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A Multivariate Model and Analysis of Competitive Strategy in the U.S. Hardwood Lumber Industry

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ABSTRACT. Business-level competitive strategy businessin the hardwood lumber industry was modeled through the identification of strategic groups among large U.S. hardwood lumber producers. Strategy was operationalized using a measure based on the variables developed by Dess and Davis (1984). Factor and cluster analyses were used to define strategic groups along the dimensions of *cost leadership*, *focus*, and *differentiation*. A five strategic group model was identified and examined for strategic orientation and intragroup homogeneity. Two groups had no distinctive strategic orientation that suggested a competitive advantage; one group exhibited an overall cost leadership strategy; one exhibited a differentiation strategy; and one group exhibited a dual overall cost leadership/differentiation strategy. Strategic change in the industry was predicted to be primarily toward increased differentiation. Three strategic groups indicated significant change in this direction, and one group indicated an increase along both the *focus* and *differentiation* dimensions. FOR. SCI. 37(2):481-499.
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THE STRATEGIC GROUP CONSTRUCT is a relatively new and useful tool for modeling and analyzing industries (Porter 1980, McGee and Thomas 1986). The underlying premise of the construct is that companies within an industry are not necessarily homogeneous, but neither are all companies unique. Instead, groups of similar companies can be defined such that the groups are, in general, homogeneous within and heterogeneous between. Differences between groups of firms are thought to be the result of deliberate strategic decisions and thus reflect differences in strategic orientation (McGee and Thomas 1986). Strategic groups in this context can be defined as groups of companies that follow similar competitive strategies (Harrigan 1985a).

The strategic group construct provides an important intermediate level for industry analyses (Porter 1980). Studies of an industry as a whole may miss important intraindustry strategic differences, and company-level analyses may not generalize to the industry level (Harrigan 1983, Hatten and Hatten 1987).

The importance of the strategic group construct lies, primarily, in the relationship of strategic groups to industry competition and performance. McGee and Thomas (1986 p. 142) state that strategic groups, if they exist within an industry, ". . . clearly have implications for the patterns of competition." The complexity of the strategic group structure within an industry has a significant influence on economic performance (Newman 1978) and has been positively correlated with

industry competitiveness (Harrigan 1980, O'Laughlin and Ellefson 1981c, Hergert 1987). Strategic groups may also differ in their response to market opportunities and threats (Thomas and Venkatraman 1988) and in their profit potential (Porter 1980). These relationships clearly suggest that the investigation of strategic groups within an industry can provide important and useful information.

This paper reports the findings of a study that sought to improve understanding of the U.S. hardwood lumber industry through the modeling of competitive strategy among large hardwood lumber producers. Strategic groupings were used as the basis of this model and as a framework for the prediction of strategic change within the industry.

Hardwood lumber producers constitute an important segment of U.S. wood-based industries. Luppold and Dempsey (1989) estimate that hardwood lumber accounts for approximately one-third of the value of domestically produced lumber—both hardwood and softwood. The industry's importance is also suggested by its employment of approximately 21,200 workers (USDC-BOC 1985) and its position as supplier to high value-added industries such as household furniture and cabinets.

Previous studies have investigated several aspects of the U.S. hardwood lumber industry. Examples include: Luppold (1984), Abt (1987), Greber and White (1982), and Buongiorno and Lu (1989). Luppold (1984) identified factors affecting market growth and prices. Abt (1987) investigated factor demand using data for Appalachian hardwood lumber companies. Greber and White (1982) and Buongiorno and Lu (1989) examined productivity in wood products industries, including hardwood lumber.

Many previous studies are limited, however, in that they implicitly treat the industry as homogeneous. This assumption, while often necessary, may be inaccurate. Company-specific resources and goals can result in differences in responses to exogenous factors and in company strategy. Strategic group analysis addresses this latter difference and is the focus of this paper. Such analysis can aid in understanding the industry and facilitate predictions of future industry changes. In addition, empirical analysis of strategic groups aids in deterrnining the applicability of theoretical strategic typologies[1] to the industry.

