Index (F) | 2 | 5 | 0 |
| Communication (F) | 2 | 4 | 5 |
| Banks and Savings & Loan Performance (misc) | 2 | 3 | 0 |
| Participative Management (F) | 2 | 3 | 0 |
| Facilities (misc) (F, B) | 2 | 2 | 38 |
| Computerization (F) | 2 | 2 | 3 |
| Product Life Cycle Stage (B) | 2 | 1 | 3 |
| Price-Cost Gap (B) | 2 | 1 | 1 |
| Return on Capital (I, F) | 2 | 1 | 1 |
| Market Characteristics (misc) (F) | 2 | 1 | 1 |
| Functional Importance of Units (misc) (F) | 1 | 101 | 487 |
| Share Turnover (F) | 1 | 44 | 0 |
| Advertising/R&D (F) | 1 | 36 | 3 |
| Variability of Organizational Measures (instability) (F) | 1 | 36 | 0 |
| Profit Growth (F) | 1 | 34 | 0 |
| Stockholder Return (F) | 1 | 34 | 0 |
| Decision Responsibility (Head Office) (F, B) | 1 | 22 | 8 |
| Decision Responsibility (Divisional Office) (F, B) | 1 | 17 | 13 |
| Advertising Variability (I) | 1 | 15 | 0 |
| Equation Fit of Model Specified | 1 | 13 | 0 |
| Decision Responsibility (Operating Subsidiary) (F, B) | 1 | 11 | 19 |
| Value Added/Employee (B) | 1 | 10 | 0 |
| Boundary Spanning (F) | 1 | 9 | 0 |
| Autonomy (B) | 1 | 9 | 0 |
| Documentation (F) | 1 | 8 | 0 |
| Return on Investment Growth (B) | 1 | 8 | 0 |
| Emphasis on Public Values (F) | 1 | 7 | 1 |
| Financial Performance (misc) (F) | 1 | 6 | 0 |
| Assets/Book Value (F) | 1 | 6 | 0 |
| Price/Earnings Ratio (F) | 1 | 4 | 0 |
| Credit Sales (F) | 1 | 4 | 0 |
| Automation (B) | 1 | 4 | 0 |
| Sales Concentration (F) | 1 | 4 | 0 |
| Structure/Stage of Growth Fit (F) | 1 | 4 | 0 |
| Conglomerate Firm vs. Simulated Portfolio | 1 | 4 | 0 |
| Supplier Type (misc) (B) | 1 | 4 | 0 |
| Managerial Preferences (misc) (F) | 1 | 3 | 0 |
| Variability in Sales (F) | 1 | 3 | 0 |
| Gross National Product (GNP) | 1 | 3 | 0 |
| Retained Earnings (F) | 1 | 2 | 1 |
| Work Flow (F) | 1 | 2 | 0 |
| Contracts, Number of (F) | 1 | 2 | 0 |
| Emphasis on Safety (F) | 1 | 2 | 0 |
| Authority, Number of Levels (F, B) | 1 | 2 | 0 |
| Exclusive Sales Agreements, Number of (F) | 1 | 2 | 0 |
| Return on Sales (F) | 1 | 2 | 0 |
| Environment & Strategy (misc) (F) | 1 | 2 | 0 |
| Environment (Perceived vs. Actual) (misc) (F) | 1 | 2 | 0 |
| Employee Cooperation (F) | 1 | 2 | 0 |
| Employee Recognition (F) | 1 | 2 | 0 |
| Reciprocity Index (I) | 1 | 2 | 0 |
| Plant & Equipment (misc) (F) | 1 | 2 | 0 |
| Employee Promotion (F) | 1 | 2 | 0 |
| Sales Force Productivity (F) | 1 | 1 | 3 |
| Price/Advertising Consistency (B) | 1 | 1 | 0 |
| Market/Book Value (F) | 1 | 1 | 0 |
| Productivity (F) | 1 | 1 | 0 |
| Shared Marketing (B) | 1 | 0 | 38 |
| Mintzberg Typology (Entrepreneurial vs. Adaptive vs. Planning) (misc) (F) | 1 | 0 | 22 |
| Industry Effect (F) | 1 | 0 | 11 |
| Decision Making (misc) (F) | 1 | 0 | 9 |
| Environmental Scanning (F) | 1 | 0 | 5 |
| Use of Proprietary Processes (B) | 1 | 0 | 3 |
| Profit Centers, Number of (F) | 1 | 0 | 3 |
| Asset Turnover (F) | 1 | 0 | 2 |
| Marketing Segmentation (F) | 1 | 0 | 2 |
| Management Agreement on Strategies (F) | 1 | 0 | 1 |
| Gross Margin (I) | 1 | 0 | 1 |

