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INDUSTRY VARIETY AND PERFORMANCE

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This study advances a nascent perspective in the strategic management literature: a focus on the beneficial effects of competition among firms in an industry. Such a perspective supplements the traditional view of competition as firm rivalry. The overall purpose of the study is to provide a theoretical foundation for the study of the mutual gains associated with industry competition. Because of its importance to several different organizational theories, the concept of variety is examined as a potential source of interfirm benefits. The influence of variety is observed in 12 industries, four each from the growth, mature, and decline stages of the life cycle. In each life-cycle stage, two of the industries have substantial amounts of foreign competition while the other two do not. The study's results support two broad conclusions. First, industry variety and performance are positively related, suggesting that interfirm benefits are most feasible in industries characterized by diversity among firms' competitive strategies. Second, as industries move through the life cycle, variety decreases, implying that both strategists and policymakers need to consider the impact on aggregate variety when evaluating prescriptions for the revitalization of declining industries. Implications of these findings are derived for researchers, practitioners, and policymakers.

Much of the strategic management literature has been written from the perspective of the individual firm as it competes in one or more industries (Porter, 1981). Concepts such as competitive strategy, core capability, mobility barriers, and so on help a firm decide how to maneuver within its industrial environment and achieve high performance. Theorists and practitioners alike have portrayed competition as a rivalry in which firms vie against each other by attempting to develop sustainable competitive advantages.

Viewing competition from this perspective, however, tends to obscure the *benefits* that may accrue to a firm from having competitive rivals. It is well established that the effects of a firm's strategy can extend well beyond that particular firm, influencing both the choices and outcomes of other companies (Schmalensee, 1978; Porter, 1980; Amit, Domowitz, and Fershtman, 1988). Recent theorizing, though, suggests that these effects may, in fact, be positive. For example, Miles and Snow (1986) speculated that an industry

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requires a rich mix of competitive strategies in order to grow or to maintain its long-term health.

Exploration of these issues requires an alternative perspective. The beneficial effects of a firm's actions on its competitors usually cannot be captured by the traditional zero-sum view of competition (Nielsen, 1988; Simon, 1983). Instead, a focus on mutual gain requires taking a dynamic industry-level perspective, one in which firms and industries co-evolve. At the heart of such a perspective is the concept of variety. Firms may generate and, in turn, profit from variety in their industry. If an industry is to reap the benefits of competitive strategies and actions, it will be argued below, variety is a necessary condition.

To investigate firm competition from an industry perspective, the present study uses five main ingredients. First, it relies on the concept of *strategic groups* (Hunt, 1972). Most industries are composed of several strategic groups each of which represents a different competitive strategy. Second, the study focuses heavily on the concept of *industry variety*. Variety increases as strategic groups within an industry become more numerous and diverse. Third, the study includes both domestic and global industries, thereby allowing the relationship between variety and the level of *foreign competition* to be examined. Fourth, variety is investigated in industries at different stages of the *life cycle* to see whether and how it changes as an industry evolves. Finally, the relationship between variety and *industry performance* is observed. If variety is a characteristic of high-performing industries, then it can be argued that both corporate strategies and government policies should focus on variety as a means of achieving both company and industry success.

THEORY AND HYPOTHESES

The notion that there may be beneficial effects from competition is not in itself new. For example, marketers have long held that one firm's advertising of a particular type of product or service can stimulate demand for all firms in the industry (Leone and Schultz, 1980; Thompson and Doyle, 1975). Similarly, it has been shown that having technological 'neighbors' who spend considerable amounts of money on research and development can increase the research productivity of all firms spending at least the industry average level of R&D (Jaffe, 1986). In both cases, individual firms' actions 'spillover' and help the industry as a whole.

It may also be possible for firms to benefit from the knowledge and/or abilities of other firms in an industry. Huff (1982) noted that firms may improve their strategies by borrowing from the experiences of other firms in the industry. Even in fragmented industries, collective strategies may emerge over time as experiences are shared with other firms (Dollinger, 1990). In industries characterized by emerging technologies, strategic alliances have been formed which allow firms with complementary skills to capitalize on innovations (Olleros and Macdonald, 1988). This has happened in biotechnology where newer, innovative bioengineering firms have entered into alliances with older, established pharmaceutical firms to develop genetic technologies (Fildes, 1989).

These and other studies identified specific interfirm effects of various competitive actions. However, Porter (1991) and Krugman (1990) have recently developed general frameworks of the mutual benefits firms may receive as a result of industry competition. Focusing on international trade, both authors argue that increased levels of competition serve to strengthen the network of suppliers used by the industry, improve the quality of the available labor pool, and increase the level of knowledge regarding techniques, pitfalls, and opportunities. In addition, Porter (1991) suggests that increased rivalry may act as a spur to innovation, forcing firms to improve available resources rather than resting on their laurels. Taken together, these factors are believed to give firms in a domestic industry an advantage when entering the global arena.