THEORY AND PREVIOUS RESEARCH

THE STRATEGY CONSTRUCT

Strategies can be conceptually classified along two dimensions. The first of these dimensions involves the corporate-level/business-level dichotomy. Business-level refers to that level in an organization at which strategy for a single industry or product market is determined (Hofer 1975). In contrast, corporate-level refers to the top level of an organization, regardless of its size, and is concerned with the configuration, management, organization, and financial transactions of business units which typically operate in several industries (Patel and Younger 1978).

[1]Strategic topologies are classification systems that seek to simplify the concept of strategy to a small set of generic strategies—strategies that apply generally regardless of industry, organization type, or size (Herbert and Deresky 1987). Examples include the topologies proposed by Porter (1980), Day (1984), and Chrisman et al. (1988).

Business-level strategy can be further classified along the second dimension—strategic focus. Business-level strategies are comprised of investment, political, and competitive substrategies (Hofer and Schendel 1978) each of which represents an area of strategic focus. Investment substrategies address the question of optimum allocation of limited (primarily financial) resources, while political substrategies are concerned with the firm's interactions with external groups. Business-level competitive substrategies (the focus of this research) address the problem of achieving and maintaining a competitive advantage within an industry or product market (Porter 1980, Day 1984, Patel and Younger 1978).

Strategy Research in Wood-Based Industries

Several studies have investigated business- or corporate-level strategy within wood-based industries. Rich (1986) studied the corporate-level intended competitive strategies of large wood-based corporations. The sample included 42 of the largest U.S. corporations whose primary business was either fiber- or wood-based products. Corporations were classified as using one or a combination of Porter's (1980) generic strategy types (overall cost leadership, differentiation, or focus).[2] Rather than infer overall corporate strategy from measurements of various strategic dimensions, Rich had respondents indicate directly which generic strategy type their company employed.

In general, Rich (1986) found that the majority of firms reported utilizing an overall cost leadership strategy. However, there was a trend toward the use of differentiation and focus strategies when compared to the results of a similar study covering the 1976-1979 period (Rich 1979). Firms utilizing differentiation and focus strategies were also found to be more profitable during 1984 than firms utilizing an overall cost leadership strategy.

In their three-article series, O'Laughlin and Ellefson (1981 a,b,c) examined the structure of a multi-industry group of firms that included manufacturers of lumber and lumber products (primarily softwood), paper and pulp products, and wood household furniture. The sample consisted of the 40 largest (by 1978 sales revenue) firms in this multi-industry group.

The third of O'Laughlin and Ellefson's articles (1981c) examined strategic groups within their sample. Firms were empirically classified into four strategic groups based on 1978 sales rank and apparent diversification strategy. O'Laughlin and Ellefson (1981c) concluded that competition in an industry increases with increased strategic group complexity (i. e., the number of significant strategic groups).

A more recent two-article series by Cleaves and O'Laughlin (1986a,b) examined realized business-level strategy within a sample consisting of 24 southern pine plywood producers. Fourteen variables were measured for each of the 24 companies, and a hierarchical clustering algorithm was used to define five stra-

[2] Porter (1980) defines the strategies as follows: overall cost leadership requires that the firm seek to become the industry's low-cost producer without ignoring quality and service. A firm pursuing a differentiation strategy seeks to produce a product or service that is perceived industry-wide as being unique. Finally, a focus strategy requires that the firm concentrate on a particular market segment and, in doing so, serve the segment more effectively or efficiently than can less specialized competitors.

tegic groups. This methodology differed from that used by Rich (1986) in that it did not force sample firms into previously defined strategy types.

Cleaves and O'Laughlin (1986a,b) point out that multidimensional clustering (as used in their study) helps to explain competition among firms that cannot be explained adequately using traditional economic models. In addition, the authors suggest that the identification of strategic groups within an industry aids in predicting industry-wide response to government regulations, technological advances, changes in raw materials, and competitor moves.

The business-level competitive strategies utilized by U.S. pulp and paper products companies were studied by Bauerschmidt et al. (1986). In this study, 363 companies or business units rated the importance of 27 competitive methods. Factor analysis of these ratings was used to empirically define five strategy types.

The fist two of these strategy types (differentiation and overall cost leadership) are analogous to Porter's (1980) generic strategies. The remaining three strategy types are variations of Porter's focus generic strategy. These included product focus, geographic focus, and customer focus.

Bauerschmidt et al. (1986) concluded that the largest companies within the sample competed exclusively on a cost basis, while smaller companies utilized one of the three focus strategies. They point out that a differentiation-based strategy can be both risky and difficult to implement in a commodity industry.