[1] "Other" relationships include results from nonsigned tests such as those found in cluster analysis, nonlinear tests, tabular listings where a linear progression cannot be established, and tests where the variables are used as moderating factors.

[2] (I), (F), and (B) indicate that these variables reported were studied at, respectively, the industry, firm and business levels of analysis.

[3] The notation "misc" indicates that this is a collection of measures all related to this heading, but not directly comparable with one another. For example, in the case of growth, this category includes growth in number of stores, last period's growth rate, (sales growth plus advertising)/sales, expected growth rate and dummy variables indicating which growth category a firm is in.

interesting results involve those that are different at different levels of aggregation. The large number of significant effects implies that study of performance requires a fairly broad base of explanatory variables and a more holistic approach to performance modeling.

### *ANCOVA Results*

Table 4 displays the contributions (fraction of variance explained) of the 7 classes of study design variables (rows) to each of the 8 ANCOVAs (columns); these are significant in 31 of 56 cases. Across the ANCOVAs, only time of study is generally insignificant,

TABLE 4

*Fraction of Variance Explained by General Effects in the ANCOVA*

| | Concentration | Market Share[1] | Growth | Advertising | Rsrch & Devlop[1] | Size (Log)[1] | Size (inverted)[2] | Capital Invest Intnsty | Significant in |
|---|---|---|---|---|---|---|---|---|---|
| MODEL SPECIFICATION | 5.1%*** | 7.3%*** | 1 9%*** | 1.0% | 10.7%*** | 1.9% | 3.7%*** | 4.0%*** | 6 cases |
| ESTIMATION METHOD | 1.8%*** | 3.6%*** | 1.4%*** | 1.5%** | 0.2% | N/A | 0 5% | 0.4% | 4 cases |
| AGGREGATION | 0.2% | 1.0% | 3.6%*** | 2.8%*** | 5.1%*** | 0.4% | 10 0%*** | 4.3%*** | 5 cases |
| RETURN MEASURE SPECFCN. | 1.1% | 5.3%*** | 2.0%*** | 5.1%*** | 0.6% | 0.3% | 1.4% | 3.7%*** | 4 cases |
| RESEARCH ENVIRONMENT | 5.9%*** | 5.5%*** | 1.5%*** | 4.1%*** | 0.0% | 0.0% | 0.4% | 1 5%*** | 5 cases |
| TIME OF STUDY | 0.1% | 1.9% | 2.0%*** | 0.0% | 0.9% | 0.5% | 0.0% | 0.3% | 1 case |
| DESIGN VARIABLES SPECIFIC TO EACH ANCOVA | 4.5%*** | 5.6%*** | 8 4%*** | 2 1%*** | 2.3%*** | N/A | N/A | 11.7%*** | 6 cases |
| ANCOVA MODEL FIT ($R^2$) | 24%*** | 31%*** | 37%*** | 42%*** | 88%*** | 46%*** | 74%*** | 48%*** | 8 cases |
| SAMPLE SIZE | 895 | 220 | 810 | 472 | 72 | 146 | 154 | 481 | |

[1] Stepwise estimation required.
[2] Size (inverted) is 1/log (assets).
** $p < 0.05$; *** $p < 0.01$.

indicating that regression coefficients are not changing systematically over time. Estimation method makes a relatively minor contribution (see also Farley and Lehmann 1986); model specification and research environment are more important. Aggregation is a major source of variability, as is, unsurprisingly, return measure specification. Design variables specific to each ANCOVA have a major impact in all cases where they exist.

