Organizational structure and economic performance: a test of the multidivisional hypothesis

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This paper empirically investigates the proposition that the organization and operation of the large enterprise along “M-form” multidivisional lines favors goal pursuit and least-cost behavior more nearly associated with the neoclassical profit maximization hypothesis than a number of alternative organizational forms. Using a sample of petroleum firms during the period 1955–1973, a positive relationship between M-form structure and profitability is observed during the period in which the M-form innovation was being diffused. This relationship is no longer observed once an organizational form equilibrium is achieved. The results provide support for the “Markets and Hierarchies” paradigm, but additional studies are needed to affirm the generality of the finding.

1. Introduction

This paper attempts to assess the importance of internal organizational structure in determining firm performance. Its principal objective is to test empirically the validity of what Williamson (1975, chapter 8) refers to as the multidivisional form (M-form) hypothesis, which posits superior performance for those organizations adopting a particular kind of multidivisional structure. The investigation will focus on the relative performance characteristics of alternative organizational forms observed in a sample of petroleum industry firms during the period 1955–1973. As such, this paper represents an empirical exploration into the validity of the “Markets and Hierarchies” paradigm.

2. The multidivisional form hypothesis

Some theoretical issues. A common approach to the study of organizational form involves examining how a firm ought to organize as it grows in size
and complexity. Chandler (1962), for instance, noted that in the early 1920s several of the larger functionally organized American corporations developed multidivisional internal structures in response to increasingly complex administrative problems encountered as firm size increased, and along with it the diversity and magnitude of the firm’s activities. In extending Chandler’s analysis, Williamson observed that two major problems were encountered by firms as they expanded; namely, cumulative control loss and the confounding of strategic and operating decisionmaking. The predicted result is a failure to achieve least-cost profit-maximizing behavior (Williamson, 1970 and 1975). The difficulties experienced by an expanding functionally organized enterprise can be expressed in terms of indecomposability, incommensurability, nonoperational goal specification, and the confounding of strategic and operating decisions. Incommensurability makes it difficult to specify the goals of the functional divisions in ways which clearly contribute to higher-level enterprise objectives. Indecomposability makes it necessary to attempt more extensive coordination among the parts; for a given span of control, this naturally results in a high degree of control loss between hierarchical levels. Moreover, to the extent that efforts at coordination break down and the individual parts suboptimize, the intrinsic interconnectedness between them virtually assures that spillover costs will be substantial. The confounding of strategic and operating decisions serves to further compromise organizational purpose (Williamson, 1975, pp. 133–134).

A multidivisional organization is one response to such difficulties. According to Williamson, a pure M-form involves control systems that induce appropriate goal pursuit by divisions, the separation of strategic and operating decisionmaking, and superior internal information and control techniques to those possessed by the external capital market. The corollary is the M-form hypothesis (Williamson, 1975, p. 150):

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1 A functionally organized firm is characterized by the decisionmaking authority, for both the development of long-run strategy and for daily operating activities, residing in a centralized management group. Coordination of the functional areas (e.g., manufacturing, sales, engineering) is also carried out by the centralized management.

2 Chandler specifically focused on the DuPont Company (under the leadership of Pierre S. DuPont) and General Motors (under the leadership of Alfred P. Sloan, Jr.).

3 What in essence occurs is that operating decisions that require immediate attention displace management attention from less immediately critical strategic planning (capital allocation) decisions. Since there are always immediate operating decisions to be made, the strategic planning process is characteristically neglected.

4 There are several essential attributes associated with such control systems. First, there must be an explicit definition of an objective function, usually in terms of a profit or rate of return measure. Second, there must exist incentive machinery within the firm that induces division managers to maximize with respect to the specified objective function. The precise form of such machinery may vary considerably. Most obvious is the use of bonuses or raises which are tied to division performance. However, less formal devices may also be effective. For example, promotions (and the accompanying boost in status) or even more direct contact/communication with superiors following positive performance results; and/or demotions or transfers following unsatisfactory performance are frequently cited as alternative effective motivational machinery (particularly for management personnel). Regardless of the exact form of the incentive devices, a key factor in assuring their effectiveness is the continuous monitoring (through internal information audits) of division performance by the centralized executive management (which itself may be an effective informal control system) with corrective actions being taken when results dictate. (See Williamson (1975, pp. 145–146).) The existence of these control systems serves the purpose of attenuating the internal control loss encountered by the management of a functionally organized firm as it expands.
The organization and operation of the large enterprise along the lines of the M-form favors goal pursuit and least-cost behavior more nearly associated with the neoclassical profit maximization hypothesis than does the U-form [functional] organizational alternative.

If this hypothesis is correct, then for a class of large complex firms the adoption of the multidivisional organizational innovation will significantly affect their efficiency. Assuming that interfirm differences in efficiency can exist at any given time and that such differences are reflected in profitability, it follows that organizational form may be expected to account for some part of the observed interfirm variation in profitability.