The idea that firms in an industry can obtain mutual benefits from competition thus appears to be gaining acceptance. What is less clear, however, is the source of these benefits and the processes by which they are obtained. The thrust of the writings by Porter (1991), Krugman (1990), and Miles and Snow (1986) appears to be that mutual gains among firms in an industry are fostered by diversity in competitive strategy. In theoretical terms, such a phenomenon can be called 'industry variety'.

INDUSTRY VARIETY

The concept of variety has played a role in theory building, either directly or indirectly, in at least four fields related to the study of organizations: cybernetics, economic theories of the firm, organizational ecology, and strategic management.

Cybernetics

Cybernetics is the theoretical study of control processes in systems. Ashby (1956), a prominent cyberneticist, developed a 'law of requisite variety' that has been widely applied. With respect to organizations, the law indicates that a firm must possess variety (i.e., potential actions) equal to or greater than the variety in its environment. If an organization has less than its requisite variety, environmental 'disturbances' and 'difficulties' will overwhelm the organization and cause it to go out of control. By extension, it could be argued that an industry (i.e., a set of firms) must possess a level of variety requisite to its environment (e.g., the domestic or global economy) or it too will experience decline.

Economic theories of the firm

Traditional microeconomic theory did not allow for variety. The theory of perfect competition, for example, treated all firms in an industry as essentially identical. Strategic choices were limited to product prices and production quantities, and moves by any given firm were rapidly responded to by competitors. Therefore, no sustainable competitive advantages based on strategic differences across firms were possible. Similarly, monopoly theory, which dealt with industries controlled by a single firm, had no need for a concept like variety.

The only area of traditional economics that permits the notion of variety is oligopoly theory. An oligopoly is a market in which a few firms supply a large number of buyers. The main feature that sets oligopoly apart from perfect competition and monopoly is that oligopolists are strategically linked to one another (Friedman, 1989). That is, the best strategy for any particular firm is dependent on the strategies being pursued by rival firms in the industry. Early oligopoly theory limited strategic choices to only a few factors, such as price or quantity, and measured them at only a single point in time. Subsequently, advances in dynamic game theory allowed for repeated choices to be made and for additional factors to be considered (e.g., advertising levels, location, market entry modes, and multiple product-market options). Nevertheless, variety, or the differentiation of firm strategies along numerous dimensions, remains 'an interesting and largely unexplored issue' (Tirole, 1989: 295).

In more recent economic theorizing, the notion of variety can be found in the area of evolutionary economics. The theory, based on Schumpeter's (1954) concepts of 'creative destruction' and 'revolutionary innovation', posits an economic system in which growth is fueled by entrepreneurs who continually search for innovations that produce excess profits. Under these conditions, variety may be a major means of generating sustainable competitive advantages within an industry. For example, Nelson and Winter (1982) described an evolutionary process in which firms, operating in a 'selection' environment, 'search' for innovations to replace their current 'routines'. Particularly important to the search process is experimentation and feedback. That is, when faced with potentially threatening problems, firms may try a variety of approaches in order to determine which new routine holds the most promise for gaining an advantage over competitors. Because firms tend to search 'locally' around their own competencies, however, a number of different 'best' solutions may be generated, some or all of which may provide benefits to the total industry. Viewing industries from an evolutionary perspective, 'one begins to get a better appreciation not only of why our current economic system is so mixed in institutional form, but why it is appropriate that this is so' (Nelson and Winter, 1982: 402).

Organizational ecology

The concept of variety is perhaps most prominent in ecological studies of organizations. Ecologists have investigated firm behavior in widely different settings, including newspaper and book publishing, brewing, music recording, restaurants, semiconductors, labor unions, trade associations, and voluntary service agencies (Aldrich and Staber, 1988; Carroll, 1984; Freeman and Boeker, 1984; Hannan and Freeman, 1977; Tucker, Singh,

and Meinhard, 1990). In every instance they have found variation, usually described as different types of 'specialist' or 'generalist' firms (Brittain and Freeman, 1980). Further, ecologists have noted that firms pursuing different strategies within the same industry may nevertheless be connected:

> Generalism and specialism not only coexist, but are fundamentally interrelated. In particular, the success of generalism creates the conditions for the success of specialism. By attempting to secure large market shares through universalistic appeals to all potential customers, generalists avoid making extended particularistic appeals to special groups of customers (the more special appeals made, the less is the general appeal). The net result of these dynamics is that markets highly concentrated by one or several generalists leave open many small, specialized pockets of consumers. These pockets are where specialists pop up and thrive. (Carroll, 1984: 122–23)

Various systems and environments have been observed, including organizations (specialist and generalist), populations of organizations, industries (or parts of industries), and geographic areas. However, except for some general references to the benefits of variety, such as a hedge against future uncertain environmental changes (Hannan and Freeman, 1989: 8), ecologists have not specified the benefits that accrue to firms from being in an industry containing diverse firm strategies. Nevertheless, the number and diversity of firms within a population is an important component of ecological analysis (Zammuto, 1988).

Strategic management

The concept of variety appears in the strategic management literature at several levels of analysis. For example, based on the law of requisite variety (Ashby, 1956), it has been argued that a firm should develop a set of possible actions that is greater than the complexity of the environment it may face in the future. 'Strategy is not choosing what to do, but choosing what it will be possible to do' (Burton, 1984: 95). Thus, strategic planning should focus, at least partially, on creating excess capacity in the firm's stock of adaptive behaviors.