The overall fit for each ANCOVA (fraction of variability in regression coefficients explained) ranges from 24% for concentration to 88% for R&D. Comparable meta-analyses of parameters from econometric models and diffusion models explain 40% to 50% of the variability of their respective estimates; Table 4 results are in this magnitude for 5 of the 8 cases. The high fit for R&D probably results from few observations relative to the size of the design; the low fit for concentration probably indicates a need for more richness in describing research environments.

Table 5 reports the estimated impact of study design variables on the values of regression coefficients for each of the 8 explanatory variables, and other descriptive information for each ANCOVA.

*The ANCOVA Grand Mean and the Mean of the Regression Coefficients.* By hypothesis and general consensus of all major theoretical frameworks, the coefficients for concentration, market share, growth and the 2 strategic resource factors—advertising and R&D—are expected to be positive. Size and capital investment intensity play a more ambiguous role in the performance literature, so these tests are more exploratory.

In a fully balanced experimental design, the grand mean of the ANCOVA and the arithmetic mean of the original regression coefficients would be equal. In the highly unbalanced designs in Table 5, the grand mean in the ANCOVA represents a conditional estimate of an underlying real mean, with adjustments made for the various effects of design variables in the ANCOVA.

The expected positive effects are found for concentration, market share, growth, advertising and R&D. Size and capital investment intensity have no significant effects. In 3 cases—concentration, market share and R&D—the ANCOVA adjusted grand means are larger than the average of the coefficients, indicating that simple averaging of the regression coefficients probably understates the magnitude of the actual effects. Incorporating the results from Assmus, Farley and Lehmann (1984), we can also say that the impact of advertising on financial performance is significantly larger than its impact on sales volume or share.

*Model Specification.* The variables included in the original models have significant reciprocal effect on each other, indicating considerable interaction among the causal factors themselves. However, advertising and size (log) are relatively independent of model specification. Overall, the significant effects of specification do not in concert change the sign of the estimated grand mean. The enormous variation in specifications reflected in Tables 2 and 3 indicates the need for a more global approach to model specification in analysis of performance.

*Estimation Method.* There is a general presumption that more sophisticated methods are "better," but adjustment for "inappropriate" method (presumably ordinary least squares) does not negate or reverse the effects studied here. It is important to note that ordinary least squares is sometimes relatively robust with regard to uncertainty about model specification (Johnson 1972); this is almost certainly a consideration in the performance literature as a whole.

*Aggregation.* Level of aggregation has a qualitatively large effect in some cases, particularly for advertising and R&D, but, importantly, not in the case of concentration. For capital investment intensity, the sign of the grand mean is actually reversed at the business level, confirming results reported in earlier sections. These results highlight the importance of systematic research at various levels of aggregation—for example, we need more industry level analyses of R&D.

*Return Measure Specification.* The primary purpose of the ANCOVA here is to help adjust the regression coefficients derived using different dependent variables so they can be compared in the meta-analysis. It is not surprising that different operationalizations of return measures systematically affect regression coefficients of explanatory variables.

*Research Environment.* The impact of causal variables is systematically different in industrial and consumer markets. For example, concentration is less valuable in consumer products; advertising produces more value in producer goods markets.

*Time of Study.* Indication of changes in effects over time is provided by examining study sample dates. Time may serve as a proxy for quality, assuming that quality of work to produce a particular coefficient improves over time because of learning, better data and improved research technology. For the most part, the meta-analysis does not detect systematic change in regression coefficients over time; system effects governing performance thus appear quite stable.

*Specific Design Variables.* The specific design variables mostly represent how particular dependent variables are defined. Like model specification, estimation and aggregation, the sizes of coefficients do not generally lead to a qualitative reversal of the conclusion rejected in the grand mean. Exceptions are, of course, possibly important and provide opportunities for further research. Concentration has a greater effect on performance when measured for fewer firms—probably indicating an effect of monopoly on return. It would be most helpful if future performance studies incorporated systematic within-study analysis of the effects of different model specifications, operationalizations and estimation procedures.