The M-form hypothesis raises several complex issues. First of all, to observe the performance differential a degree of operating inefficiency must be sustainable, at least transitionally. That is, if the hypothesis is correct and large M-form firms do possess superior efficiency characteristics, then presumably large functionally organized firms will exhibit inferior efficiency characteristics (control loss and possibly subgoal pursuit). To the extent that both types of organizational forms simultaneously exist in the economy when only the M-form organization is appropriate, then some form of transitional survival mechanism must exist to allow us to observe both types of firms. It is perhaps useful in this regard to think of the M-form organizational structure as an organizational innovation which is subject to a diffusion process. During the diffusion period when the M-form innovation is gradually replacing less efficient alternatives (e.g., functional forms) superior and inferior structures simultaneously exist, and it is possible to observe differential performance. However, once the innovation has been fully diffused, its superior efficiency attributes, as disclosed by superior performance, cease to be empirically observable in a competitive market. This suggests that an investigation should focus on a period which appears to be marked by the transitional adoption of the M-form structure and not on a period in which most firms have already adopted the structure.

Finally, to the extent that the M-form hypothesis is correct, it implies that previous empirical studies of firm profitability which have ignored internal structure may be subject to specification bias, and that this bias may be particularly serious if organizational form is correlated, as seems likely, with other variables (e.g., firm size) that are typically included in such studies. This potential error is of some concern in view of the implications for public policy relating to firm size and industrial structure issues.5

Sample selection considerations. The M-form hypothesis admits the simultaneous existence of optimally organized functional and multidivisional firms. This has important implications for the choice of a sample to test the hypothesis. For instance, suppose a sample which included firms whose optimal structure was of the functional form (e.g., firms in which cumulative control loss and the confounding of operating and strategic decisionmaking processes are not experienced) was chosen. Because some of the firms in the sample would have optimal functional forms, a simple comparison of the performance of M-form firms with the corresponding performance of functionally organized

5 In an extensive review of 47 prominent (and not so prominent) profitability studies made by Weiss, not a single investigation included an organizational form variable. See Weiss (1974, pp. 184–223).
firms would contain an inherent bias against finding empirical support for the M-form hypothesis. However, if the sample selected were to consist of only those firms which will realize superior performance from the adoption of the M-form structure, the above bias vanishes, because only the M-form structure is optimal. An obvious problem is deciding whether a sample of firms includes optimally organized functional enterprises. The hypothesis does not specify the level of firm size and/or degree of task complexity for which the purported superior attributes of a multidivisional structure become apparent. Accordingly, one must resort to a somewhat arbitrary procedure for assigning optimal/nonoptimal classifications.6

□ Measurement of firm performance. The M-form hypothesis rests on the assumption that an optimally organized M-form firm will realize superior performance not only because the resource conversion process is more efficient (i.e., the firm is operating closer to the production possibility frontier), but also because the strategic planning and decisionmaking processes allocate resources to high-yield opportunities more effectively. A performance measure that appears to be capable of reflecting superior performance is the rate of return on stockholders' equity (after-tax profits divided by stockholders' equity). The numerator of such a measure is appropriately defined as profits after tax, rather than before tax, since taxes might vary because of differing tax treatments and competitive entry should bring after tax profit rates (risk adjusted) toward equality under competition. The denominator of the measure is stockholders' equity and not total capital. This is the correct specification since it is what managers acting in the stockholders' best interest would seek to maximize (see Hall and Weiss (1967)).7

6 The above discussion does, however, suggest the following research strategy. As has been pointed out, when a sample is selected, it is not known for sure whether it includes optimally organized functional firms. Hence it is not clear whether a comparison of functional firm performance with multidivisional firm performance is biased against the M-form hypothesis. If a statistical test is conducted and results consistent with the hypothesis are found, one can be fairly confident of the results, since, if a bias was in fact present (and it may not have been), it would operate against such a finding. With this outcome subjective optimal/nonoptimal structural classifications are avoided. Unfortunately, if the results are not affirmative and one cannot reject the M-form hypothesis, it is necessary to resort to subjective classification assignments. The implications for research are clear. First, compare the performances of multidivisional and functional firms. If findings consistent with the hypothesis are revealed, they can be confidently accepted. If the results do not support the hypothesis, proceed to make necessarily subjective judgments regarding the optimal/nonoptimal nature of the structures involved and undertake a second performance comparison on the basis of the new classifications.

7 There is still the question of whether the above performance measure should reflect market or book values. The desirability of using a book value measure can be illustrated as follows. Consider a firm which has identified and pursued a market opportunity yielding a return disproportionate with the risk involved (e.g., a product or process innovation, or a superior internal control system). Assume that this above normal return is effectively isolated from competitive pressure for an extended period of time (e.g., due to patent protection or to a significant lead time for competitive entry into the relevant market). The return on the equity invested in the endeavor, as measured by appropriate book values, will continue to reflect the disproportionate return realized by the firm until competitive entry has effectively eliminated it, or until the firm is sold and its assets are revalued, with the above normal returns being fully capitalized into the selling price. The capitalization of these returns into the value of the firm's securities will occur, however, at a much more rapid pace, since as soon as investors learn of the disproportionate return associated with the underlying assets, the price of the securities will be bid up to the point where the associated capital market return just compensates for the inherent risk. Furthermore, it
Model. The basic model posited in the present investigation can be expressed in its functional form as:

\[ \pi_{it} = f(SIZE_{it}, STRUCTURE_{it}, RISK_{it}, CAPUTIL_{it}, GROWTH_{it}) \]

where

- \( \pi_{it} \) = the rate of return on stockholders’ equity (book value) associated with the \( i \)th firm in the \( t \)th period;
- \( SIZE_{it} \) = the size of the \( i \)th firm in the \( t \)th period as reflected in beginning period total assets (book value);
- \( STRUCTURE_{it} \) = the organizational form corresponding to the \( i \)th firm in the \( t \)th period;
- \( RISK_{it} \) = the variability (variance) of the dependent variable associated with the \( i \)th firm in the \( t \)th period calculated on the basis of the observations in the five previous years;
- \( CAPUTIL_{it} \) = a measure of capacity utilization in the petroleum industry in period \( t \); and
- \( GROWTH_{it} \) = the arithmetic average of the growth rates associated with the \( i \)th firm in the \( t \)th period in the five previous years.

Firm size is included in the model to control for the possible effects of economies or diseconomies of scale. Moreover, the arguments made to support the M-form hypothesis suggest that a relationship may exist between firm size and organizational structure, and hence, if organizational form is a determinant of firm performance, it is likely that the size variable included in previous studies has been subjected to specification bias due to the exclusion of internal structure variables.

A growth variable is present to help correct for potential inflationary

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Footnotes:

8 Note that this specification omits the market structure variables that permeate other profitability studies. The reason for this is quite simple. Past studies have characteristically been interindustry investigations in which market structure varied widely across industries. The present investigation focuses on a single industry, the market structure of which has not significantly changed over the sample period. Accordingly, it seems reasonable to omit consideration of the prevailing market structure.

9 The size variable is defined to be beginning period size rather than end of period size to avoid a simultaneity problem between firm size and the dependent variable. That is, the increase in firm size during the year (as measured by book values) is clearly a function of the year’s profits unless all such profits are distributed to shareholders.

10 That is, \( GROWTH = \left( \frac{SIZE_{-1}}{SIZE_{-2}} \right) + \left( \frac{SIZE_{-2}}{SIZE_{-3}} \right) + \left( \frac{SIZE_{-3}}{SIZE_{-4}} \right) + \left( \frac{SIZE_{-4}}{SIZE_{-5}} \right) + \left( \frac{SIZE_{-5}}{SIZE_{-6}} \right) \right) \left( 5 \right) - 1. \)
bias in the dependent variable. Given the arguments made above, a faster growing firm, *ceteris paribus*, will have an asset base whose value more closely approximates market values than will a slower growing firm. Accordingly, the performance of fast growing firms will be understated relative to that of slower growing firms. A measure of the rate of capacity utilization in the petroleum industry is included in the specification to account for the effect of industry-wide supply and demand conditions on firm profitability. The variable is defined as world refining runs divided by world refining capacity. A risk variable is included, since economic theory suggests that the rate of return associated with a particular asset is a function of the risk inherent in the asset, and (assuming risk aversion) the greater the risk, the greater the expected return. The theoretical construct that is widely accepted as the foundation of modern capital market theory—the capital asset pricing model and subsequent derivative models (see Jensen (1972))—indicates that the measure of risk relevant to determining the requisite return on a security is the covariability of the security’s return with the returns on all other securities. However, Beaver, Kettler and Scholes (1970) found that in attempting to predict the systematic risk of a firm’s securities (the covariance of the securities’ return with the return on all other securities) on the basis of financial statement information, earnings variability proved to be a more accurate predictor than earnings covariability. Accordingly, earnings variability has been selected for use as a measure of risk in this study. It is also interesting to note that of the 47 profitability studies reviewed by Weiss (1974), only one (Shepherd, 1972) included a measure of risk.

The organizational form variables to be used in the investigation consist of binary structural dummies. That is, a particular structural form variable will take the value of one in period t if the observation is associated with that structural form. Otherwise, the variable has a value of zero. The organizational structure classification scheme utilized includes the following categories: functional (*F*-form), functional with subsidiaries (*FS*-form), corrupted or degenerate divisionalized (*C*-form), holding company (*H*-form), transitional (*T*-form), and multidivisional (*M*-form). Lest one be tempted to interpret organizational structure solely in terms of the organizational chart, it is important to emphasize that internal control, planning, communication and coordination systems, and the degree of delegation of authority and responsibility represent equally (if not more) important dimensions of organizational structure. Although recent research has shown that consistent differences among the latter dimensions exist when categories are defined solely on the basis of organizational charts (Rumelt, 1974, pp. 33, 36), care must be taken to examine thoroughly the internal form of each sample firm to ensure that appropriate classification results. Firms are assigned to the functional category (*F*-form) if they are or-

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11 The variable excludes Sino-Soviet bloc data. This capacity utilization measure was chosen because it is believed to reflect general economic conditions throughout the industry (i.e., in the crude oil market, the transportation market, and the refined products market). This is true because crude oil itself (which is obviously required to produce refined products—with the minor exception of wellhead gas) can rarely be used without being somewhat refined. That crude production over crude reserves was not used as the capacity variable stems from the much more reliable refining capacity data than the crude reserves data. The minor difference between crude production and refining runs is almost totally the result of changes in year-end crude inventories.