Operationalizing the Strategy Construct

Operationalization concerns the assignment of numbers to represent quantities of attributes (Churchill 1979). In the case of business-level strategy, operationalization requires that a complex phenomenon be simplified to a relatively small set of measurable strategic dimensions.[3] Researchers have found this process extremely difficult to accomplish in a manner that is consistent and widely applicable (Hambrick 1980, Harrigan 1983). Numerous approaches have been investigated, but none has been universally accepted. However, the choice of strategic dimensions is extremely important since it is the single most influential factor in the outcome of a study of strategy and the greatest source of variation between studies (McGee and Thomas 1986).

Thomas and Venkatraman (1988) classify measurement schemes as narrow (unidimensional) or broad (multidimensional). Narrow schemes use a single variable such as company size, degree of vertical integration, or market share to operationalize strategy. Broad schemes are based on observable characteristics of the firm or scores on measures of various strategic dimensions.

The validity of narrow measurement schemes is limited since, at best, such schemes can only be considered useful proxies that are correlated with strategy. Thomas and Venkatraman (1988 p. 539) state the problem succinctly:

> Our position is that the development of strategic groups using a narrow conceptualization of strategy is unlikely to capture the complexity of the strategy construct, thus limiting the usefulness of strategic groups for both descriptive and predictive purposes.

[3] As used in this paper, the term *strategic dimension* refers to the major strategic directions in which companies can move in order to gain a competitive advantage.

Because of this limitation, a multidimensional approach was used in this study. Since strategy is a universal rather than industry-specific phenomenon, valid measures should generalize across industry boundaries. Porter (1980) supported the universality of strategy by proposing three generic strategy types that are applicable to all industries. Dess and Davis (1982, 1984) built on Porter's work by developing and testing a measure of strategy that uses these three generic strategy types as dimensions of overall strategic posture. This study adopted Dess and Davis' approach and utilized an adapted version of their measure.

METHODOLOGY

The study focused on business-level intended competitive strategy within the hardwood lumber industry. Since the strategy professed by company executives may differ from the strategy that a company actually implements, intended strategies may differ from realized strategies (Snow and Hambrick 1980). Realized strategies may be the result of deliberate strategic decisions (intended strategies) or they may reflect reactions to industry changes that have no underlying strategic basis. However, focusing on intended strategy allows the use of strategic self-typing by top management personnel. The perceptions and opinions of this group largely determine the organizations strategy (Snow and Hambrick 1980). Focusing on intended strategy also allows strategic change in the industry to be predicted.

RESEARCH INSTRUMENT

Quantitative strategic data were gathered via a 20-item measure adapted from Dess and Davis (1982, 1984). The measure developed by Dess and Davis was judged to have met the three concerns in strategic measurement presented by Thomas and Venkatraman (1988): (1) It captured (with minor changes) the basis of competition in the industry; (2) It had a strong relationship to existing strategic topologies-specifically, Porter (1980); and (3) the works of Dess and Davis (1982, 1984) provide evidence of the validity and reliability of the measure.

Minor changes were made in the measure to ensure applicability to the hardwood lumber industry. The content validity of the resulting measure was checked through a review by knowledgeable Forest Service, university, and trade association personnel. Figure 1 lists the variables included in the measure.

The measure was incorporated into a questionnaire that also included questions concerning the nature of the firm (sales, production levels, location, etc.). The 20 items included in the measure were rated for their importance to the company's competitive strategy using 7-point Likert-type scales that ranged from, 1 = Not Important to 7 = Extremely Important. The questionnaire also asked recipients to indicate how important they expected each item to be in their company's future (next 5 years) competitive strategy.

SAMPLE

The sample used in this study consisted of the 100 largest (by production) U.S. hardwood lumber producers. Sample companies were identified through a review

FIGURE 1. Variables used to measure business-level strategy (adapted from Dess and Davis 1984).

of production figures provided by industry fact books (Miller Freeman 1987, 1988), trade association membership directories, *The Weekly Hardwood Review* (Barrett 1987), and telephone conversations with company personnel. Where companies participated in more than one industry, only the business unit involved in hardwood lumber production was included in the study.