In a similar manner, it has been argued that variety among members of a top management team is a necessary condition for the success of a diversified firm. For example, the team must develop a level of cognitive complexity that matches the strategic variety of the firm's business portfolio. If top management's mind-set or 'dominant logic' is restricted to a few core businesses, then performance may deteriorate as the firm diversifies into new areas (Prahalad and Bettis, 1986).

Last, variety has been observed within entire industries, usually under the rubric of 'strategic groups' research. A comprehensive review of the empirical literature on strategic groups, covering widely different industries such as air transportation, brewing, investment banking, and office equipment, concluded that no industry is homogeneous (Thomas and Venkatraman, 1988). However, the same review noted that it is not enough simply to note the presence of variety. To be useful theoretically, variety must be related to other important variables to determine its causes and effects.

Summary

From a theory-building perspective, variety appears to be a concept of central importance. It can be found in several literatures, and it has been examined at different levels of analysis. Yet, with the possible exception of ecological analysis, variety has not been used in a systematic way to explain firm behavior and performance. It is our belief that useful industry-level theory can be developed by defining variety as the number and diversity of competitors in an industry and then examining its relationship with industry performance as well as key contingency variables.

INDUSTRY PERFORMANCE

Although some specific interfirm benefits have been attributed to variety (Dollinger, 1990; Hanssens and Johansson, 1991; Huff, 1982; Jaffe, 1986; Porter, 1985; Thompson and Doyle, 1975), it is not clear if or how variety is related to overall industry performance. However, previous organization theory and research suggest that there is a positive relationship. For example, the cybernetics literature implies that at least some variety is necessary for an industry to meet the demands of the environment (Ashby, 1956).

Similarly, evolutionary economists argue that greater variety in an industry increases the likelihood that appropriate firm responses are available to meet changing industry conditions (Nelson and Winter, 1982). It has also been claimed that, because of their differential ability in product and process innovation, an industry is healthier when both small and large firms are present (Rothwell, 1983). Finally, research on 'economic space' suggests that variety among firm strategies is more likely to meet consumer demand and to maximize consumer satisfaction (Greenhut, 1970). This in turn should lead to increased overall returns for the industry. Taken together, these various perspectives suggest the following hypothesis:

Hypothesis 1: There will be a positive association between industry variety and performance.

CONTINGENCY VARIABLES: FOREIGN COMPETITION AND LIFE CYCLE STAGE

All industries do not necessarily need the same amount of variety, nor is a given industry likely to experience the same variety of firm strategies over time. While maintaining some minimal level of variety may be necessary for industry health, a number of factors presumably could affect the amount of variety found in any particular industry. Of all the factors that could affect variety, two that appear to have the most potential impact are (a) stage in the industry life cycle and (b) level of foreign competition.

Although industry evolution is continually occurring in nearly every business, there is no one way in which industries evolve (Porter, 1980). However, most industries that reach significant stature do in fact begin small, experience growth, and eventually mature. Therefore, the familiar product life cycle concept (Rink and Swan, 1979)—which divides the process of development into phases such as introductory, growth, mature, and decline—remains the best overall means of characterizing the evolution of an industry. As an industry evolves, the aggregate focus of all firms tends to shift from product to process. Consequently, strategies in new and growth industries may revolve around such diverse areas as product design, market research, advertising, and the like. In mature industries, strategies are more likely to emanate from narrower concerns about production efficiency, plant design, and so on. Thus, life cycle stage may negatively affect the amount of strategic variety found in an industry:

Hypothesis 2: There will be an inverse relationship between industry variety and stage of industry life cycle.

A second factor likely to affect most industries is the amount of foreign competition they face. While the exact direction of its influence is more difficult to predict than are the effects of the life cycle, one possible outcome of increased foreign competition is a decrease in the variety of strategies being pursued. Two different theoretical rationales can be cited for this expectation. First, research on threat-response rigidity has shown that a common response to threat is a restriction of the options considered and heavy reliance on traditional methods (Staw, Sandelands, and Dutton, 1981). If foreign competition is seen as a threat, then it may evoke a similar response from firms in an industry. That is, individual firms may react to the threat with increased rigidity and less experimentation. As a group, firms may respond by reducing intragroup competition and presenting a common front to the foreign 'enemy' (Sherif and Sherif, 1966). In both cases, the result would be a net decrease in the variety of strategies being pursued.

Another rationale for the prediction that foreign competition reduces variety comes from research on the competitive advantage of nations (Porter, 1990). Particular nations, due to their resource base, demand conditions, government policies, and so on, may be able to support certain types of competitive strategies but not others. If true, firms competing globally should, over time, become focused on those strategies best supported by their home-country conditions. This would most likely lead to a decrease in the variety of strategies being pursued in those industries substantially affected by foreign competition. Thus, the final hypothesis is:

Hypothesis 3: There will be an inverse relationship between industry variety and level of foreign competition.