12 Williamson (1975, p. 151) suggests that such an examination of the internal systems and interactions of the firm is required in order to avoid misleading classification assignments. This is particularly important when empirically assessing the performance implications associated with alternative organizational structures.
ganized along functional lines with the decision-making authority for both the development of long-run strategy and for daily operating tactics highly centralized. Coordination of the functional areas is similarly centralized in these organizations. The functional with subsidiaries category (FS-form) refers to firms that are functionally organized with one or more divisions (which may or may not be legal subsidiaries) reporting to top management. These divisions are semiautonomous in the sense that daily operating decisions are made within the divisions rather than by the centralized top management. The centralized management continues, however, to make operating decisions in the "non-subordinates." The characteristics of a multidivisional firm (M-form) should be quite clear from the previous discussions. It has an internal structure in which operating and strategic decisionmaking is clearly separated and in which the requisite internal control systems exist and are systematically employed. A corrupted or degenerate divisionalized firm (C-form) is one in which a divisionalized structure and appropriate internal systems exist. In these firms, however, general management is highly involved in the operating decisionmaking process, a clear division between strategic and operating decisionmaking authority thus being absent. A holding company (H-form) structure possesses a centralized shell which is responsible for financial reporting but which has limited control over the operating divisions. Both strategic and tactical decisionmaking occur within the separate divisions. The holding company organizational structure is not necessarily associated with firms that are holding companies in a legal sense. A transitional classification (T-form) is assigned to all firms whose internal structure is in a state of flux as the firm moves from one internal form to another. Furthermore, this classification is assigned to all firms during the year immediately following a major organizational restructuring. The reason for this latter decision rule was to ensure that the observed firm performance following a reorganization was the result of the new internal form and not due to a Hawthorne effect.

The above classification scheme is summarized in Table 1 and is quite similar to those proposed by Williamson and Bhargava (1972, pp. 125–128), by Chandler (1962), and by Rumelt (1974, pp. 33–40). In the Williamson and Bhargava scheme the functional with subsidiaries and the transitional categories are combined. They have been separately defined in this study because it is believed that for some firms, particularly those with several business activities quite distinct from their basic or predominant business, the functional with subsidiaries structure may prove to be optimal. A transitional classification as defined above to reflect possible Hawthorne effects has not been previously proposed or used in the literature.

The proposed model is subject to the limitations of a single equation approach. We recognize that this performance equation is probably only one equation in a system of simultaneous equations in which performance, internal structure, size, and growth are jointly determined. However, as Cowling

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13 The primary functional areas in the petroleum industry are: crude oil exploration and production, refining, transportation, and marketing.

14 A Hawthorne effect in the present context can be defined as improved performance (following a structural reorganization) which results not from characteristics of the new structure, but rather from the novelty of a new system or from heightened workers' interest (and hence productivity) in the system. For a more complete discussion, see Luthans (1973, pp. 23–32).
(1976, p. 1) has pointed out, it may be realistic to view such a system as being recursive. That is, although there may be feedbacks in the system, the associated lags are sufficiently long to allow us to pull out individual equations for separate treatment. In any case, this is what is done in the present investigation.

*The sample and the data.* The sample period runs 19 years from 1955 to 1973. 1955 was selected as the first year of the sample period since 1950 was the first year that data were available for many sample firms and since five previous annual observations on the dependent variable and on firm size were required to calculate the first observations on the risk and growth variables, respectively. Although data were available for 1974 and 1975, the sample period was defined to end in 1973 because of the effect that the Arab oil embargo and the quadrupling of crude oil prices by OPEC had on firm profitability in these years.15 Were it the case that all sample firms were similarly affected by these events, a 1974–1975 dummy (binary) variable could be employed to isolate this effect. Unfortunately, this simply is not true. Since the effect the above events had on profitability operated primarily through inventory windfall gains, a variable that might adequately capture their influence would be the ratio of firm petroleum inventories to firm inventory capacity. Such data, however, are not publicly available, and the only recourse was to drop 1974 and 1975 from the sample period.

