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Resource Allocation as an Outcropping of Strategic Consistency: Performance Implications

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RESOURCE ALLOCATION AS AN OUTCROPPING OF STRATEGIC CONSISTENCY: PERFORMANCE IMPLICATIONS

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Similarities in financial resource allocations across the lines of business of diversified firms may indicate corporate strategic consistency, which may lead to superior corporate performance. In support of this argument, the variance in R&D intensity across the lines of business of 96 diversified firms was found to be inversely related to industry-adjusted return on assets. However, no relationship was found for capital intensity. These results provide partial support for the usefulness of a resource-based approach to the study of diversification strategy.

The increase in the diversification of business organizations in the United States and elsewhere over the past several decades has been accompanied by an increase in research on the topic. Hoskisson and Hitt (1990) included 254 citations in their review of the diversification literature (cf. Ramanujam & Varadarajan, 1989). Although much of this research has centered on the relationship between diversification and financial performance, contradictory findings have made it difficult for researchers to agree on which of many alternative theories best represents this critical relationship (Hoskisson & Hitt, 1990). Of particular concern is the role of relatedness among a firm's diversified businesses in producing synergy and thus higher performance.

The purpose of this article is to present theory and empirical evidence that support a resource-based view of the relationship between diversification and performance (Barney, 1988; Harrison, Hitt, Hoskisson, & Ireland, 1991; Mahoney & Pandian, 1992; Wernerfelt, 1984). The resource-based view, which focuses on the management of firm resources to produce a sustainable competitive advantage, is in harmony with some of the tradi-

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tional diversification literature. However, it also provides unique perspectives on the relatedness-performance relationship. We developed these perspectives and tested some resulting hypotheses. In particular, our hypotheses concern the performance effects of resource allocation similarities among the lines of business of large, diversified firms over a seven-year period.

THEORY AND HYPOTHESES

The traditional product-market approach to conceptualizing and measuring diversification has limitations. We offer an alternative approach stemming from the resource-based view of firms.

Traditional Perspectives on Diversification

Many management scholars believe that relatedness among the lines of business of diversified firms results in higher performance (e.g., Bettis, 1981; Bettis & Mahajan, 1985; Capon, Hulbert, Farley, & Martin, 1988; Davis, Robinson, Pearce, & Park, 1992; Lubatkin & Rogers, 1989; Rumelt, 1974, 1982; Shelton, 1988; Varadarajan & Ramanujam, 1987; Wernerfelt & Montgomery, 1986). However, researchers have reported both results that support that idea and results that do not (e.g., Amit & Livnat, 1988; Bettis & Hall, 1982; Dubofsky & Varadarajan, 1987; Grant & Jammine, 1988; Grant, Jammine, & Thomas, 1988; Michel & Shaked, 1984; Palepu, 1985). These discrepancies are sometimes traceable to the influence of differing perspectives and methodologies (Hoskisson & Hitt, 1990; Montgomery, 1979; Venkatraman, 1989). A closer examination of widely used measures of relatedness and supporting theoretical explanations will help bring these issues to light.

Most empirical studies of the relatedness construct have made use of output-based measures that rely on product, market, or technological similarities within a diversified firm's business portfolio (e.g., Capon et al., 1988; Montgomery & Wernerfelt, 1988; Nathanson & Cassano, 1982; Palepu, 1985; Rumelt, 1974, 1982; Shelton, 1988; Simmonds, 1990; Varadarajan & Ramanujam, 1987). For example, in one of the most frequently cited studies, Rumelt defined lines of business as related if they were "tangibly related to the collective skills and strengths possessed originally by the firm" (1974: 11). He observed three types of relatedness: "(1) relationships among markets served and distribution systems; (2) relationships based on similar production technologies; or (3) the exploitation of science-based research" (Rumelt, 1974: 17).

In another widely cited study, Palepu (1985) employed the Jacquemin and Berry (1979) entropy measure, which is based on the Standard Industrial Classification (SIC) system created by the United States Department of Commerce. SIC codes are based on traditional industry groupings in the U.S. economy. For example, the two-digit "major group 33" is used to identify businesses that are engaged in primary metal industries. The major group is then divided into three-digit groups such as blast furnaces (331), iron and

steel foundries (332), and primary metal industries (333). These groups are then divided into more specific four-digit industries such as copper (3331) and lead (3332). According to Jacquemin and Berry (1979), businesses are related if they are involved in different four-digit industries within the same major two-digit group.

In theory, similarities among products, markets, or technologies, as identified with measures such as those described above, should lead to synergies, often through economies of scope (Panzer & Willig, 1981; Rumelt, 1982; Teece, 1980). Synergies can arise from tangible similarities among businesses that allow the combining of physical processes, such as use of the same marketing channels for several related products or use of excess production capacity to produce an additional product. Synergies may also arise from intangible resource commonalities that result in an ability to share management expertise or know-how across several related business segments (Porter, 1985, 1987).

Although output-based approaches to the measurement of relatedness are often considered valid indicators for the potential for resource-based synergies, these synergies may never be realized (Nayyar, 1992), which may partially explain the contradictions noted earlier. One reason for this loss of potential could be that some related diversification strategies are well formulated but inappropriately implemented. For example, Hill, Hitt, and Hoskisson (1992) discovered that high performance in related-diversified firms is partially dependent on high centralization of control, high integration of activities, use of both subjective and objective criteria in evaluating divisional performance, and incentive schemes that are linked to the profitability of an entire corporation.

Another reason companies may not realize synergies is that the potential for synergies based on intangible resources relies on assumptions that business units producing similar products or marketing goods to similar customers use similar management techniques or share a strategic focus. These assumptions may not always be valid. For example, it is possible for two companies to produce the same product but have very different perspectives on the usefulness of research and development in the way it is produced (Porter, 1985). In addition, the same two companies may have dissimilar capital structures, with one company favoring human labor and customization while the other emphasizes a more highly automated production process and standardization. This type of diversity is common in industries such as steel and automobiles.