## 5. Discussion and Implications

This paper reviews the empirical literature on industry, firm and business level financial performance using 2 forms of meta-analysis: counting the occurrence of qualitative relationships and ANCOVA of regression coefficients associated with 8 frequently-studied causal variables. The literature is large, diverse and found in many fields of study, reflecting widespread interest in determinants of financial performance. The counting methodology's flexibility is demonstrated by its ability to include studies using both regression analysis and other technologies; the trade-off for using just regression analysis results in the richness of the ANCOVA method.

TABLE 5

*Estimated Impact of Study Design Variables on Values of Regression Coefficients*

| | Concentration | Market Share | Growth | Advertising | Rsrch & Devlop | Size (Log) | Size (Inverted)[1] | Capital Invest Intnsty |
|---|---|---|---|---|---|---|---|---|
| MEAN OF REGRESSION COEFFICIENTS (IN ORIGINAL STUDIES) | 0.07*** | 0.26*** | 0.13*** | 0.77*** | 0.17*** | −0.00 | −0.04*** | 0.05*** |
| ANCOVA GRAND MEAN[2] | 0.22* | 0.39*** | 0.18* | 0.98*** | 0.65*** | −0.13 | 0 00 | 0.10 |
| MODEL SPECIFICATION | | | | | | | | |
| Concentration included[3] | *d* | 0.04 | −0.02* | 0.02 | −0.31** | −0.14 | *x* | 0.01* |
| Market share included | 0.06 | *d* | 0.07*** | 0.16 | −0.27*** | 0.21** | −0.11 | 0.05*** |
| Growth included | 0.05** | −0 008 | *d* | 0.01 | 0.03 | −0.06 | 0.18*** | −0.03*** |
| Advertising included | 0.05** | −0 12 | 0.03** | *d* | −0.18 | −0.09 | 0.11** | 0.01 |
| Research & Development included | −0.10 | *e* | −0.02 | 0.01 | *d* | *x* | *x* | 0 05 |
| Size included | 0.09** | −0.21** | −0 02 | −0.11 | −0 10 | *d* | *d* | 0.04* |
| Capital Investment included | −0 11*** | *e* | 0.04** | 0.06 | *e* | 0.13 | 0.16*** | *d* |
| Count of variables in equation (*c*) | −0.02*** | −0.02** | −0.002 | 0.02* | −0.03*** | 0.01 | 0.01 | 0.004 |
| ESTIMATION METHOD: | | | | | | | | |
| *Estimation technique*[4] | | | | | | | | |
| Ordinary least squares | 0.01 | −0.24*** | 0.04 | 0 13 | 0.05 | *x* | 0.01 | −0.02 |
| 2- or 3-stage least squares | −0.08 | *x* | −0.09** | −0.40*** | *x* | *x* | *x* | 0.02 |
| Generalized least squares | 0.07 | 0.24*** | 0.05 | 0.27*** | −0.05 | *x* | −0.01 | *x* |
| Weighted least squares used | 0.12*** | 0.04 | −0.001 | −0.03 | *x* | *x* | 0.001 | 0.01 |
| Each observation has one data point/year | *x* | *x* | 0.04 | −0.14 | *x* | *x* | *x* | *x* |
| Standardized coefficients reported | 0 05 | *x* | 0.17*** | *x* | *x* | *x* | *x* | −0.04 |
| AGGREGATION. | | | | | | | | |
| *Level of Aggregation*[4] | | | | | | | | |
| Industry level | −0.06 | *x* | −0.10* | 0 52** | *x* | *x* | *x* | 0.19*** |
| Firm level (mixed industry) | 0.001 | *e* | 0 18*** | −0.32 | −0.51** | *e* | −0.14 | −0.06* |
| Firm level (single industry) | 0.10 | *e* | 0.03 | 0.14 | 0.74*** | *e* | 0.14 | −0.00 |
| Business level | −0.04 | 0.04 | −0.11* | −0 34 | −0.23* | *x* | *x* | −0.13** |
| Sample size (*c*) | 0.0000 | −0.0002 | −0.0000 | −0.0003* | 0.0000 | 0 0004 | −0.0003*** | −0.0000 |
| Time period (years) of indep. measure (*c*) | 0.004 | −0 03 | 0.02*** | −0 12*** | *e* | *e* | 0 04 | −0.01* |
| RETURN MEASURE SPECIFICATION: | | | | | | | | |
| *Type of Measure Used*:[4] | | | | | | | | |
| Return on Equity | −0 03 | 0.13* | 0.09 | −0.22** | *x* | −0.03 | −0.03 | −0.10*** |
| Return on Capital | −0.06 | 0.09 | 0.04 | −0.13 | *x* | *x* | 0.003 | *x* |
| Return on Assets | −0.06 | −0.22** | −0.04 | −0.19 | 0.37* | 0.03 | 0.03 | −0.05** |
| Return on Sales | 0.11* | *x* | −0.02 | −0.18 | −0.37* | *x* | *x* | 0.08*** |
| Price/Cost margin | 0.04 | *x* | 0.19*** | 0.72*** | *x* | *x* | *x* | 0.07** |
| Stockholder return | *x* | *x* | −0 26** | *x* | *x* | *x* | *x* | *x* |
| Measure adjusted for known biases | −0.01 | *x* | 0.004 | −0.03 | *x* | *x* | −0 007 | *x* |
| Time period (years) of measure (*c*) | −0.02** | 0.05*** | 0.02*** | 0.03 | *e* | 0.004 | −0 05 | 0.006 |
| Log measure used | 0.06 | *x* | *x* | 0.28** | *x* | −0.03 | *x* | −0.03 |
| RESEARCH ENVIRONMENT: | | | | | | | | |
| U.S. firm or industry | 0.02 | *x* | 0.06*** | 0.13* | *x* | 0.01 | *x* | −0.02 |