The sample was defined to include all petroleum industry firms in the 1975

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15 Although the embargo took place late in 1973, significant effects on petroleum firms' profitability did not occur until 1974.
There were 32 such firms, 28 of which participated in this study. The organizational history of each of these firms was then traced back, when possible, to 1955. If a firm was involved in a significant merger during the 1955–1975 period, the merger partner was included in the sample in the premerger years if sufficient organizational information was available. For instance, Atlantic Refining Company and Richfield Oil Company are in the sample from 1955–1965 (adequate data being available for both firms) and Atlantic Richfield Company (ARCO) is in the sample from 1966–1975. However, the Pure Oil Company was not included in the sample prior to 1963 when it merged with Union Oil Company of California because there were insufficient data available on Pure. Admittedly, the 1975 Fortune 500 is an arbitrary category from which to draw the sample. There certainly exists an inherent large firm bias. However, this is not troublesome in the present investigation because of the considerations mentioned earlier. Given that the purported superior attributes of the M-form can be realized only after a certain firm size/complexity is reached, it is appropriate to examine the performance of large firms such as the Fortune 500. Finally, by using the 1975 Fortune 500 rather than 1955 rankings, a surviving firm bias is introduced. To compensate for this the above-mentioned inclusion-of-merger-partners rule was adopted. The rationale for working from presently existing firms backwards in time (including earlier merger partners) rather than from 1955 firms forward was that there was a much larger organizational information data base for the former class of firms.

The procedure utilized in making the organizational form classifications and the resultant classifications are contained in the Appendix. Data on the dependent variable (the rate of return on stockholders' equity (book value)), firm size, risk, and growth were obtained from the 1950–1969 and 1956–1975 Compustat Annual Industrial tapes prepared by Investors Management Sciences, Denver, Colorado. World refining runs and refining capacity data from which the capacity utilization variable was calculated were obtained from the American Petroleum Institute (1975).

□ The regression model and econometric procedures. The regression model used in the investigation of the M-form hypothesis can be expressed in its most general form as:

$$
\pi_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 MFORM_{it} + \beta_3 SFSFORM_{it} + \beta_4 TFORM_{it} + \beta_5 CHFORM_{it} + \beta_6 RISK_{it} + \beta_7 CAPUTIL_{it} + \beta_8 GROWTH_{it} + e_{it},
$$

where $\pi_{it}$, $SIZE_{it}$, $RISK_{it}$, $CAPUTIL_{it}$, and $GROWTH_{it}$ are as defined earlier in this section and

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16 Firms were defined "petroleum firms" if more than 50 percent of total firm revenues were derived from petroleum industry activities. Two additional reasons for using the Fortune 500 are as follows. First, a preliminary information search revealed that organization data for smaller firms were not widely available. Second, classification of the organizational structures of the firms in the 1975 Fortune 500 (and earlier merger partners) itself was a considerably large task.

17 Crown Central Petroleum, Tesoro Petroleum, Pennzoil Company, and Amerada Hess did not participate in the research project.

18 A list of the firms and the years they were included in the sample is available from the authors.
\[ M_{\text{FORM}}_{it} = \begin{cases} 1 & \text{if the } i\text{th firm in the } t\text{th period is characterized by an } M\text{-form internal structure,} \\ 0 & \text{otherwise;} \end{cases} \]

\[ F_{\text{FORM}}_{it} = \begin{cases} 1 & \text{if the } i\text{th firm in the } t\text{th period is characterized by a functional with subsidiaries structure,} \\ 0 & \text{otherwise;} \end{cases} \]

\[ T_{\text{FORM}}_{it} = \begin{cases} 1 & \text{if the } i\text{th firm in the } t\text{th period is characterized by a structure of a transitional nature,} \\ 0 & \text{otherwise;} \end{cases} \]

\[ C_{\text{FORM}}_{it} = \begin{cases} 1 & \text{if the } i\text{th firm in the } t\text{th period is characterized by either a corrupted divisionalized structure or a holding company internal form,} \\ 0 & \text{otherwise;} \end{cases} \]

\[ e_{it} = \text{a random disturbance term.} \]

The corrupted and holding company classifications are combined because of the relatively small number of observations associated with each structure. The merged category can be interpreted as representing nonoptimal divisionalized structures. Note that a functional form binary variable is excluded from the model. This is done to avoid singularity in the data matrix. \( \beta_0 \) thus represents the effect of a functional organizational form on profitability. The coefficients of the other organizational form variables reflect the differential performances associated with these forms as compared to the functional form. For example, suppose \( \beta_0 = 0.10 \) and \( \beta_2 = 0.02 \). This indicates that on average \( M \)-form firms realize a 12-percent rate of return on stockholders’ equity, two percentage points above what the average functional form realizes.¹⁹

The econometric procedures used to estimate the above model are outlined in an appendix available from the authors. Briefly, the equation was first estimated with raw data by using ordinary least squares (OLS) techniques. Possible violation of the OLS assumption of nonautocorrelated error terms was then investigated (assuming an autoregressive scheme was constant across all firms). If significant autocorrelation was detected, an appropriate transformation of the data was made. Subsequently, the appropriateness of the OLS assumption of homoscedastic disturbance terms was assessed and another data transformation (designed to produce disturbances with homoscedastic properties) was performed if necessary.