A resource-based view of diversification can overcome some of the limitations associated with traditional product- or market-based diversification theory and research (Harrison et al., 1991; Mahoney & Pandian, 1992; Wernerfelt, 1984). From a resource-based perspective, the management of firm resources is closely linked to both strategy formulation and strategy implementation, but the use of traditional measures encourages a focus on strategy formulation only. In addition, similar levels of investment in resources such

as R&D and capital across the lines of business of a diversified firm could be a sign of consistency in dominant logic, distinctive competency, or other organizational factors.

A Resource-based Perspective on Diversification

From a resource-based view, business executives should manage diversified resources so as to achieve a sustainable competitive advantage (Barney, 1991), which should lead to short- and long-term economic profits (Mahoney & Pandian, 1992). Barney classified firm resources into three types: physical (Williamson, 1975), human (Becker, 1964), and organizational (Tomer, 1987). Most closely related to the present study's concerns are (1) human resources, organizational elements such as the training, experience, judgment, intelligence, and insight of a firm's managers, and (2) organizational resources, which include the firm's formal and informal planning, controlling, and coordinating systems and its formal reporting structure.

According to Mahoney and Pandian, unique capabilities arising from technical know-how and managerial ability "are important sources of heterogeneity that may result in sustained competitive advantage" (1992: 365). Distinctive competence and superior organizational routines may enable a firm to generate profits (e.g., economic rents) from a resource advantage (Hitt & Ireland, 1985; Mahoney & Pandian, 1992). Citing Penrose (1959), Mahoney and Pandian continued, "A firm may achieve rents not because it has better resources, but rather the firm's distinctive competence involves making better use of its resources" (1992: 365)."

Harrison and colleagues (1991) recently investigated the issue of whether resource allocation similarities or differences between acquiring firms and their targets are associated with better management of combined resources in post-merger periods. Specifically, they compared acquiring and target firm premerger expenditure levels in key strategic areas such as R&D. Surprisingly, they discovered that differences, not similarities, in expenditure levels were associated with higher financial performance. They explained that their findings were primarily a result of the competitive bidding process for acquisitions, which tends to result in acquiring firms' paying higher premiums when they are strategically similar to their targets (Barney, 1986, 1988).

Although the bidding process argument applies well to acquisitions, it is not compelling in the case of a firm with an established portfolio of businesses. One reason for the discrepancy is that a lot of diversification occurs through internal development (Porter, 1987), where the external bidding process does not apply. Also, even in the case of acquisitions, the short-term effects and high costs, such as premiums, attorney and advisement fees, and transaction costs, are likely to be dissipated over the long term, especially as the operations of the acquired firm are integrated into its parent.

Harrison and colleagues (1991) also explained that acquiring firms may have the opportunity to satisfy unmet needs in their existing business portfolios through acquisitions. Citing the example of a food processor acquiring

a food packager, they stated that the complementarity of these two businesses could lead to synergy. However, both those authors and Stewart, Harris, and Carleton (1984) discovered that firms tended to acquire targets with resource allocation similarities, not dissimilarities (cf. MacDonald, 1985; Montgomery & Hariharan, 1991). Therefore, we concluded that the performance effects Harrison and colleagues found were due primarily to the bidding process and not resource complementarity.

In summary, we contend that resource similarities, not differences, among the lines of business of diversified firms are likely to lead to higher performance. In a sense, this idea conflicts with classic portfolio theory, which advocates that a firm's businesses be positioned at different stages of the product life cycle, a pattern that implies varying demands for capital and R&D. In other words, a strategy that makes sense from a cash flow perspective may not lead to effective management of resources.

Dominant Logic and Resource Allocations

Mahoney and Pandian contended that "a rich connection among the firm's resources, distinctive competencies and mental models or 'dominant logic' . . . of the managerial team drives the diversification process" (1992: 365). A firm's dominant logic consists of a knowledge structure and a set of management processes that are acquired through the experiences of managers during their careers (Prahalad & Bettis, 1986). Furthermore, these experiences are influenced by the dominant business of a firm, which Prahalad and Bettis called the core business. As those authors explained: "The characteristics of the core business, often the source of top managers in diversified firms, tend to cause managers to define problems in certain ways and develop familiarity with and facility in the use of those administrative tools that are particularly useful in accomplishing the critical tasks of the core business" (1986: 491). According to Prahalad and Bettis, managers consider few organizational events as being totally unique or requiring detailed analysis. Instead, they process events through preexisting knowledge systems known as schemata (Norman, 1976). Schemata represent beliefs, theories, and propositions that are developed over time through participation in certain firms and businesses. Therefore, managers of different firms within strategically similar businesses or industries may have similar schemata as a result of their personal experiences in those businesses.

Prahalad and Bettis (1986) reasoned that differences in the strategic characteristics of the businesses in a firm's portfolio can influence the ability of top managers to successfully manage the firm. In other words, managers may learn to be successful in the core business or in businesses that are strategically similar to the core business but may not have the skills necessary to be successful in businesses with different strategic characteristics. Also, Grant explained that the effectiveness with which corporate managers of diversified firms allocate resources among businesses and guide and coordinate business unit strategies "is determined, in part, by the ability of top management to apply similar knowledge and systems to the different busi-

nesses within the firm (1988: 640). Relatedness based on a common dominant logic may transcend traditional relatedness boundaries based on products, markets, or technologies.

One possible extension of these arguments is that businesses that allocate strategic resources in similar ways are more likely to share a similar dominant logic than those that do not. Prahalad and Bettis recognized the link between dominant logic and resource allocations in stating that "a dominant general management logic is defined as the way in which managers conceptualize the business and make critical resource allocation decisions" (1986: 490).