TABLE 5 (*cont'd*)

| | Concen-tration | Market Share | Growth | Advertising | Rsrch & Devlop | Size (Log) | Size (Inverted)[1] | Capital Invest Intnsty |
|---|---|---|---|---|---|---|---|---|
| Banking industry | *x* | *x* | 0.13[4] | *x* | *x* | *x* | *x* | *x* |
| Consumer goods market or industry | −0.23***[4] | −0.17**[4] | −0.06 | −0.51***[4] | *e* | *x* | 0.01 | 0.04***[4] |
| Producer goods market or industry | 0.12** | 0.42*** | 0.04 | 0.51*** | *x* | *x* | *x* | −0.04* |
| Other (mixed or unknown) | 0.11** | −0.25 | −0.11 | −0.00 | N/A | N/A | N/A | −0.00 |
| Durables market or industry | −0.16**[4] | *x* | 0.09[4] | *x* | *x* | *x* | *x* | *x* |
| Non-durables market or industry | 0.13** | −0.01 | −0.03 | 0.03 | 0.02 | *x* | 0.01 | −0.02 |
| Other (mixed or uknown) | 0.03 | N/A | −0.06 | N/A | N/A | N/A | N/A | N/A |
| TIME OF STUDY (if known): | | | | | | | | |
| 1949–1960 | −0.02[4] | −0 20*[4] | −0.12**[4] | 0.03[4] | *x* | 0 04[4] | 0.00[4] | −0.01[4] |
| 1961–1973 | 0.02 | 0 30** | 0.06** | 0 03 | 0.09 | −0.10 | −0.002 | 0 02 |
| 1974–1980 | 0.002 | −0.10 | 0 06 | −0.06 | 0.27* | 0 06 | *x* | −0.01 |
| ANCOVA MODEL FIT ($R^2$) | 0.24*** | 0.31*** | 0.37*** | 0.42*** | 0.88*** | 0 46*** | 0 74*** | 0.48*** |
| STANDARD DEV. OF ERROR TERM | 0.44 | 0.45 | 0.24 | 0.71 | 0.20 | 0 13 | 0.07 | 0.11 |
| SAMPLE SIZE | 895 | 220 | 810 | 472 | 72 | 146 | 154 | 481 |