This nonprobabalistic approach to company selection resulted in a purposive (judgment) sample and limits traditional probability-based extrapolations of the study results to the entire industry. However, it was felt that given limited research resources, strategic change within the industry could best be investigated by examing larger, influential firms. Purposive sampling also allowed the sample to be controlled for the potentially confounding effects of extreme variations in company scope and resources (Dess and Davis 1984). Nonprobability samples are commonly used in marketing research (Green and Tull 1978). In addition, Karmel and Jain (1987) have shown that a nonrandom, purposive sample of large firms within an industry can outperform randomized sampling schemes for estimating industry parameters.

DATA COLLECTION

Survey techniques were used to gather data from the sample firms. In multi-industry companies, the questionnaire was directed to the head of the business unit producing hardwood lumber. In single-industry companies, the questionnaire

was directed to the top executive. In some cases, it was not possible to contact the top executive, and senior marketing/sales people were substituted.

The questionnaire was mailed during June 1989 to 80 sample companies. An additional 19 questionnaires (one sample firm refused to be interviewed) were administered between June and September 1989 as part of in-person interviews. A total of 72 questionnaires (72%) were returned by the time analysis began.

IDENTIFYING STRATEGIC GROUPS

Factor Analysis

Factor analysis refers to a group of multivariate methods for establishing dimensions within a data set and for data reduction (Stewart 1981, Hair et al. 1987). In this study, principal-component (factor) analysis was used to confirm the measure used to operationalize strategy and to generate factor scores for use in cluster analyses.

Factor analysis of the competitive variable ratings requires that the data be considered interval-scaled (Norusis 1988). Depending on the assumptions one makes, rating-scale data can be considered to be ordinal, interval, or ratio-scaled (Green and Tull 1978). While some authors have expressed concern with the use of metric statistics with rating-scale data (see, for example, Martilla and Carve y 1975), such use is generally accepted in the marketing and strategic management literature and was followed in this study.

Factor analysis was deemed an appropriate technique since examination of the correlation matrix (Table 1) suggested relationships between variables, and a Bartlett test of sphericity (Stewart 1981) rejected the hypothesis that the matrix was an identity ($P < 0.000$). In addition, the Kaiser—Meyer—Olkin measure of sampling adequacy (O. 71) was within the range considered acceptable by Stewart (1981) and Norusis (1988).

The three-factor solution was chosen *a priori* since the measure was designed to evaluate Porter's (1980) three generic strategies as dimensions of competitive strategy. In addition, the three-factor solution was supported by a scree test and an examination of factor eigenvalues (Stevens 1986). Table 2 provides the resulting factor loadings after Varirmax (orthogonal) rotation.

Recommendations vary as to the level at which a factor loading can be considered significant. Hair et al. (1987) report that, as a rule of thumb, factor loadings with an absolute value greater than 0.30 can be considered significant. Stevens (1986) suggests that only loadings with an absolute value greater than 0.40 have practical significance. In keeping with Stevens' more conservative recommendation, variable 15 (ownership of timberlands and/or logging operations), which was designed to assess the importance of backward integration, was excluded from further analyses due to its low loading on all three factors.

The remaining variables were assigned to the factor on which they had the greatest loading and formed submeasures that represented the three strategic dimensions. The reliability of the submeasures was evaluated by computing Cronback's Alpha, a commonly accepted formula for assessing the reliability of a multi-item measure (Peter 1979). Table 2 provides the Alpha values for each submeasure. These values are considered acceptable by Churchill (1979) for exploratory work.

Analysis of the variables that were assigned to Factor 1 indicated that it clearly

TABLE 1.

Correlation matrix of variables used to operationalize strategy.