These concepts will now be developed around two strategic resource variables, R&D and capital expenditures, both of which have been found to be important in strategic management research (Baysinger & Hoskisson, 1989; Baysinger, Kosnik, & Turk, 1991; Franko, 1989; Fryxell, 1990; Harrison et al., 1991; Hoskisson & Hitt, 1988; Montgomery & Hariharan, 1991).

R&D Resource Allocations as a Source of Strategic Information

Resource allocations across business units can be a source of strategic information. In particular, similarity in R&D resource allocations across lines of business can signal two strategically relevant phenomena: firm involvement in industries having similar requirements for R&D because they are in the same stage in the business life cycle, or an attempt on the part of corporate executives to manage lines of business similarly. According to the theory of dominant logic developed earlier, these two phenomena are inseparably intertwined; that is, the dominant logic developed in a firm's core business is likely to influence both its selection of businesses in which to compete (Harrison et al., 1991; Stewart et al., 1984) and the way businesses are managed (Prahalad & Bettis, 1986).

A consistent pattern of high R&D intensity across lines of business, regardless of the reason for it, is likely to make skill and knowledge transference through executive transfers, promotions, and other means easier and more effective. But if one business does not share the corporate emphasis on R&D, it likewise may not fit the dominant logic of the corporation. We would expect such a lack of fit to reduce the ability of corporate managers to understand the outlier business unit and the conditions necessary for its success. The effectiveness of skill and knowledge transference through executive transfers and promotions may also be reduced.

Alternatively, a corporation with a dominant logic that places a low emphasis on R&D activities can experience similar difficulties in managing a line of business that requires large allocations to R&D to remain competitive. In this case, corporate executives are unlikely to appreciate the competitive conditions of the outlier business unit. Likewise, a manager who is transferred from a core unit of the firm to the outlier may not have the skills necessary to make it a success.

Independent of the dominant logic arguments is the following: a firm that encourages large allocations to R&D across all its businesses may also be

trying to develop a distinctive corporate competence in research (Hitt & Ireland, 1985, 1986). Stalk, Evans, and Shulman (1992) referred to distinctive corporate competencies as core capabilities, business processes that are critical to success across multiple units (and multiple stages of the value chain) within an organization. Because core capabilities are "everywhere and nowhere" (Stalk et al., 1992: 62), no one executive or business unit controls them.

The corporate emphasis in an organization that is developing a core capability is not on products and markets, but on improving particular business processes to such an extent that they lead to a sustainable competitive advantage (Stalk et al., 1992). Hitt and Ireland (1986) argued that even in firms that are classified as unrelated-diversified using traditional relatedness criteria, there may be some common distinctive competencies that can be applied across businesses that will promote higher overall performance in the corporation. Therefore, similar R&D resource allocations to different lines of business may be associated with an attempt to develop a distinctive competence or core capability in this area.

On the other hand, varying levels of R&D expenditures across lines of business may be associated with totally different business-level strategies. Scarpello, Boulton, and Hofer (1986) suggested that new product leadership first requires a wide range and high level of R&D commitments, then process development, and finally, product development. However, an imitator strategy requires very little or no R&D.

High or low levels of R&D expenditures may also be associated with other organizational factors. For example, highly research-intensive firms employ many highly trained professionals and specialists. Professional employees desire freedom from bureaucratic rules and authority (Podsakoff, Williams, & Todor, 1986). Because of the high levels of training and the rapid product and process changes associated with high levels of R&D, an organic organizational system is probably appropriate in these types of firms (Burns & Stalker, 1961). But firms that place less emphasis on R&D are likely to have workers with less training, as well as slower product and process change; thus, these firms are likely to be more mechanistic.

Inconsistent organizational systems—for example, a mix of organic and mechanistic systems—among lines of business that are or are not research-intensive can make skill transference and proper management difficult. Clashing systems can also make physical resource sharing among business units very difficult, thus reducing the probability of identifying and exploiting synergies based on existing tangible resource commonalities.

Organizational culture is another influence closely related to the organic-mechanistic dimension. It is likely that the culture of a highly R&D intensive firm will develop differently from the culture of a firm that places little emphasis on R&D. Willingness to assume risk, desire for autonomy, and decision making are among the cultural factors that are likely to be affected, with high R&D firms favoring more risk taking and decentralized decision making. Chatterjee, Lubatkin, Schweiger, and Weber (1992) discov-

ered that cultural differences between acquiring firms and their targets were associated with low levels of shareholder return when culture was measured as, among other things, attitude towards risk, autonomy, and decision making.

In summary, firms should diversify in directions that are consistent with their overall corporate emphases on R&D. The arguments contained herein should also extend to corporate performance. Resource allocation similarities among lines of business should lead to more successful transference of skills, knowledge, and experience and greater understanding of a firm's various lines of business by corporate managers. These advantages should lead to higher performance in diversified firms. Stated differently, low variance in R&D intensity across lines of business should lead to higher performance.

> *Hypothesis 1: Variance in R&D intensity across the lines of business of diversified firms will be inversely related to corporate financial performance.*

Some of these arguments also apply to allocations of capital across the lines of business of diversified firms.

Capital Intensity and the Center of Gravity

Harrison and colleagues (1991) discovered that capital-intensive firms sought out other capital-intensive firms as acquisition targets (cf. Montgomery & Hariharan, 1991). However, the effect, although significant in a correlational analysis ($r = .32$, $p < .01$), was not as strong as it was for R&D intensity ($r = .64$). Galbraith and Kazanjian (1986) developed a model that is helpful in understanding why businesses with similar capital requirements may also display other strategic similarities.

The model developed by Galbraith and Kazanjian (1986) is based on the stages of the manufacturing supply chain, which is similar to the value-added industry supply chain found in economics. The upstream supply flow moves from raw materials extraction through primary manufacturing to fabrication. The downstream stages include final product manufacturing, distribution, and retail sale. According to Galbraith and Kazanjian, a company establishes its "center of gravity" by beginning its operations at a particular stage of the supply chain in an industry. Once a company is successful (if it is successful) in mastering the management techniques and processes that are necessary at that stage, strategic changes take place through moves around and from this center of gravity.