DESIGN VARIABLES SPECIFIC TO EACH ANCOVA

| | | | |
|---|---|---|---|
| *Concentration*: | | *Research & Development*: | |
| 3-firm measure used[4] | 0 39*** | Measured as R&D/sales[4] | −0 24*** |
| 4-firm measure used | −0 13** | Measured as R&D/capital | 0.29*** |
| 5-firm measure used | −0.08 | Measured as product R&D/revenue | 0.05 |
| 8-firm measure used | −0.07 | | |
| Herfindahl Index used | −0.21*** | *Size (log)*: | |
| Log measure used | −0.03 | Measured in sales | *x* |
| Weighted measure used | −0.21*** | Measured in assets (98% of the sample) | *x* |
| Measure adjusted for known biases | −0.04 | | |
| *Market Share*: | | *Size (inverted)*: | |
| Based on sales | 0 20** | Measured as 1/ln assets | *e* |
| Weighted measure used | −0.32*** | Measured as $1/\log_{10}$ assets | *e* |
| *Growth*: | | *Capital Investment Intensity*: | |
| Based on production[4] | 0.27*** | Measured as investment/sales[4] | −0.12*** |
| Based on shipments | −0 13** | Measured as capital/sales | −0.06 |
| Based on sales | 0.04*** | Measured as capital/output | −0.05** |
| Based on assets | −0 03 | Measured as capital/labor | 0.29*** |
| Based on demand | −0.05 | Measured as (efficiency × (assets/sales)) | 0.02 |
| Based on value added | −0.10** | Measured as (minimum efficient scale × (capital/sales)) | −0.04 |
| Log measure used | −0.05* | Measured as assets/shipments | −0.04* |
| Measure based on regression on time trend | 0.14*** | Measured as assets/sales | 0.001 |
| Not averaged by year | −0.01 | | |
| Growth in industry (with firm-level study) | 0.05*** | Measured relative to industry average | 0.09** |
| | | Measure adjusted for known biases | 0.07** |
| *Advertising (measured as advertising/sales)*: | | Log measure used | 0 01 |
| Measure adjusted for known biases | −0.09 | Industry level of investment (with firm level study) | 0.02 |
| Industry advertising (with firm-level study) | 0.43*** | | |

[1] Size (inverted) is 1/log (assets).
[2] Interpretation of figures: for 1% increase in concentration, return measure increases 0 22%.
[3] Interpretation of figures: impact of market share on performance is increased by 0.04% if concentration is included in the model.
[4] Constitutes an exhaustive set of effects; the other design variables are considered individually
*x* design variable excluded due to low or high occurrence, generally less than 10 observations which provide additional information.
*e* design variable excluded due to collinearity. *d*: dependent variable in this regression (*c*): indicates covariate.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