METHOD

Industry and firm sample

To examine these hypotheses, a sample of 12 industries was selected for study. The choice of industries was guided by several criteria. First, it was necessary to include industries in the growth, mature, and decline stages of the life cycle. (Required data were not available for new industries.) Second, half of the chosen industries had substantial amounts of foreign competition, while the other half did not. Third, in order to generate meaningful strategic groups, industries were chosen such that they were the principal source of revenue for the majority of firms competing in them. Last, in order to enhance the generalizability of the study's findings, industries whose products were well known and widely used were chosen. The sample of industries is shown in Table 1.

Industries were selected according to 4-digit SIC codes as reported in *U.S. Industrial Outlook*, and data were collected for the period 1982–87. This time frame was used because it allowed for full availability of data, was long enough to determine trends clearly, and encompassed both recessionary and growth years. Growth industries were defined as those with average annual sales increases (in constant 1982 dollars) above 10 percent over the 6-year period, mature industries as those with sales increases of 1–10 percent, and declining industries as those with negative sales increases. The amount of foreign competition in an industry was defined by the ratio of imports to total new shipments (domestic and foreign), and was considered to be substantial if greater than 10 percent. Industries with import ratios below 10 percent were considered to be low in foreign competition.

After selecting industries, a search was undertaken to identify those firms that accounted for at least the top 70 percent of industry sales. This cutoff figure was chosen after reviewing the data. It was necessary to account for this much market share to insure that all major competitors were included in the data set. To account for much more market share would have required, in some industries, adding large numbers of minor competitors. *Dun's Business Rankings*, which lists firms in order of sales based on their 4-digit SIC code, was used to create an initial list of firms for each industry. Because of variation in reported SIC codes, however, this list was verified and adjusted using information from *Value Line, Standard and Poors Industry Reports, Wards Million Dollar Directory*, and *Compact Disclosure*. Thus, to the fullest possible extent, firm samples for each industry were constructed such that major participants were represented.

Measures

Industry variety

Although, as indicated earlier, variety is an important concept in several research fields, no agreed upon measure of this construct has emerged in the organizational literature. After exploring several different measurement approaches, three related indicators of industry

Table 1. Industry sample, by stage of life cycle and amount of foreign competition

Foreign competition	Life cycle stage: Growth	Maturity	Decline
Low	Computers	Major home appliances	Mobile homes
	Biological products	Pharmaceuticals	Cigarette manufacturers
High	Semiconductors	Tires and tubes	Farm machinery and equipment
	Consumer electronics	Commercial paper mills	Basic steel producers

variety were created using cluster analysis and strategic groups. These particular measures were employed because they provided the most accurate depiction of both the amount and form of variety existing in an industry.

The first step in the development of these measures was identification of the strategic groups among which industry variety could be measured. Following previous research (Harrigan, 1985; Lawless, Bergh, and Wilsted, 1989; Lewis and Thomas, 1990), cluster analysis was used to identify strategic groups. To make sure that the clustering was meaningful theoretically, a balance had to be struck between having too few or too many variables with which to calculate the clusters (Hatten and Hatten, 1987). Therefore, the process began with the construction of a comprehensive list of firm-level characteristics that encompassed the concept of strategy yet were not idiosyncratic to any one industry. This list was based on Khandwalla's (1981) typology of key competitive factors: production, marketing, and research and development. Though comprehensive, the original set of variables was too large to be useful in interpreting the cluster analysis. By pretesting the variables on a separate sample of firms, the list was reduced to those variables that (a) represented each key competitive factor and (b) clearly discriminated between strategic groups. Thus, the production factor was measured by the level of capital intensity in each industry (dollar value of plant, property, and equipment per employee). The marketing factor was the ratio of advertising to sales. The ratio of R&D to sales was the measure of research and development intensity.

The data for these measures came from the COMPUSTAT tapes covering the period 1983–87. To provide the best estimate of the long-term competitive strategies of the sample firms, the average for each measure over the time period was calculated. This time frame, which is a year shorter than the period used to measure industry growth, was chosen to insure that strategic choices made during the period were reflected in the accounting data used to measure strategy.

After the three competition variables were calculated, cluster analysis was performed using Ward's minimum variance method (Punj and Stewart, 1983). A sequential approach was used to make the final cluster determinations. First, the tree diagrams provided by the statistical program were examined, as were the incremental increases in explained variance that different cluster combinations provided. Then the final specification of strategic groups was made after it was determined that all identified clusters within an industry were significantly different from each other on at least one of the three competition variables.

After identifying strategic groups, the next step in the process was to construct the actual measures of industry variety. The size of the industry sample constrained the analysis to nonparametric measures. Following Conover (1980), measures were based on rank orderings. Conover argued that analyses based on ranks (or rank transformations) are most appropriate when the distribution of a sample is not assumed to be normal and/or the numbers assigned to observations have little meaning in themselves, but the order within the distribution is important. In this study, normality could not be assumed with a sample of 12 industries. The values of the three competition variables were meaningful but only as a means to the end of estimating industry variety. Further, since there is no absolute standard of industry variety, it is the relative position of industries that is of interest. For these reasons, the three measures of industry variety were created either by ranking the industries in various ways or by calculating variety scores and converting those scores to ranks.