Firms that have similar centers of gravity are expected to have similar strategic characteristics (Galbraith & Kazanjian, 1986). For example, firms that engage in raw materials extraction and primary manufacturing (upstream companies) are expected to be much more capital-intensive than companies that produce and market finished goods (downstream companies). The capital-intensive upstream companies are characterized by an emphasis on commodity products, standardization, maximization of the

number of end users of products, low-cost production, line-driven organization structures, process innovation, high emphasis on a capital budget, high levels of technological know-how, and a functional emphasis on manufacturing and engineering. Alternatively, the market-oriented downstream companies are characterized by proprietary products, customization, target marketing, high margins, line and staff-driven structures, product innovation, high emphasis on an advertising budget, high levels of marketing skills, and a functional emphasis on product development and marketing (Galbraith & Kazanjian, 1986).

Consequently, similar capital requirements among lines of business may indicate a narrow dispersion around the center of gravity, which should facilitate effective management and skill and knowledge transference. However, even if lines of business with similar capital resource allocations are not at the same stage of the supply chain, they are still likely to share some strategic characteristics.

Therefore, lines of business that have similar capital requirements may also share other strategic similarities, which should lead to more successful transference of skills, knowledge, and experience and more effective corporate-level management.

Hypothesis 2: Variance in capital intensity across the lines of business of diversified firms will be inversely related to corporate financial performance.

METHODS

Data

Line-of-business data were extracted from the COMPUSTAT data base, specifically the line-of-business segment, which includes information for the seven-year period 1984–90. Since this study focused on diversified firms, companies that were not active in more than one line of business were excluded. Data for the performance and control variables were drawn from the COMPUSTAT primary, secondary, tertiary, full, and research data bases. All variables were averaged over the study period to minimize errors resulting from year-to-year volatility in the measures. Consequently, companies that did not report complete data for at least four of the seven years for each of the variables were dropped from the study.[1]

Complete data were available for 96 firms. These firms participated in 203 different four-digit and 55 different two-digit SIC industries. Although the study group is not particularly large, it compares well with the sizes of

[1] A less restrictive inclusion criterion of three years of complete data for each variable resulted in an increase to 133 firms and similar results for the tests of hypotheses. However, the less stable measures caused the model error terms to increase, which resulted in a drop in significance level for some of the models. For example, the significance level of the primary R&D model dropped from $p < .0001$ to $p < .001$. Therefore, we had more confidence in the results using the more restrictive criterion.

the samples used in other, widely cited diversification studies, including Bettis (1981, $N = 80$), Bettis and Hall (1982, $N = 80$), Montgomery (1982, $N = 128$), and Palepu (1985, $N = 30$).[2] Furthermore, as Table 1 demonstrates, the studied firms represent the distribution of industries in the entire line-of-business data base fairly well. Studied companies averaged sales of $1.8 billion, assets of $1.8 billion, and 15,197 employees. Therefore, the results of this study are not generalizable to small firms.

Variables

To examine Hypotheses 1 and 2, we used the variances of R&D intensity and capital intensity across lines of business as measures of the difference or dispersion in resource allocations.[3] The intensity variables were calculated in the traditional manner, by dividing R&D expenditures and capital expenditures by sales.

Return on assets (ROA) was the measure of financial performance used in this study. Although accounting-based measures of performance are not without their faults, several researchers have recently defended them (Bromiley, 1986; Jacobson, 1987; Long & Ravenscraft, 1984). Furthermore, since ROA is the most commonly used accounting-based measure of performance in the strategic management literature, its use provides comparability with many past studies of diversification. To control for industry influences, we used a weighted average of the ROA of the dominant four-digit industry of each firm, excluding the firm's own financial figures. The dependent variable was an industry-adjusted measure in which industry ROA was subtracted from firm ROA prior to analysis (Fowler & Schmidt, 1988; Rumelt, 1982).

In addition to industry profitability, four other control variables—leverage, relative market share, firm growth, and diversification—were added to the analysis. We considered leverage important because firms sometimes accomplish diversification through acquisitions that are heavily debt financed, and the correspondingly high interest payments can reduce profitability levels. We calculated leverage as the ratio of long-term debt to total assets. Another common measure of leverage, long-term debt to equity, was not as highly correlated with ROA and was therefore judged inferior.

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[2] Most small or privately held companies are not required to file Securities and Exchange Commission 10-K reports detailing their line-of-business expenditures. Furthermore, of the companies that are required to file 10-Ks, most do not report R&D expenditures by line of business. Standard & Poor's compiles information directly from 10-Ks and annual reports. An exhaustive search of these source documents, which are reproduced on microfiche, would have been prohibitively expensive and unlikely to produce a much larger data set. Consequently, we concluded that any biases that may have resulted from use of the COMPUSTAT line-of-business segment data base were unavoidable (Palepu, 1985).

[3] There was no theoretical reason to believe that variance was superior to other potential measures of dispersion. Consequently, in pretests we substituted standard deviation and a measure that compared the highest to the lowest intensity and found comparable results.