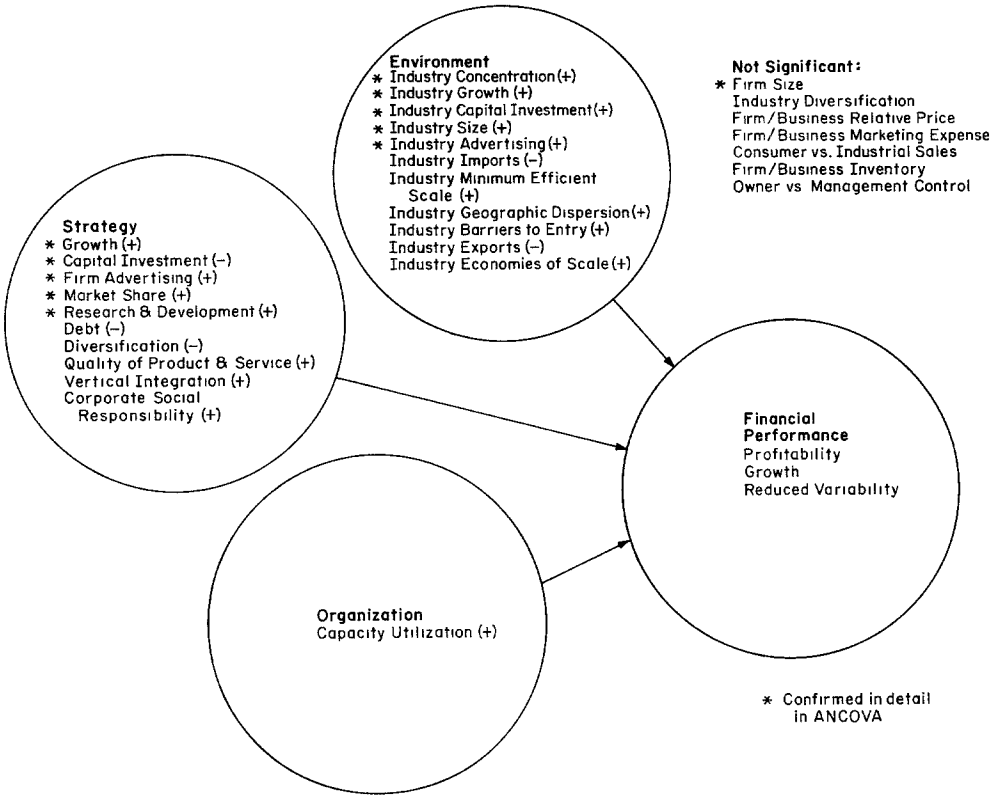


FIGURE 1. Summary of meta-analysis results: determinants of financial performance (variables listed in order by frequency in the literature).

A pictorial summary of the results, presented in the often-used environment, strategy and organization framework, is shown in Figure 1. The figure shows the basic complementarity of the counting methodology and the ANCOVA methodology when the latter is feasible.

*Environmental variables*, measured at the industry level, have a significant impact on industry and firm/business performance. Factors identified by both methodologies as contributing to increased financial performance include: industry concentration, growth, capital investment, size and advertising. The counting methodology also identified industry minimum efficient scale, geographic dispersion of production, barriers to entry and economies of scale as positive performance contributors. Industry imports and exports impact performance negatively. In general, these results are consistent with industrial organization theory (Bain 1968); factors that deter new entrants (e.g., high advertising, barriers to entry, capital investment, concentration and economies of scale) are related to increased performance levels.

Among *strategy* variables that increase firm and business performance, both methodologies identified growth, low capital investment, firm advertising, market share and R&D. The counting methodology also identified product and service quality, vertical integration, corporate social responsibility, and lower levels of debt and less diversification, as having consistent positive relationships to performance.

Few studies address *organization* issues. Capacity utilization is positively related to firm and business performance, but other explanatory variables, though potentially useful, demonstrate a lack of research in the area; more work is needed on this general family of financial performance determinants. Firm size, industry diversification, relative price,

marketing expense, consumer vs. industrial sales, inventory and type of control (owner vs. management) have little directional relation to financial performance.

*Limitations*

Meta-analysis, like most research methods, has certain inherent shortcomings; among these are publication bias, quality and other biases created by lack of controlled conditions, lack of statistical independence among studies and lack of homogeneous measures.

The performance literature is large and several branches have a long history. Since meta-analysis depends heavily on published literature, various publication biases may develop (Rust, Lehmann and Farley 1988). Certain independent variables may be systematically excluded because of accepted beliefs and disbeliefs in a particular field. Furthermore, the reviewing process may exclude studies with weak results or "outliers," even though these contain more information than yet another conventional study testing already-discredited null hypotheses of no effect. More seriously, over zealous desire for rigorous methodology may lead editors to reject rich, broad sweeping and more holistic studies that provide field integration by virtue of the many variables studied, while they publish instead narrowly defined, intellectually vapid research reports.

This particular meta-analysis depends heavily on the consistency of a relationship in a large number of occurrences under quite different conditions to indicate robustness (or lack thereof) of a result. No attempt is made here to adjust for the "quality" of individual research studies that contribute values of the dependent variable. Some recent experiments using such quality assessments indicate that they may not affect the basic conclusions of meta-analysis (Sultan, Farley and Lehmann 1989); nevertheless better means to deal with quality-related issues would be most helpful.

*Implications for Managers*

Managers are understandably curious about what is known and what should be done with information regarding factors affecting financial performance—for example, whether market share affects earnings and (more importantly) how much. They are, also understandably, frustrated with debates over the results of particular studies, as well as with the fact that no one study is likely to deal with the exact situation she or he faces.