V1[1]	—																			
V2	0.35	—																		
V3	0.17	0.31	—																	
V4	0.23	0.49	0.56	—																
V5	0.25	0.34	0.41	0.42	—															
V6	0.05	0.06	0.15	0.15	0.40	—														
V7	0.29	0.22	0.10	0.37	−0.02	−0.01	—													
V8	0.50	0.39	0.28	0.41	0.09	−0.01	0.70	—												
V9	0.11	0.15	0.09	0.35	0.27	0.31	0.34	0.45	—											
V10	0.19	0.17	0.26	0.17	0.32	0.20	0.00	0.11	0.06	—										
V11	0.09	−0.04	0.06	0.17	0.07	0.19	0.35	0.37	0.27	0.13	—									
V12	0.48	0.24	0.01	0.04	0.33	0.00	0.18	0.26	0.26	0.04	0.23	—								
V13	0.37	0.28	0.22	0.32	0.31	0.09	0.46	0.65	0.36	0.17	0.41	0.26	—							
V14	0.26	0.05	0.23	0.31	0.31	0.28	0.36	0.39	0.19	0.17	0.22	0.08	0.48	—						
V15	0.06	−0.03	0.05	0.16	0.13	0.14	0.28	0.09	0.02	0.10	0.33	0.16	0.01	0.14	—					
V16	0.32	0.23	0.18	0.11	0.30	0.30	−0.08	0.03	0.08	0.29	0.10	0.12	0.12	0.16	0.07	—				
V17	0.51	0.13	0.03	0.21	0.33	0.07	0.50	0.57	0.32	0.17	0.38	0.41	0.49	0.31	0.16	0.14	—			
V18	0.33	0.20	0.34	0.32	0.40	0.22	0.23	0.31	0.29	0.31	0.05	0.07	0.34	0.46	0.06	0.30	0.40	—		
V19	0.36	0.13	0.21	0.16	0.20	0.06	0.29	0.46	0.27	0.27	0.45	0.41	0.45	0.30	0.04	0.20	0.45	0.40	—	
V20	0.32	0.32	0.19	0.30	0.29	0.05	0.10	0.31	0.29	0.18	0.18	0.10	0.27	0.04	0.01	0.12	0.22	0.12	0.14	—
Variable number	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20

[1]Variable numbers reference Figure 1.

TABLE 2.

Factor and submeasure structure after varimax rotation.

Variable	Factor 1—differentiation	Factor 2—focus	Factor 3—cost leadership
		Factor loadings[1]	
Market research	**0.75**	0.16	0.13
Using new marketing techniques/methods	**0.73**	0.52	–0.14
Developing brand identification	**0.71**	0.28	–0.22
Serving special geographic markets	**0.67**	-0.15	0.16
Promotion and advertising	**0.65**	0.37	0.10
Serving particular customer groups	**0.64**	0.10	0.25
Ability to manufacture specialty products	**0.50**	0.06	0.11
Developing new products	**0.46**	0.40	0.16
Maintaining a company sales force	**0.45**	0.15	0.38
Controlling channels of distribution	**0.45**	0.26	0.16
Owning timberlands and/or logging operations	0.32	–0.19	0.22
Providing customer service	0.04	**0.77**	0.07
Product quality control	0.16	**0.73**	0.19
Efficient operation of production facilities	–0.05	**0.62**	0.35
Reputation within the industry	0.15	**0.52**	0.08
Competitive pricing	0.06	– 0.06	**0.69**
Employing trained/experienced personnel	0.09	0.39	**0.68**
Providing rapid delivery	0.04	0.10	**0.63**
Procurement of raw materials	0.07	0.16	**0.56**
Investment in new processing equipment	0.30	0.32	**0.50**
Factor Eigenvalue	5.73	2.13	1.57
Cronback's Alpha (For items forming submeasure)	0.84	0.69	0.69

[1]Bold type denotes the variables used to form the factor submeasure.

represented the differentiation dimension. Factor3 represented the cost leadership dimension. Interpretation of Factor 2 was less clear since it incorporated variables that were originally thought to assess either the differentiation or cost leadership dimensions. This result is not surprising since a focus strategy, as defined by Porter (1980), is a differentiation and/or overall cost leadership strategy aimed at a specific market segment. Consequently, Factor 2 was interpreted as representing the focus dimension.

Cluster Analysis

Cluster analysis is a term applied to a group of empirical techniques for classification of objects without prior assumptions about the population (Punj and Stewart 1983). While developed in the biological sciences, cluster analytic techniques are commonly used in marketing research (Saunders 1980).