TABLE 1
Two-Digit Industry Participation of Companies in the Study and in the COMPUSTAT Data Base

Two-Digit SIC Code	Description	Lines of Business	Percentage of Sample	Percentage of Data Base
01	Agriculture: Crops	2	0.8	0.3
02	Agriculture: Livestock	1	0.4	0.2
10	Metal mining	1	0.4	1.7
12	Coal mining	1	0.4	0.6
13	Oil and gas extraction	8	3.1	4.9
15	Building construction	1	0.4	1.2
16	Construction other than building	2	0.8	0.5
17	Construction: Special contractors	1	0.4	0.5
20	Food and kindred products	4	1.5	1.9
22	Textile mill products	2	0.8	0.8
25	Furniture and fixtures	1	0.4	0.7
27	Printing and publishing	3	1.1	1.4
28	Chemicals and allied products	18	6.9	4.8
29	Petroleum refining	3	1.1	0.7
30	Rubber and plastics	1	0.4	1.7
31	Leather and leather products	1	0.4	0.3
32	Stone, glass, concrete products	1	0.4	0.9
33	Primary metal industries	4	1.5	1.8
34	Fabricated metal products	9	3.4	2.6
35	Machinery, except electrical	18	6.9	6.8
36	Electrical-electronic machinery	15	5.7	5.9
37	Transportation equipment	8	3.1	2.2
38	Measuring-controlling instruments	16	6.1	5.3
39	Miscellaneous manufacturing	5	1.9	1.3
42	Motor freight	1	0.4	0.8
45	Transportation by air	1	0.4	0.5
47	Transportation services	1	0.4	0.4
49	Electric, gas, and sanitation services	3	1.1	3.3
50	Wholesale: Durable goods	12	4.6	3.6
51	Wholesale: Nondurable goods	10	3.8	2.2
52	Retail: Building materials	4	1.5	3.8
53	Retail: General merchandise	12	4.6	0.8
54	Food stores	9	3.4	0.7
55	Auto dealers and service stations	1	0.4	0.3
56	Apparel-accessory stores	6	2.3	0.5
57	Furniture stores	1	0.4	0.5
58	Eating-drinking places	6	2.3	1.3
59	Miscellaneous retail	11	4.2	1.5
61	Credit agencies	2	0.8	1.8
62	Security-commodity brokers	1	0.4	1.2
63	Insurance	2	0.8	1.7
65	Real estate	9	3.4	2.6
67	Investment offices	7	2.7	3.9
70	Hotels-lodging places	5	1.9	0.6
72	Personal services	1	0.4	0.3
73	Business services	10	3.8	5.5

TABLE 1 (continued)

Two-Digit SIC Code	Description	Lines of Business	Percentage of Sample	Percentage of Data Base
75	Automobile repair services	1	0.4	0.3
76	Miscellaneous repair services	1	0.4	0.2
79	Amusement-recreation services	6	2.3	0.9
80	Health services	2	0.8	1.7
82	Educational services	1	0.4	0.3
87	Other services	10	3.8	3.0

Market power and growth have also been found to be important control variables in studies of this type. The data base provided the information necessary to calculate a measure of relative market share, defined as the sales of a firm in a particular four-digit industry divided by the sales of the largest competitor in that industry. We computed relative market share by averaging this ratio across all of the lines of business in which a firm participated during the study period. Growth was measured as average growth in total firm sales across the period.

Finally, we controlled for firm diversification through the use of entropy measures, which were discussed earlier (Jacquemin & Berry, 1979; Palepu, 1975). We were interested in discovering whether the main predictor variables could explain a significant amount of variance in performance in the presence of more traditional diversification measures. The entropy measures included three components: unrelated diversification, related diversification, and total diversification, which is the sum of unrelated and related diversification. Palepu (1985) provides a detailed description of the computational methods involved.

Statistical Tests

Analysis of variance using SAS procedure GLM was used to test Hypotheses 1 and 2 (SAS Institute, 1985). We first computed the models with the variance measures and three of the control variables, excluding the diversification measures. Each of the three entropy measures was then added in turn. We then divided the data set into an early (1984–86) and a late (1987–90) period to test the stability of the main effects across the time period under study. Only 83 firms were available for use in the early period tests because 13 of the 96 firms studied only reported adequate data for 1987–90. The full group of 96 firms was available for the late period tests. All analyses were cross-sectional, with all the variables representing averages over the particular period under study (three to seven years, depending on the test).

Tests of the interactions between the variance scores and the entropy measures were also conducted to examine the notion that the importance of variance in resource allocations varied with the level of traditionally measured diversification within the firms. These tests did not add much to our

understanding of the relationships being studied.[4] Therefore, we do not report the interaction test results herein.

RESULTS

Table 2 provides descriptive statistics for the dependent and independent variables and their correlations. Since all the firms studied were diversified, at least to the extent that they were involved in more than one line of business, the negative average industry-adjusted ROA (−3.2%) suggests that diversified firms, on the average, earn low returns (Chang & Thomas, 1989). However, the observed relationship between diversification and profitability was not linear, since higher unrelated diversification was associated with higher profitability. The negative relationship between related diversification and profitability also suggests that a highly complex and somewhat surprising relationship exists between diversification and performance.

The values for related diversification appeared to be low relative to the values for unrelated diversification. Unfortunately, Palepu (1985) did not provide descriptive statistics on the firms he studied as a base for comparison to our data. Consequently, we calculated the diversification measures for all companies in the line-of-business data base over the seven years of the study. We felt that this procedure offered a reasonable comparison because Palepu also used this data base. The data base means (N = 6,970 companies) were .176 for unrelated diversification, .012 for related diversification, and .188 for total diversification, compared to .600, .027, and .627 for the 96 firms in our study group. We concluded that the firms we studied were significantly more diversified than the firms in the data base but that the figures were reasonable given our selection criterion of involvement in more than one line of business; the data base includes many single-business companies. Also, Hitt, Hoskisson, Ireland, and Harrison (1991) reported an average total diversification score of 1.628 for firms that were actively engaged in acquisitions.

The two variance measures were not significantly correlated, which could indicate that the measures assessed different things. Accordingly, lines of business that were outliers on one dimension might have fit within an overall corporate focus on the other. Furthermore, the only significant relationship between the variance measures and the entropy measures was demonstrated by a coefficient of −.20 between the variance of R&D intensity and unrelated diversification.