Regressions were run on data from two subsample periods: 1955–1968 and 1969–1973. The reason for this was that the former period appeared to be one in which the \( M \)-form organizational innovation was being diffused, in which case it was possible that differential performance might be observable. The latter period appeared to be one characterized by close-to-full diffusion of the \( M \)-form, and so differential performance would be difficult to discern.²⁰ This diffusion process is made apparent by the data presented in Table 2 which reveal the percentage of \( M \)-form firms in the sample for each sample year.²¹ If

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¹⁹ For a discussion of binary variable models, see Kmenta (1971, pp. 409–429).
²⁰ Arguments in support of this split sample procedure were outlined above.
²¹ Table 1 contains a brief summary of the organizational form categories used in the in-
the hypothesis advanced here is correct, we should expect the estimated coefficients to have the following indicated signs: $\hat{\beta}_1$ (no a priori hypothesis—positive (negative) if economies (diseconomies) of scale exist)); $\hat{\beta}_2$ (positive on the basis of the M-form hypothesis, though perhaps only observable in the 1956–1968 period); $\hat{\beta}_3$ (unclear, depends on the efficiency ranking of the various organizational forms of which theory has little to say in this case; $\hat{\beta}_4$ (positive due to possible Hawthorne effects); $\hat{\beta}_5$ (unclear, though it should be less in value than $\hat{\beta}_2$; $\hat{\beta}_6$ (positive, assuming risk aversion); $\hat{\beta}_7$ (positive since a high capital utilization rate is associated with relatively strong demand conditions); and $\hat{\beta}_8$ (negative during inflationary periods because the asset bases of faster growing firms (as reflected in book values) will more closely reflect market values than will the asset bases of slower growing firms).

Results. The results are summarized in Table 3. We find strong statistical support for the M-form hypothesis. In the 1955–1968 period the multidivisional
### TABLE 3
REGRESSION COEFFICIENTS, t–STATISTICS, AND F–TESTS IN REGRESSION EQUATIONS TO EXPLAIN THE RATE OF RETURN ON STOCKHOLDERS’ EQUITY USING POOLED TIME SERIES–CROSS SECTION OBSERVATIONS

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>C</td>
<td>$0.767338 \times 10^{-1}$</td>
<td>$-0.471747$</td>
</tr>
<tr>
<td></td>
<td>(3.649)**</td>
<td>(-1.952)</td>
</tr>
<tr>
<td>SIZE</td>
<td>$0.326463 \times 10^{-6}$</td>
<td>$0.282800 \times 10^{-5}$</td>
</tr>
<tr>
<td>($ Millions)</td>
<td>(0.371)</td>
<td>(1.569)</td>
</tr>
<tr>
<td>M–FORM</td>
<td>$0.207939 \times 10^{-1}$</td>
<td>$-0.172323 \times 10^{-1}$</td>
</tr>
<tr>
<td></td>
<td>(2.838)**</td>
<td>(-0.754)</td>
</tr>
<tr>
<td>T–FORM</td>
<td>$0.235716 \times 10^{-1}$</td>
<td>$-0.201286 \times 10^{-1}$</td>
</tr>
<tr>
<td></td>
<td>(2.254)**</td>
<td>(-0.561)</td>
</tr>
<tr>
<td>FS–FORM</td>
<td>$0.125329 \times 10^{-1}$</td>
<td>$-0.529042 \times 10^{-1}$</td>
</tr>
<tr>
<td></td>
<td>(1.360)</td>
<td>(-1.703)</td>
</tr>
<tr>
<td>CH–FORM</td>
<td>$-0.558522 \times 10^{-1}$</td>
<td>$-0.322291 \times 10^{-1}$</td>
</tr>
<tr>
<td></td>
<td>(-0.048)</td>
<td>(-0.744)</td>
</tr>
<tr>
<td>RISK</td>
<td>$-0.274530$</td>
<td>$-0.353145$</td>
</tr>
<tr>
<td></td>
<td>(-1.571)</td>
<td>(-0.877)</td>
</tr>
<tr>
<td>CAP.UTIL.</td>
<td>$0.342317 \times 10^{-3}$</td>
<td>$0.610820$</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(2.278)**</td>
</tr>
<tr>
<td>GROWTH</td>
<td>$0.279929$</td>
<td>$0.363157$</td>
</tr>
<tr>
<td></td>
<td>(8.713)**</td>
<td>(5.075)**</td>
</tr>
<tr>
<td>R²</td>
<td>0.249</td>
<td>0.271</td>
</tr>
<tr>
<td></td>
<td>0.231</td>
<td>0.224</td>
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<tr>
<td>F</td>
<td>13.686</td>
<td>5.721</td>
</tr>
<tr>
<td>D–W</td>
<td>1.774</td>
<td>1.776</td>
</tr>
</tbody>
</table>

* **SIGNIFICANT AT 95% LEVEL.  
** **SIGNIFICANT AT 99% LEVEL.