The first variety measure was based on the spatial plots of the clusters for each industry. The plots were used to qualitatively rank each of the 12 industries from the lowest to the highest level of variety. The initial comparison was based on the number of identified clusters because of the belief that an industry with more strategic groups has more variety. For industries with equal numbers of groups, additional comparisons were made based on differences between the groups along the three competitive strategy dimensions. For each industry, an estimate was made (through visual inspection of the cluster plots) of the distances between groups on these dimensions. Greater spatial differentiation across the three variables was considered to be indicative of greater variety. This process was repeated until industries were ranked from lowest to highest variety. Figure 1 provides the spatial plots of each industry's cluster analysis.

The second measure of industry variety was quantitatively based. To construct this measure, means were calculated for each strategic group on each variable. These scores were then standardized by converting them to Z scores. Next, within each industry, comparisons were made of the mean value for each cluster to every other cluster on all three competition variables to generate an aggregate variety score. The absolute values of these variables were then added for the final measure of industry variety. An example should help to clarify this procedure. With regard to the capital intensity variable for the biological products industry, the mean standardized scores for each of the three strategic groups were:

Cluster A	*Cluster B*	*Cluster C*
− 0.17	− 0.24	1.15

Comparing A to B yields an absolute difference of 0.07, comparing A to C yields a difference score of 1.32, and comparing B to C yields a score of 1.39. The addition of these three values results in a capital intensity variety score of 2.78 for the biological products industry. This procedure was repeated for the other two competition variables, and the three sums were added to arrive at a total variety score for the industry. Once calculated, variety scores for all 12 industries were converted to ranks for the reasons described above.

The third industry variety measure was created to counterbalance the potential biasing effects of the second measure. In particular, some of the clusters had extreme mean values for some of the variables. Because these extreme values could unduly influence the final variety scores, a procedure was devised to reduce the influence of these outliers. First, rather than standardizing the mean scores, a natural log transformation was performed on them. This transformation is appropriate when a distribution has extreme outliers on the ends of the distribution (Tukey, 1977). The natural log transformation 'brings in' the extreme tails but still preserves the basic order of the distribution. Its main limitations are: (a) it inflates fractional values less than one and (b) the value of zero is undefined. Since both zero and fractional values occurred in the data set, a constant value of one was added to each cluster's mean score prior to doing the log transformation.

Second, to reduce the possibility that variation on a single variable would inflate the variety score, this procedure did not involve adding the scores from the three competition variables as was done when constructing the second measure. Rather, after summing scores within each variable (see the discussion of the second measure), all of the industries were ranked on each variable. Each industry's rankings on the three variables were then averaged, and these mean scores were rank ordered to define the third measure of industry variety.

Table 2 lists each industry's ranking on the three variety measures. As can be seen, there was a great deal of overlap among the measures. Because the three variety measures were so highly correlated (all ≥ 0.89, $p < 0.001$), the average of each industry's ranks was used in all subsequent analyses.

Industry performance

Data from the period 1984–87 (a period 1 year shorter than the time frame used to calculate industry variety) were used to calculate the measures of industry performance. The shorter period was chosen because of the assumption that there would be a lag between firms' strategic choices and the industry's performance outcomes. To be consistent with past research, both accounting and market-based measures of performance were used (Chakravarthy, 1986; Keats, 1988; Venkatraman and Ramanujam, 1986). The accounting-based measure was a 4-year average of return on investment (ROI). The market-based measure was the percent change in stock price (adjusted for stock splits and new issues) over the time period. To calculate industry performance, the values of these two variables for the individual firms in each industry were aggregated (Bain, 1968; Scherer, 1990). These data were then converted to ranks for the reasons indicated earlier.

RESULTS

Industry variety and performance

Table 3 presents three sets of results for all 12 industries: (a) industry performance over the 4-year period, (b) industry performance rankings, and (c) industry variety rankings based on an