Four of the six control variables were significantly correlated with industry-adjusted ROA. Of particular interest was a negative and significant correlation between industry-adjusted ROA and growth in sales. Further analysis revealed a very high mean and standard deviation for growth in sales, an indication that some of the firms studied were growing very fast.

[4] The only significant interaction effect was a negative interaction between the variance in capital intensity and related diversification for the complete seven-year period. However, this effect was not significant in either the early or late time period. Given the instability of the effect, we chose not to investigate it further.

TABLE 2
Means, Standard Deviations, and Correlations[a]

Variables	Means	s.d.	1	2	3	4	5	6	7	8
1. Industry-adjusted ROA	−0.03	0.11								
2. Variance of R&D intensity	0.03	0.21	−.41***							
3. Variance of capital intensity	0.06	0.33	−.03	−.01						
4. Growth in sales	0.84	3.58	−.27**	.13	−.03					
5. Leverage	0.22	0.17	−.13	.11	.01	.10				
6. Relative market share	0.28	0.27	.27**	−.16	.02	−.04	−.10			
7. Unrelated diversification	0.60	0.31	.29**	−.20*	.17	−.22*	−.03	.34***		
8. Related diversification	0.03	0.09	−.32**	.12	−.05	.03	−.13	.14	−.01	
9. Total diversification	0.63	0.32	.19	−.16	.15	−.21*	−.06	.37***	.96***	.28**

[a] All values represent averages for the period 1984–90.

* $p < .05$

** $p < .01$

*** $p < .001$

Such high rates of growth, whether through acquisitions or internal development, could have resulted in inefficiencies in some firms. In fact, some firms may have been sacrificing profits for growth. Also observed were a negative and significant relationship between related diversification and performance and a positive and significant relationship between unrelated diversification and performance.

Both the primary regression models, models 1 and 2, were found to be highly significant in explaining firm performance (Table 3). The results of model 1 support the existence of a negative relationship between the variance in R&D and industry-adjusted ROA, after growth in sales, leverage, and relative market share are controlled. These results remained more or less unchanged with each entropy measure introduced (models 1a–1c).

The analyses were also conducted with the control variables in the absence of the R&D variance measure to assess the incremental R^2 attributable to the variance in R&D intensity. The incremental R^2 was .114 ($p < .001$) for the model with no entropy measures, .101 ($p < .001$) for the model with the unrelated entropy measure included, .080 ($p < .01$) for the model with the related entropy measure included, and .111 ($p < .001$) for the model that included the total entropy measure. Consequently, we concluded that the variance in R&D intensity across the lines of business of diversified firms added a significant amount of explanatory power, even in the presence of the control variables. These results offer strong support for Hypothesis 1.

Hypothesis 2 predicts a negative relationship between variance in capital intensity and performance. The results of the second regression model failed to support any significant relationship between firm performance and variance in capital intensity. Furthermore, these results did not change when the entropy measures were added. Therefore, no support was found for Hypothesis 2.

Table 4 gives the results of tests for the effects of period (1984–86 or 1987–90) on variance in R&D intensity. Not only are the results highly significant in both periods, but the R^2 values increased in six of the eight models over values in the models' seven-year counterparts. The variance in R&D intensity coefficients is much larger in the late period, an indication that the R&D effect increased in importance. Overall, these results provide further support for Hypothesis 1.[5] It is also interesting to note that leverage,

[5] We also conducted simple tests to examine causality. To test for forward causality, we used variance in R&D intensity during the early period (1984–86) to predict later (1987–90) performance (all the control variables were consistent in time frame with the performance variable). We also used late-period variance in R&D to predict earlier performance, seeking reverse causality. All the models were highly significant ($p < .0001$), which suggests some degree of reciprocal causality—firms do it, it works, so they keep doing it. However, the highest R^2's were found in the tests of forward causality (.352 for the basic model, .368 for the model with the unrelated diversification variable as a control, .425 for the model with related diversification, and .355 in the model with total diversification). In fact, the individual significance levels for the R&D variable increased to $p < .0001$ in all these models. Therefore, we concluded that the predominant causal direction was forward.

TABLE 3
Results of Regression Analysis for Industry-adjusted ROA

Independent Variables	Industry-adjusted ROA							
	Model 1	Model 1a	Model 1b	Model 1c	Model 2	Model 2a	Model 2b	Model 2c
Intercept	−.036	−.060*	−.026	−.039	−.042	−.076**	−.029	−.052
Variance of R&D intensity	−.186***	−.177***	−.158**	−.185***				
Variance of capital intensity					−.013	−.023	−.019	−.015
Growth in sales	−.007*	−.006*	−.006*	−.007*	−.008*	−.007*	−.007**	−.007*
Leverage	−.031	−.034	−.060	−.031	−.049	−.053	−.080	−.049
Relative market share	.082*	.066	.103	.080	.103*	.077	.124**	.095*
Unrelated diversification		.046				.069		
Related diversification			−.395***				−.454***	
Total diversification				.005				.019
F	7.92***	6.72***	10.05***	6.27***	3.89**	3.83**	7.05***	3.14*
R^2	.259	.272	.358	.258	.146	.175	.281	.149
df	4,91	5,90	5,90	5,90	4,91	5,90	5,90	5,90

* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 4
Results of Regression Analysis for Two Periods, R&D Variance Only[a]

Independent Variables	Industry-adjusted ROA, 1984–86				Industry-adjusted ROA, 1987–90			
	Model 3	Model 3a	Model 3b	Model 3c	Model 4	Model 4a	Model 4b	Model 4c
Intercept	−.021	−.031*	−.018	−.017	−.010	−.046	−.001	−.029
Variance of R&D intensity	−.033***	−.032***	−.033***	−.033***	−1.020***	−.960***	−.846***	−1.003***
Growth in sales	−.003*	−.003*	−.003*	−.003*	−.008	−.008	−.007	−.008
Leverage	−.074	−.073	−.084	−.075	−.136*	−.137*	−.169**	−.134*
Relative market share	.062	.056	.074*	.064	.067	.052	.084	.058
Unrelated diversification		.018				.067		
Related diversification			−.137				−.441**	
Total diversification				−.007				.034
F	9.28***	7.41***	8.22***	7.34***	8.18***	7.29***	9.24***	6.68***
R^2	.322	.325	.348	.323	.265	.288	.339	.271
df	4,78	5,77	5,77	5,77	4,91	5,90	5,90	5,90

[a] The earlier-period models have fewer observations ($N = 83$) because 13 of the firms that qualified for the undivided group had complete data for only the last four years. All companies ($N = 96$) are included in the later models.