In this study, hierarchical agglomerative cluster algorithms were used to de-

termine strategic groupings among the sample companies. Factor submeasure scores for each company were generated for input into the cluster algorithm using the model:

$$F_i = a_{i1}x_{i1} + a_{i2}x_{i2} + a_{i3}x_{i3} \ldots a_{ik}x_{ik} \quad (1)$$

where

F_i = Score on submeasure i (i = 1 to 3)

a_{i1} = Rating of the importance on the first variable included in submeasure i

x_{i1} = Rotated factor loading of variable a_{i1} on factor i

k = Number of variables included in the submeasure

Prior to clustering, the data were examined for the presence of potential outliers that could skew the cluster solution. Based on plots of the three submeasure scores and the Mahalanobis distance statistic (Norusis 1988) for each company, two outliers were identified and removed from further analyses. An additional two companies were removed due to missing data—resulting in a cluster sample that included 68 companies.

The companies were first clustered using Ward's method, which seeks to minimize the sum of squared within-cluster distance (Hair et al. 1987). This algorithm was chosen because it has been shown to outperform others in many situations (Punj and Stewart 1983) and is the most conceptually appealing for the identification of strategic groups.

Unlike theoretical statistics, cluster analysis does not provide precise rules for choosing a solution (Dess and Davis 1984, Harrigan 1985a). Instead, the choice of an appropriate solution must be based on less rigid guidelines and the interpretability of the results. A five-cluster solution was chosen based on analysis of a plot of the number of clusters versus the standardized distance coefficient and because this number of clusters was the smallest that adequately differentiated the companies.

The reliability of the five cluster solution was tested using the three part approach suggested by Choffray and Lilien (1980) and used by Doyle and Saunders (1985). This approach consists of:

1. Testing for outliers in the data.
2. Testing the randomness of the data structure.
3. Testing the uniqueness of the solution.

The first of these tests has been previously described. To facilitate testing the randomness of the data structure, 15 sets of random data with distribution characteristics (mean and standard deviation) similar to the actual data were generated. Each of these data sets was clustered using Ward's method. The mean standardized distance coefficients at critical cluster levels were then compared to the coefficients from the actual data (Table 3). If the distance coefficient did not significantly differ from the random data, the cluster solution would be trivial. As illustrated in Table 3, significant differences were noted—suggesting that an underlying structure existed in the data.

The final test required that the cluster solution based on Ward's method of cluster formation be compared to the solutions based on alternative methods. This

TABLE 3.

Comparison of cluster structure to random data.

Number of clusters	Standardized distance coefficient		*t* statistic	Bonferroni significant difference[1]
	Actual (ward's)	Mean Random[2]		
1	3307.8	3985.3	6.07	X
2	1464.2	1800.6	5.83	X
3	934.9	1168.5	5.93	X
4	670.8	897.4	8.62	X
5	536.9	736.6	10.09	X
6	458.4	624.4	10.55	X
7	387.6	537.7	12.38	X
8	333.6	471.3	12.57	X
9	301.9	415.4	11.30	X
10	220.9	367.0	16.50	X
20	122.3	159.8	8.19	X
30	64.7	73.9	4.53	X
40	35.4	35.4	0.00	
50	15.1	14.6	0.67	
60	3.1	3.0	0.31	

[1]Since multiple comparisons were made, family-wise error rate was controlled to 0.05 by using a Bonferroni *t* statistic (Howell 1987). The critical value of *t* was 3.53. X indicates a significant difference at the indicated cluster level.

[2]Mean distance at each cluster level from 15 sets of random data.

test is necessary since each method of cluster formation has certain biases. For example, single-linkage cluster methods tend to form long, weakly connected clusters, and Ward's method is biased in favor of spherical clusters with equal numbers (Saunders 1980). If a cluster solution based on Ward's method is non-trivial, it should exhibit stability when compared to the solutions generated by other clustering methods. Table 4 provides the results of a multiple method comparison. The relatively good agreement between the clustering methods provides additional evidence of the reliability of the solution.

TABLE 4.

Comparison of clustering methods.

	Ward's method	Complete linkage	Average linkage
Ward's method	—		
Complete linkage	79%[1]	—	
Average linkage	76%	68%	—

[1]Percent of cases consistently grouped based on five cluster solutions. Naive assignment of cases to the largest Ward's cluster results in correct classification of 32% of the cases.

RESULTS

STRATEGIC GROUPS

The strategic groupings resulting from cluster analysis provide a model of competitive strategy within the hardwood lumber industry. This model is depicted in Figure 2. The axes in Figure 2 represent the three strategic dimensions used to define competitive strategy. The location of each group corresponds to its cluster centroid, and groups are depicted with a symbol size that is proportional to the mean squared Euclidian distance between pairs of companies within the group-a measure of group homogeneity.