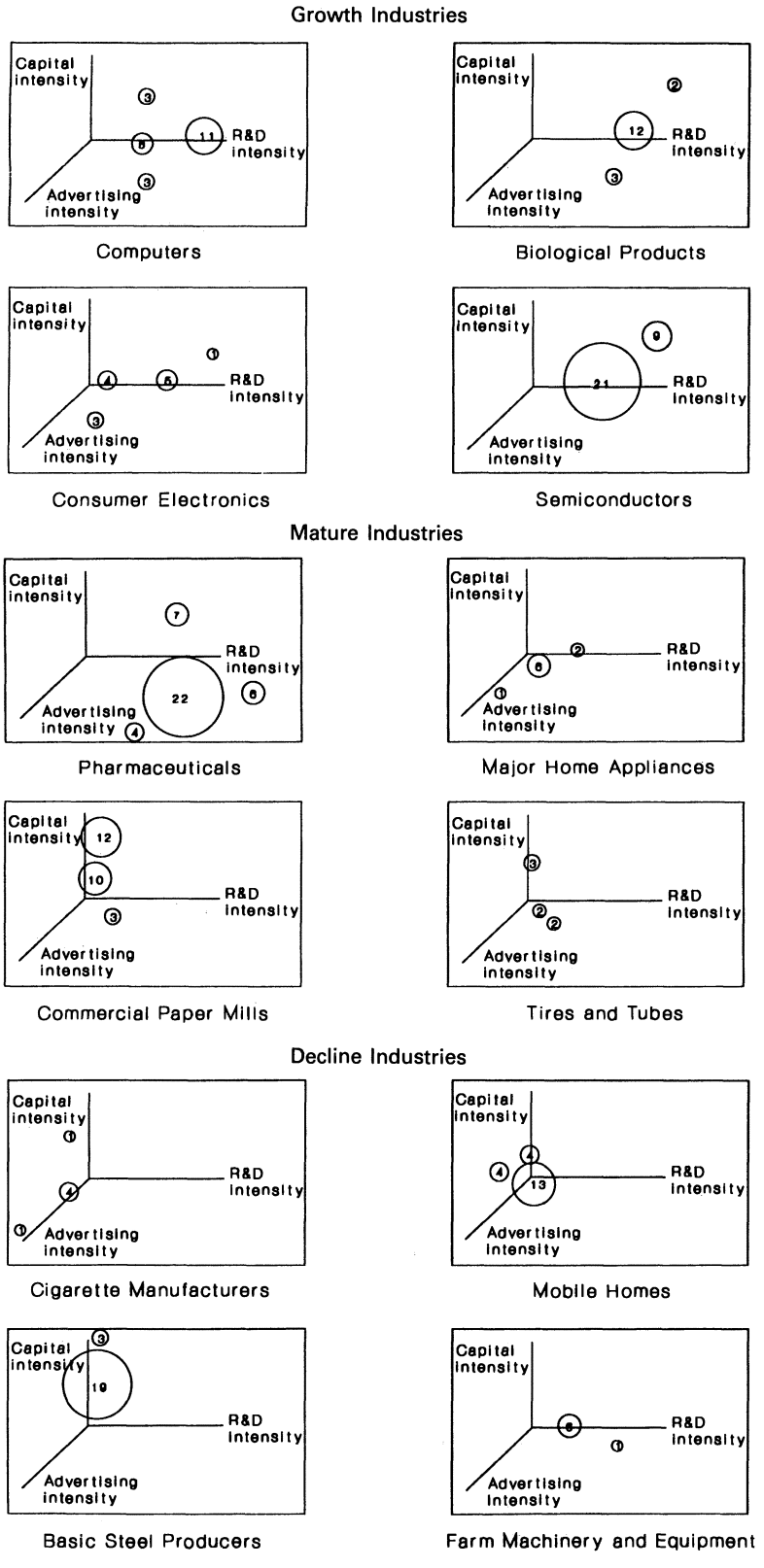

Figure 1. Cluster analysis results.
Note: The numbers shown inside the circles refer to the number of firms in that strategic group.

Table 2. Variety rankings, by industry and stage of life cycle

	Measure 1	Measure 2	Measure 3
GROWTH INDUSTRIES:			
Computers	2	3	2
Biological products	4	2	4
Consumer electronics	3	5	3
Semiconductors	9	11	8
MATURE INDUSTRIES:			
Pharmaceuticals	1	1	1
Major home appliances	6	4	6
Commercial paper mills	7	6	5
Tires and tubes	8	9	9
DECLINE INDUSTRIES:			
Cigarette manufacturers	5	7	7
Mobile homes	10	10	12
Basic steel producers	11	8	10
Farm machinery and equipment	12	12	11

Note: 1 = most variety, 12 = least variety.

average of the three measures. The first hypothesis, which predicted a positive relationship between industry variety and performance, was tested using Spearman's rho correlation. The correlation between industry variety and ROI was $r = 0.54$ ($p < 0.07$), and the correlation between variety and stock price change was $r = 0.59$ ($p < 0.05$). These correlations generally provided support for the assertion that the entire industry benefits when firms pursue a variety of competitive strategies.

Industry variety and life cycle stage

The rankings in Table 3 also offer support for the second hypothesis. That hypothesis predicted that industries in the earlier stages of the life cycle would show greater variety than those in the later stages, and this was the case for the present sample. Among growth industries, a diverse assortment of strategies was evident with computers, consumer electronics, and biological products ranked second, third, and fourth in overall variety. Even though semiconductors ranked ninth, the growth stage still had the highest variety ranking (4.5 compared to 5.0 for the mature stage and 10.0 for the decline stage).

In the mature stage, major home appliances, commercial paper mills, and tires and tubes were ranked in the middle of the distribution (fifth, sixth, and eighth, respectively). Here again there was an outlier, with pharmaceuticals ranked as having the most variety. Even with this outlier, the mature stage of the life cycle showed less variety than the growth stage. Last, for decline-stage industries, the highest ranking was seventh (cigarette manufacturers), while basic steel producers, mobile homes, and farm machinery and equipment were ranked tenth, eleventh, and twelfth, respectively (an average ranking of 10.0). Thus, variety markedly decreased as industries moved from maturity to decline.