ESTIMATED AUTOREGRESSIVE AND HETEROSCEDASTIC PARAMETERS ARE THE FOLLOWING:

<table>
<thead>
<tr>
<th>EQUATION</th>
<th>ESTIMATED AUTOREGRESSIVE PARAMETER ($\hat{p}$)</th>
<th>ESTIMATED HETEROSCEDASTIC PARAMETER ($\hat{\delta}$)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1956–1968</td>
<td>0.631†</td>
<td>$-0.566††$</td>
</tr>
<tr>
<td>1969–1973</td>
<td>0.208†</td>
<td>$-0.259$</td>
</tr>
</tbody>
</table>

* **HETEROSEDASTIC PARAMETER t–STATISTIC IN PARENTHESES.  
† AUTOREGRESSIVE TRANSFORMATION PERFORMED IN REPORTED REGRESSION EQUATION (INITIAL DURBIN–WATSON STATISTIC INDICATING SIGNIFICANT AUTOCORRELATION).  
†† HETEROSEDASTIC TRANSFORMATION PERFORMED IN REPORTED REGRESSION EQUATION (ESTIMATED HETEROSCEDASTIC PARAMETER BEING SIGNIFICANTLY DIFFERENT FROM ZERO AT THE 95% LEVEL).

(M-form) structure significantly influenced (at better than the 99-percent level) the rate of return on stockholders’ equity, raising it on average by about two percentage points ($\hat{\beta}_2 = 0.02079$) above the 7½ percent level ($\hat{\beta}_0 = 0.0767$) realized by the average functional form firm. Although firms in the transition between two organizational structures appear to have out-performed steady-state M-form firms ($\hat{\beta}_3 = 0.02337$), their performance is not significantly dif-
ferent from that of M-form firms at the 95-percent level. That the transitional coefficient was insignificantly different from zero in the second period suggests that the Hawthorne phenomenon was relatively unimportant in this investigation. A plausible interpretation of the coefficient’s initial period significance is simply that since most firms in the transitional category had just adopted an M-form structure, the coefficient actually reflected M-form performance (and hence was similar in magnitude to $\hat{\beta}_2$). Regardless, it certainly does not appear that the adoption of the M-form structure by a firm with an alternative previous structure is accompanied by any significant net adjustment costs.

Firms characterized by functional with subsidiaries or degenerate and holding company divisionalized structures do not appear to realize significantly different performance from an average functionally organized firm. The size of the degenerate and holding company coefficient relative to the M-form coefficient is as expected (indicating inferior relative performance).

Our results also indicate that observable superior multidivisional performance does not persist into the second sample period (1969–1973), a period characterized by close-to-full diffusion of the M-form structure. This is a reassuring result, implying that observable differential performance deriving from organizational form does not persist indefinitely. Nonoptimally organized firms are apparently faced with sufficiently strong competitive pressures to adopt the superior M-form structure and hence to eliminate the differential performance previously observed. Thus a plausible explanation for the unobserved superior performance in the second period is that the sample firms were, in general, appropriately organized. Support for this explanation lies in the observation that the six firms classified as F- or FS-form at any time in the 1969–1973 period were among the seven smallest sample firms. The average asset size of these firms in 1969 was $247,530,000. In comparison, the average asset size of M-form firms in 1969 was $4,338,346,000. If one accepts the argument that the superior attributes of a multidivisional structure become increasingly relevant and important as firm size increases, the above observation can be interpreted as suggesting that firms whose characteristics in the second sample period were such that the M-form organizational structure would improve performance had in fact adopted the structure, while other firms remained appropriately organized as functional or functional with subsidiaries.

The positive sign of the capacity utilization coefficient is as expected in both sample periods. However, whereas the level of capacity utilization seems not to influence firm performance significantly in the 1955–1968 period, it does appear to do so in the 1969–1973 period. This effect in the latter period explains why the coefficient reflecting functional firm performance ($\hat{\beta}_0$) is negative, implying negative rates of return ($\hat{\beta}_0 = -0.4717$). When the average rate of capacity utilization in the 1969–1973 period (90 percent) is multiplied by the capacity utilization coefficient and the result added to $\hat{\beta}_0$, one sees that the average functionally organized firm (with average capacity utilization) in this period realized a rate of return on stockholders’ equity of about 14 percent.

The coefficient associated with firm size is positive in both sample period regressions, though not significant at the 90 percent level. Thus, if there are any

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22 The relevant t-statistic for testing the significance of the difference in the T-form and M-form estimated coefficients has a value of 0.478.

23 The six firms were: American Petrofina, Clark Oil & Refining, Commonwealth Oil Refining, Murphy Oil, Superior Oil, and United Refining.
binding economies of scale associated with large firm size, they do not seem to be very important in determining overall firm performance.

The risk associated with a firm’s performance, as measured by past variability in earnings, appears not to influence significantly current period rates of return on stockholders’ equity in either sample period. The estimated coefficients are negative in sign, but they are not significantly different from zero at the 90 percent confidence level.

The average rate of growth experienced by the average firm in the five previous years significantly affects present period performance in a positive fashion. This is not in accord with the sign expected for this coefficient. It was postulated that in an inflationary period rapidly growing firms’ asset bases would more nearly reflect current market values than would those of slower growing firms which have equal economic value (though lower book value), the performance of the former class of firms being relatively understated. A negative sign for this coefficient would hence be expected, though perhaps only in the latter sample period, since inflationary pressures were not serious prior to the late 1960s (and after the early 1950s). A possible explanation for this is that superior management is associated with fast growing firms, independent of any organizational form considerations. That is, it is possible that the managers of fast growing firms are more alert and aggressive, ceteris paribus, than the managers of corresponding slow growing firms with the result that the former firms tend to realize superior performance.