Companies varied along each of the strategic dimensions. However, the eigenvalues associated with the factor analysis results (Table 2) suggest that the differentiation dimension explains the largest portion of the variance in the data.

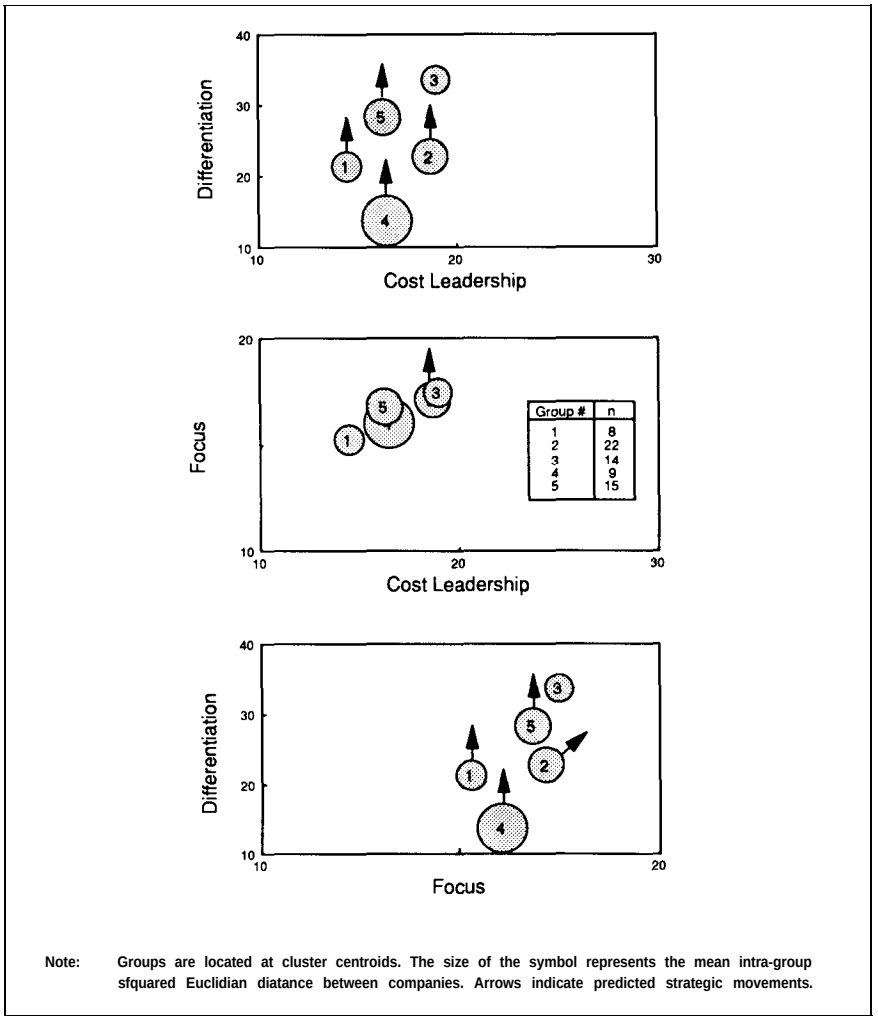

FIGURE 2. Strategic group positions and predicted movements along three strategic dimensions.

Competitive Advantage

The strategic position of Group 4 indicates no distinctive orientation that could be the basis for competitive advantage. Companies in this group have the lowest level of differentiation orientation and medium positions on focus and cost leadership. Without a distinctive orientation on one of the strategic dimensions, the only alternative for companies in this group may be to depend on price competition. The result is likely to be depressed profitability for all companies in the group. Porter (1980) termed this situation "Stuck in the middle" and concluded that such a strategic position assures low profitability.

Group 1 also appears to be "Stuck in the middle." This group has an intended strategy that is lowest on both the focus and cost leadership dimensions and exhibits a medium level of differentiation orientation. Group 2 is strategically similar to Group 1 in terms of differentiation but has developed a stronger cost leadership orientation that can lead to competitive advantage and increased profitability.