* $p < .05$
** $p < .01$
*** $p < .001$

which was not significant in the seven-year tests, became important in the tests of the late period, perhaps because of an increase in acquisitions by these firms and the increasing use of junk bonds and high interest rates to finance such acquisitions.

DISCUSSION

The primary purpose of the present study was to relate differences in the emphases given to two strategic resources across diversified companies' lines of business to overall corporate performance. Results offered support for the idea that consistency across businesses in the emphasis given to R&D is positively associated with corporate performance. However, there was no support for a similar conclusion with regard to capital intensity. Therefore, the results were mixed.

In spite of these mixed results, this study makes an important contribution to diversification research. In the traditional approach to diversification, firms appear to be little more than repositories for the production functions mandated by their lines of business. Accordingly, researchers can assess synergy without regard for intraorganizational structures and processes, by using straightforward processes like comparing SIC codes. We argued previously that one weakness of this approach is that it overemphasizes strategy formulation and virtually ignores strategy implementation.

In contrast, in the approach used, we treated each firm as a unique configuration of resources with the potential for achieving a sustainable competitive advantage. Accordingly, synergy can be assessed by penetrating a firm to evaluate the level of consistency arising from processes such as resource allocation. This type of consistency may result from, among other things, firm involvement in industries that have traditionally been thought to be related, but it is not limited to traditional product-market-industry boundaries. Furthermore, this more subtle measurement approach taps both implementation and execution.

The theory developed herein suggests that firms that maintain a consistent R&D strategy across lines of business may be trying to develop a corporate distinctive competence that, according to Hitt and Ireland (1985), can facilitate effective management of interdependencies among multiple units. Consistency may also be a by-product of the dominant logic of an organization (Grant, 1988; Prahalad & Bettis, 1986). For example, unit managers who have become accustomed to a particular R&D emphasis in their business strategies as they are rising through the ranks are likely to continue this R&D emphasis when they arrive at the corporate level or are transferred to other business units within a corporation.

Similarity or consistency across business segments with regard to R&D intensity could also signal a potential to exploit synergies through economies of scope or scale (Panzar & Willig, 1981; Rumelt, 1982; Teece, 1980). Resource sharing and skill transference should be easier because of similarities among the lines of business in their organizational systems (Burns &

Stalker, 1961), organizational cultures (Chatterjee et al., 1992), or business-level strategies (Fryxell, 1990; Scarpello et al., 1986).

The results contained herein were not consistent with the findings of Harrison and his colleagues (1991), who discovered that differences, not similarities, in resource allocations between acquiring and target firms led to higher post-merger performance. However, as explained earlier, performance effects associated with the bidding process in acquisitions do not necessarily apply to an established portfolio of diversified businesses. For example, Barney (1988) suggested that acquiring firms receive above-normal returns when private or uniquely valuable synergistic assets are involved. Harrison and colleagues argued that "the possibility of uniquely valuable synergy is more likely to occur under dissimilar resource allocations rather than similar resource allocations (1991: 177)." Therefore, the development of a uniquely valuable synergy associated with resource allocation differences may occur only with acquisitions, demonstrating that prescriptions regarding acquisition behavior may not be generalizable to all diversified firms. Method of diversification may be as important as type of diversification, at least in the short term. Inversely, this proposition would certainly explain why theory concerning related diversification does not necessarily hold for acquisitions (Chatterjee, 1986; Elgers & Clark, 1980).

Although this study offers strong support for the notion that consistency in R&D resource allocations across lines of business is positively related to performance, there is no support for the accompanying argument regarding capital intensity. A capital intensity–performance relationship might not occur because, now more than ever, competition requires quick mobility, the ability to enter or leave businesses rapidly as conditions change. Organizations making consistently high capital expenditures may reduce their strategic flexibility, since capital equipment is much less adaptable to new businesses than the knowledge and skills gained through R&D. Alternatively, organizations that consistently allocate small amounts of capital to their lines of business may find themselves uncompetitive because they lack necessary technologies.

Some of the relationships observed in the correlation matrix deserve further explanation. For example, unrelated diversification exhibited a strong positive relationship with performance, but a strong negative relationship was found between related diversification and performance. Furthermore, as indicated by the very small correlation between related diversification and unrelated diversification ($r = -.01$), the firms studied here did not demonstrate a pattern of pursuing related and unrelated diversification simultaneously. This fact aids interpretation of the independent effects of related and unrelated diversification on performance.

On the surface, the positive effect of unrelated diversification on performance was surprising. However, the firms studied here that had high levels of unrelated diversification had low levels of variance in R&D intensity ($r = -.20$, $p < .05$). Combining these results created a picture of efficient unrelated diversification. That is, although some firms diversified

in directions that were outside their traditional product, market, or technological boundaries, exhibiting traditional unrelated diversification, they could still be efficient by diversifying into areas with similar R&D requirements or by consistently emphasizing or deemphasizing R&D within their existing lines of business.

Hoskisson and Johnson (1992) recently demonstrated that during the 1980s, restructuring firms were predominantly organizations that originally had intermediate levels of diversification. Furthermore, they found that most of their restructuring firms were moving away from unrelated diversification. Consequently, the unrelated-diversified lines of businesses that were left would likely have been those with the most positive performance implications. Our findings suggest that higher performance would be expected if the remaining businesses shared a similar R&D emphasis.