3. Conclusion

The results are broadly consistent with the M-form hypothesis. It certainly appears that there are characteristics associated with a multidivisional form that lead to superior firm performance. That such superior performance is observed only in the 1955–1968 period and not in the 1969–1973 period is consistent with prior arguments made with respect to the diffusion of this organizational form. That is, one would expect to observe superior performance (if the attributes of the M-form exist as postulated) only while the organizational innovation was in the process of being diffused (i.e., when inferior substitutes simultaneously existed). Once the multidivisional structure had displaced inferior internal forms, differential performance would not be observable, since the efficiency gains would have been passed on to consumers rather than having been impounded in profits.

The sample of firms used in the present investigation could have included firms which are optimally organized as functional forms, thereby creating a potential bias against positive empirical support for the M-form hypothesis.24 In view of this, the results affirming the M-form hypothesis are particularly impressive. They imply not only that the efficacy of internal exchange is a function of organizational form (and hence that the appropriate division of economic activity between firms and markets is a function of organizational

24 Other sources of statistical bias against the M-Form Hypothesis exist because of our focus on surviving firms (inefficient functionally organized enterprises could have been eliminated) and because superior management may be able to sustain functional firms beyond their appropriate life cycle. It often appears that organizational change is associated with the introduction of a new group of top managers after the retirement of senior executives who have made the functional structure perform through the application of Herculian management efforts.
structure), but also that previous investigations of firm profitability may have been subject to specification bias as a result of the exclusion of organizational form considerations. Our findings suggest that past conclusions concerning the relationship between firm size and profitability may not be valid, since our results for the domestic petroleum industry suggest that such a relationship does not exist independent of organizational structure. Additional studies are needed to affirm the generality of this finding.

Appendix

Organizational form classifications

The procedure utilized in making organizational classifications was the following. Information on the organizational characteristics of each sample firm

<table>
<thead>
<tr>
<th>TABLE A1</th>
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</thead>
<tbody>
<tr>
<td>SAMPLE FIRMS AND ORGANIZATIONAL FORM CLASSIFICATIONS*</td>
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</tbody>
</table>

<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>RICHFIELD OIL: (1955–1965)</td>
<td>1950–1965 (F)</td>
</tr>
<tr>
<td>COMMONWEALTH OIL REFINING: (1953–1975)</td>
<td>1953–1975 (F)</td>
</tr>
</tbody>
</table>

*THE ORGANIZATIONAL FORM CLASSIFICATIONS ARE DESCRIBED IN TABLE 1. THE SYMBOLS REFER TO THE FOLLOWING CLASSIFICATIONS.

(F) – FUNCTIONAL
(FS) – FUNCTIONAL WITH SUBSIDIARIES
(T) – TRANSITIONAL
(M) – MULTIDIVISIONAL
(C) – CORRUPTED OR DEGENERATE DIVISIONALIZED
(H) – HOLDING COMPANY

**THE YEARS IN PARENTHESES UNDER THE COMPANY NAME REPRESENT THE PERIOD IN WHICH THE FIRM WAS INCLUDED IN THE SAMPLE. THAT THIS PERIOD IS SHORTER THAN THE PERIOD FOR WHICH ORGANIZATIONAL FORM DATA ARE AVAILABLE IS DUE TO DATA UNAVAILABILITY FOR OTHER MODEL VARIABLES.
over the sample period was assembled from a review of annual reports, 10-K forms filed with the Securities and Exchange Commission, prospectuses, business periodical articles, recruiting literature, publicly available texts of speeches by corporate officials before various organizations (most helpful were those presented to the Society of Security Analysts), Chandler’s Strategy and Structure, books describing the evolution of the industry or of specific firms in the industry, and several other public sources. A considerable amount of information about the structural development of the larger firms in the sample was obtained from files maintained by O. E. Williamson at the University of Pennsylvania. After these files had been assembled, an attempt was made to classify the internal organizational form (with respect to the above classification scheme) of each firm for every year in the sample period on the basis of the file information. If there was insufficient information for a classification to be assigned, a set of questions relating to information and control systems (the answers to which would permit an appropriate classification to be made) was sent to the firm. Finally, after all classifications had been made every sample firm was requested to verify the assignments.25 This verification process was undertaken to provide additional support and credence to the classification, since the information underlying the assignments is qualitative in nature. These final verified classifications (appearing in Table A1) represent the organizational form data utilized in this study.

References


25 Four classification changes were made on the basis of information acquired in the verification process. Additionally, it is worth noting that the Corrupted or Degenerate Divisionalized classification was renamed Developing Divisionalized when the classifications were sent to the firms for verification to avoid response bias.
Rumelt, R. P. *Strategy, Structure, and Economic Performance*. Division of Research, Graduate School of Business Administration, Harvard University, 1974.