The same pattern of variety emerged after examining the standard deviations of the average industry ranks within each life cycle stage. The standard deviation for growth industries was 3.1; for the mature stage, it was 2.9, and for the decline stage, it was 2.2. In effect, the standard deviations indicated that there was a greater dispersion of variety scores among growth industries than among decline industries, with mature industries falling in between. Therefore, both the average rankings and the standard deviations indicated that variety decreases as industries move through the life cycle.

Industry variety and level of foreign competition

Hypothesis 3 predicted that amount of foreign competition would be inversely related to industry

Table 3. Industry performance and variety, by stage of life cycle

	Industry performance[a]		Performance rank[b]		Industry variety rank[c]
	Change in stock price (1984 vs. 1987)	Average ROI (1984–87)	Change in stock price	Average ROI	
GROWTH INDUSTRIES:					
Computers	74.5 (8.8)	10.7 (8.8)	5	3	2
Biological products	51.9 (145.0)	−17.6 (36.5)	6	12	3
Consumer electronics	38.8 (146.0)	1.4 (18.3)	8	7	4
Semiconductors	−8.3 (91.0)	0.4 (16.8)	11	8	9
MATURE INDUSTRIES:					
Pharmaceuticals	97.4 (114.0)	16.9 (21.2)	1	1	1
Major home appliances	13.3 (52.0)	10.2 (8.2)	9	4	5
Commercial paper mills	89.7 (67.0)	8.6 (3.6)	2	6	6
Tires and tubes	84.2 (53.0)	9.0 (11.0)	3	5	8
DECLINE INDUSTRIES:					
Cigarette manufacturers	76.6 (34.0)	14.8 (6.2)	4	2	7
Mobile homes	−16.9 (115.0)	−0.8 (13.4)	12	9	11
Basic steel producers	47.5 (116.0)	−1.9 (14.0)	7	10	10
Farm machinery and equipment	5.8 (104.0)	−4.6 (18.1)	10	11	12

[a] Listed are means (in percentages) and standard deviations (in parentheses).
[b] 1 = highest performance, 12 = lowest performance.
[c] 1 = most variety, 12 = least variety.

variety. To test this hypothesis, a Spearman rank order correlation was calculated between each industry's rank on variety and its rank on level of foreign competition. This analysis yielded a correlation of $r = 0.40$ (ns). Although the correlation was in the predicted direction, suggesting that more foreign competition was associated with less strategic variety in an industry, the test did not reach the conventional significance level. Therefore, Hypothesis 3 was not supported.

Further analysis of several industries in the sample, using historical accounts (Dertouzos, Lester, and Solow, 1989), indicated that the relationship between industry variety and foreign competition was too complex to be captured by a general hypothesis. For example, in the consumer electronics industry, many American firms quickly exited when faced with foreign (mostly Japanese) competition. As a result, both the number and diversity of American firms in the industry decreased, but some if not all of their strategic roles were taken over by Japanese (and later Korean) companies. In steel, the American firms that chose to remain in the industry were forced into specialty markets. Here the number of American firms declined somewhat, while strategic diversity across the industry appeared to remain largely unchanged.

Finally, in computers, American firms reacted strongly to the perceived threat of foreign competition. These firms were large, well-financed, and run by managers who took a global view of competition. Consequently, the number of American firms in the industry remained essentially stable, and the diversity of strategies across all domestic and foreign firms actually may have increased.

In sum, the introduction of foreign competitors to an industry affected both the number and diversity of domestic firms, thus altering industry variety. However, industries responded to foreign competition in different ways; there did not appear to be a dominant pattern.

DISCUSSION AND IMPLICATIONS

This study explored the general proposition that an industry might benefit from the presence of strategic variety among competing firms, a previously underdeveloped perspective in the strategic management literature. In doing so, the study introduced new concepts and measures. Any conclusions drawn from it must therefore be considered as speculative. However, based on the above results, three general observations can be made. First, the positive relationship found between industry variety and performance suggests that variety is an important concept for the analysis of competitive dynamics among firms in an industry. Lack of variety means not only that more head-to-head competition will be present in the industry but also that there will be less opportunity for firms to learn—that is, to directly or indirectly benefit from the diverse experiences of other firms. By maintaining variety, the industry as a whole is more likely to be aware of changing conditions and to have appropriate responses available.

Second, the finding that variety decreases over the course of the life cycle, particularly when combined with the finding regarding variety and performance, provides a rationale for the poor performance of many declining industries. As variety diminishes over time, the industry may find that it is no longer able to adapt to environmental fluctuations, and performance suffers as a result. Of course, this causal explanation can also be reversed. That is, industry decline may be due to other factors, such as changes in technologies or consumer tastes, which in turn drive firms from the industry and result in less variety. Whatever the cause, the lack of variety is likely to mean that these industries will have a difficult time finding appropriate responses to their decline without outside help (Dowdy and Nikolchev, 1986).