The negative relationship between related diversification and performance was also somewhat surprising. However, related diversification was not associated with a consistent pattern of R&D allocations across lines of business. In fact, the coefficient representing this relationship, although not significant ($r = .12$, $p < .23$), was in the opposite direction. This was an important result because it demonstrated that participation in the same major industry group did not necessarily mean that two businesses shared other strategic characteristics.

Also, we defined lines of business as related only if they were in different four-digit industries within the same two-digit major group (Jacquemin & Berry, 1979; Palepu, 1985). Given this classification system, many related-diversified corporations were managing two or more related businesses as separate lines of business, as indicated by separate financial reporting. This form of organization may be inferior to combining related operations into one line of business. In other words, the negative performance effects might be associated with the way the related-diversified firms were structured.

The Resource-based View of Diversified Firms

The findings reported herein lend some support to the viability of a resource-based approach to the study of diversity (Harrison et al., 1991; Mahoney & Pandian, 1992; Wernerfelt, 1984). A key issue in determining whether a resource can generate profits is whether it is idiosyncratic (Barney, 1991; Mahoney & Pandian, 1992). From a transaction-cost-economics perspective, the question is whether the advantages related-diversified firms gain can be just as easily obtained by their competitors as they trade goods and services in an open market (Teece, 1984; Williamson, 1975). If they cannot, a market failure exists.

We suggest, as have many proponents of the resource-based view, that related-diversified firms can create idiosyncratic advantages because some of the resources they control, such as experience, are imperfectly indivisible (Caves, 1982; Prahalad & Bettis, 1986). Also, a firm's resource configuration may itself be idiosyncratic, in that competitors may not be aware of or able

to imitate the configuration, at least in the short term. In fact, the decision makers of some firms may not even be aware that their resource configurations, which may have been prompted by their dominant logics, are providing profits (Mahoney & Pandian, 1992). Causal ambiguity exists when the relationship between the resources a firm controls and the profits they create are imperfectly understood (Barney, 1991). Nevertheless, the results contained herein offer evidence that certain resource configurations do lead to higher profits, whether or not firm executives are fully aware of the reasons for the phenomenon.

Suggestions for Future Research

Future research can overcome some of the weaknesses found in this study. For example, in an effort to maintain an adequately sized study group, we limited the investigation to R&D and capital resources expenditures, which are the only two variables strategically relevant to the theory developed here on which firms publicly and routinely report information by line of business. However, marketing and advertising expenditures are other key resource allocations that may be important in the context of a resource-based theory. The use of other methods for gathering data, such as surveys, could lead to richer and more comprehensive measures of resource allocations among lines of business. Surveys might also help overcome a major weakness of this study, which is its focus on large, publicly traded firms. A question remains as to whether the results reported here are generalizable to small or privately held firms.

Also, the measures of resource configurations used in this study are coarse grained. For example, even though we discovered a relationship between variance in R&D intensity and performance, it may be more important that organizations develop idiosyncratic R&D skills within each of their highly research-intensive lines of business. In so doing, they may be able to develop tacit skills that are difficult to imitate. In fact, the coarse-grained nature of the measures may be another reason that we found no support for the capital intensity hypothesis. Future research could delve deeper into the specific manner in which resources are deployed as firms attempt to develop sustainable competitive advantages.

Another obvious extension of this research would include other indexes of performance, such as measures based on stock values. However, one of the key advantages of market measures is their assumption that the market absorbs all the strategically relevant information about a firm and adjusts the stock price accordingly (Lubatkin & Shrieves, 1986). Unfortunately, the market has sometimes been shown to be inaccurate in assessing the future value of diversification strategies (Schleifer & Vishny, 1991). In the present study, we would not have expected an accurate market assessment of the future performance of a corporation to be based on the consistency of the firm's allocations to R&D across its lines of business. In other words, causal ambiguity might have led to erroneous conclusions. Nevertheless, it might be interesting to see if the market, which represents the collective knowledge of

analysts and investors, is able to detect the performance effects of R&D consistency across lines of business.

In addition to these methodological variations on the present study, more theoretical and empirical work is needed to clarify the relationships that exist between resources, resource configurations, and profits. For example, behavioral and cognitive theory may shed light on the processes and stimuli that lead to various levels and types of resource allocations. Also, organization theory has the potential to explain the different types of structures and systems that are necessary to effectively manage business units with various R&D orientations. In addition, transaction cost economics may help explain the internal resource allocation processes that lead to various resource configurations. Finally, industrial organization economics and classical economics can provide important insights concerning the role of industry in determining a firm's most desirable resource allocation profile.

CONCLUSIONS

Researchers have already recognized a firm's level of R&D intensity as an important determinant of strategic competitiveness (e.g., Franko, 1989; Hitt, Hoskisson, & Harrison, 1991). Also, according to Hoskisson and Hitt (1988), less diversified firms are more research-intensive, and they achieve higher returns for their investments in R&D. Our results complement most earlier findings on R&D by suggesting that consistency in the R&D emphasis of an organization across lines of business is also important to obtaining high organizational performance. However, the results contained herein are not consistent with the findings of Harrison and his colleagues (1991), which implies that theory regarding diversification may not be directly generalizable to acquisitions, and vice versa.

Merging the present results with previous findings on R&D suggests that a consistently high emphasis on R&D across closely related lines of business can provide strategic advantages that are unavailable to diversified firms that do not display such consistency. Alternatively, firms that do not emphasize R&D in one line of business should consistently maintain this position across other lines of business, by, for instance, constraining diversification to industries in which high levels of R&D are not essential to success.

The resource-based measurement approach used in this study was found to be a viable method for uncovering one element of strategic consistency within diversified firms. Other elements may be accessible through similar methods, supplemented with surveys and other data.

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