By assessing the evidence provided by those meta-analysis approaches in which the many detailed characteristics of particular studies are at least partially controlled statistically, we can develop a set of guidelines to aid management practice which "generally" hold true for most situations. With much qualification, we present the following observations:

- High growth situations are desirable; growth is consistently related to profits under a wide variety of circumstances.
- Having high market share is helpful. Unfortunately, we don't have a clear picture of whether trying to gain market share is a good idea, other things equal.
- Bigness per se does not confer profitability.
- Dollars spent on R&D have an especially strong relationship to increased profitability. Investment in advertising is also worthwhile, especially in producer goods industries.
- High quality products and services enhance performance; excessive debt can hurt performance; capital investment decisions should be made with caution.
- We can learn from history—the lack of major changes in strength of relationships over time indicates that financial performance history repeats itself.
- No simple prescription involving just one factor is likely to be effective. Our results indicate that the determinants of financial performance involve many different factors. Furthermore, results hint at the presence of strong interactive effects among variables.

Although these generalizations hold true for the majority of situations, they should be

viewed with caution, as there is documented variation in the magnitude, and sometimes even the sign, of a given effect in different contexts.

*Implications for Research Practice*

This meta-analysis opens a variety of research issues that lurk beneath the surface of the performance literature. Tables 2 and 3 present a bewildering array of possible causal variables—far more than are likely to be specified in any single study. Meta-analysis provides one route for integrating the results of effects of these many factors, even when they are not explicitly studied together. In fact, given the large number of potential explanatory factors and relatively limited data bases, meta-analysis may be the only feasible way to sort through alternative explanations in the existing literature.

Some explanatory variables have been studied so extensively that we wonder if more research effort is really needed (e.g., concentration and growth); other variables (e.g., organizational) have been neglected. Examination of the little studied factors listed in Tables 2 and 3 would provide a more comprehensive understanding of performance relationships and provide for better integration of the field. Meta-analysis provides one method of achieving integration; more creatively designed studies would provide an additional and richer approach.

We found many more significant positive than significant negative relationships. We suspect a bias operates towards seeking variables related to good financial performance. However, there is value in theory development and empirical testing involving variables that lead to poor financial performance; not simply those involving low values of positive attributes. There is evidence that a theory of poor financial performance would not simply be a symmetric mirror of a theory seeking to explain good financial performance (Capon, Farley and Hulbert 1987).

One result of this meta-analysis is that level of analysis (industry vs. firm) along with other contextual factors such as model specification, estimation technique, return measure specification and research environment matter. When any factor makes a qualitative difference in interpretation of results, an individual study may come to the fore because it is an outlier. For example, a study of the profit/concentration relationship at the business level (Gale and Branch 1982) reported different results than the large number of studies at the industry level. In this particular case, the study which accepted the null hypothesis of no effect (generally discredited by the aggregate results of almost 100 studies at the industry level) is such an outlier that it requires special attention and interpretation. This demonstrates an important use of meta-analysis—identifying outliers so that further analyses can focus on reasons for differences.

Regression analysis and interpretation from statistical tabulation are the most popular statistical techniques used to test performance models. Although these methods work fairly well, it is apparent that new methodologies are needed to deal with special classes of problems found in performance measurement: high variable count, possible high levels of interactions among variables and possible interactions within and among systems of characteristics (environment, strategy and organization).

*Needs for Future Research.* This meta-analysis points up needs for four particular types of research.

- The field is badly in need of more work on organization. In particular, there are few integrated studies that consider the nature of top management, effectiveness of planning, or the impact of skill in managing human capital.
- There is a dearth of genuinely dynamic analysis that tracks organizations as they evolve over time. This limits investigation of the nature of causality; research has almost entirely focused on performance as a dependent measure at a single point in time. We need more work on how successful firms stay successful, how unsuccessful firms become successful, and how successful firms become unsuccessful.

- Much performance research appears driven by data availability rather than by efforts to examine alternative explanations. This is partly caused by lack of data that makes such analysis infeasible. It would be extremely useful to have available a comprehensive data base that systematically links over time key elements of environment, strategy and organization at the firm and business levels.
- There may be synergies (positive and negative) leading to various optimal combinations of factor inputs. Work on interaction of causal factors is badly needed if the goal of analysis is to move towards optimal allocation of resources among controllable variables.

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