Finally, the mixed results regarding variety and foreign competition suggest that there is no simple relationship between these two variables. Different industries respond in different ways to foreign competition, and the ultimate impact on variety may be quite complex. For example, if the foreign competitors entering a domestic industry are themselves diverse in their strategies, then total industry variety, viewed on a global basis, should at least stay the same and may even increase. On the other hand, if entrants are simply taking advantage of home-country conditions to compete on the basis of lower costs, then overall industry variety may decrease. Before more useful hypotheses involving foreign competition and variety can be generated and tested, further conceptual work is needed regarding globalization and its effects on company strategies and the composition of industries.

Taken together, these general findings have several important implications for strategic management theory and practice as well as for public policy.

Theory

In this study, industry variety was defined as strategic diversity among competitors and was measured by production, marketing, and research and development characteristics. This approach yielded the 'raw' or 'sheer' strategic variety of each industry. However, now that the importance of variety has been demonstrated, future research should be aimed at refining this concept.

First, rather than looking only at sheer variety, the notion of 'ideal' variety should be explored. It is possible that there is a specific mix of competitive strategies that will allow an industry to reach its highest level of performance. The present findings suggest that ideal variety may vary according to the stage of industry evolution.

Second, in addition to strategic variety, other forms of industry variety could be studied. In some industries, for example, variety in process technology may be particularly important to

overall industry performance. In other industries, a variety of marketing and distribution approaches may contribute most to industry success.

A third area of exploration lies in determining whether there is a minimum or maximum level of variety necessary for reaping performance benefits. In this study, industry variety and performance were positively and linearly associated. However, it was not possible to determine when the benefits of variety began or whether these benefits extended indefinitely. It is possible, for example, that there is a U-shaped relationship between industry variety and performance, whereby performance increases with variety up to some level, then drops off if variety is increased. A large industry sample would be required to test the 'excess' variety hypothesis.

A final area for further development concerns theory building. Given that variety is positively related to performance, the notion of variety may provide an avenue for the exploration of what we choose to call industry 'synergy'. The concept of industry synergy supplements the traditional idea of competition as rivalry and can be defined as the benefits that accrue to firms, either intentionally or unintentionally, as a result of actions taken independently or jointly by competitors. Variety among firm strategies may be the means of stimulating these industry-level synergies. However, whether it is a necessary condition or simply a sufficient one remains to be determined. More detailed research, especially that which takes a longitudinal perspective to analyze how variety is generated and how interfirm benefits are realized, would be useful in exploring the industry synergy concept.

Public Policy

This study's findings have direct implications for policymakers. Because of the positive relationship between industry variety and performance, U.S. industrial 'policy' should encourage the creation and maintenance of a variety of competitive strategies across all industries. This means not only encouraging increased innovation and differentiation in mature and declining industries but also helping at least some firms in new and growing industries to focus on efficiency-based strategies. Such a policy might have helped small U.S. semiconductor firms develop large-scale manufacturing ability rather than having this expertise gradually shift to the Japanese (Dertouzos *et al.*, 1989). It would also be in line with recent calls for government assistance in promoting industrial learning and the diffusion of new technologies ('Industrial Policy', 1992).

Moreover, the positive relationship between industry variety and performance suggests that variety may help to determine where antitrust laws should be enforced. Although overall competition should be encourged in all industries, it must be realized that not all interfirm collaboration is anticompetitive. To the degree that company interactions add to an industry's variety, the beneficial impact of collaboration is likely to extend beyond the particular firms involved. Thus, in judging the potential outcomes of mergers, acquisitions, and especially joint ventures, the effect on industry variety levels becomes an important policy consideration.

Practice

Finally, these findings have implications for strategists at both the corporate and business level. For example, when considering the choice of industries to compete in, corporate planners may make better decisions by incorporating the concept of industry variety into their analyses. Appraising the level of variety in an industry should provide some indication of the future overall health of the industry. Further, an understanding of variety may lead to better choices about which industries to enter in the hope of obtaining interfirm benefits. To the extent that an industry is lacking in areas where the focal firm is strong, entry into the industry should benefit the firm directly, due to differentiation, as well as indirectly due to a positive impact on overall industry performance because of added variety.

At the business level, it may also behoove managers to consider the nature of industry variety when formulating specific action plans. For example, managers who are considering a strategic alliance of some kind should forecast the impact of the alliance on the aggregate variety in the industry. Variety-adding alliances may increase total industry performance as well as produce direct benefits for the allying firms or business units. Also, business-level managers must be careful about pursuing 'me-too' strategies. This study's findings indicate that industries

are better off in the aggregate when firms try different approaches.

CONCLUSIONS

The ultimate purpose of the strategic management literature is to help firms improve their performance. This study contributes to this objective in two main ways. First, it takes an industry-level perspective. Industries are the basic building blocks of the total economy, so it is obviously important to keep them as healthy as possible. If firms lose sight of industry health during their battles with competitive rivals, then both they and the economy may suffer. By urging researchers to search for mutual gains among firms in an industry, this study emphasizes the importance of the industry perspective.

Second, this study describes a promising avenue for future theory building: uncovering relationships between industry variety and synergy. Variety is related to industry performance and may be the basis upon which interfirm synergies can be constructed. Therefore, further examination of the variety and synergy concepts potentially has both theoretical and practical value.

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