Ideally, companies would avoid becoming "Stuck in the middle" (Porter 1980) by developing and implementing a strong strategic orientation along one dimension while maintaining only a nominal level on the remaining dimensions. However, in a pseudo-commodity (Unger 1983) industry such as hardwood lumber, a nominal level of cost leadership orientation would be expected to be higher than in true specialty industries.

Group 5 exhibits above-average emphasis on differentiation and a level of cost leadership that approximates the industry norm. This cost leadership position is consistent with Porter's (1980) definitions since he states that differentiators seek cost parity or proximity relative to competitors. Consequently, companies in Group 5 appear to have a tenable strategic position.

Companies in Group 3 had the highest scores on both the differentiation and cost leadership dimensions. This suggests a dual strategy that clearly has competitive advantages if the two goals can be achieved simultaneously. Porter (1980, p. 38) states:

> . . . achieving differentiation will imply a trade-off with cost position if the activities required in creating it are inherently costly, such as extensive research, product design, high quality materials, or intensive customer support.

This does not seem to be the case in the hardwood lumber industry. In addition, Murray (1988) states that the external preconditions for overall cost leadership and differentiation strategies do not preclude such dual strategies. Consequently, the strategic position of Group 3 is likely to provide significant competitive advantage.

Group Profiles

In order to investigate possible reasons for differences in strategic orientation, groups were compared on two measures of size: lumber production and number of employees. Table 5 provides group means and the results of comparisons using analysis of variance (ANOVA) techniques.

Examination of group means suggested that differentiation orientation and company size were positively correlated. Some support for this hypothesis was found in the results of the ANOVA. As shown in Table 5, a difference was indicated when groups were compared based on number of employees but no difference

TABLE 5.

Strategic groups compared on selected characteristics.

Characteristic	Group number					*F* statistic[1]	Probability *p*
	1	2	3	4	5		
	..... (Mean)						
Annual lumber production (mmbf)	20.81	35.10	24.81	9.79	52.95	1.30	0.28
Number of employees[2]	113.14	110.45	199.15	42.67	173.54	2.91	0.03
Percentage of lumber production sold rough and green[3]	21.38	32.50	18.43	46.11	24.93	2.10	0.09

[1]Analysis of variance (ANOVA) techniques were used to test the hypothesis of no difference between population means.

[2]The LSD (Least Significant Difference) procedure with $\alpha = 0.05$, was used to test the equality of group means. Group 3 differed from groups 4 and 2 and group 4 differed from group 5.

[3]The LSD procedure indicated that group 4 differed from groups 3, 1, and 5.

was indicated based on annual lumber production (at normal levels of significance), A Least-Significant Difference (LSD) test, at the 0.05 level of significance, found a difference in number of employees between groups 3 and 4, 4 and 5, and 2 and 3. In each of these comparisons, the group with the larger number of employees also had a higher level of differentiation orientation.

This result helps to explain the strategic position of companies in Group 4. Smaller firms may fail to develop a strong strategic thrust because of the risk associated with the attempt or because they do not have the resources to implement the necessary changes (Dess and Davis 1984). Resource requirements may also preclude smaller firms from successful overall cost leadership or differentiation strategies (Wright 1987).

Some groups were also found to differ on the amount of their lumber production that was sold rough and green (Table 5). Companies in Group 3 sold the smallest portion (18%) of their production rough and green while companies in Group 4 sold the greatest portion (46%) of their production in this form.

This finding seems consistent with the strategic positions of these groups. Additional processing of hardwood lumber (such as kiln drying and/or planing) offers more opportunity to differentiate the product or tailor it to a specific customer group. In fact, successfully implementing a focus or differentiation strategy may be difficult without some form of additional processing. This reasoning may explain why Group 4, which contained smaller companies that sell large portions of their lumber rough and green, scored low on these dimensions.

Group Homogeneity

In addition to the positions of groups depicted in Figure 2, insight into the industry can be drawn from group strategic homogeneity. Harrigan (1985a,b) states that group homogeneity has implications concerning within-group competition. Specifically, less homogeneous groups are more likely to face intragroup discord and more likely to revert to price as a basis for competition because of dissimiliar outlooks toward competition and reduced tacit cooperation. Hergert (1987) sug-

gests that companies in homogeneous groups are better able to sustain joint maximum profits. This may result from tacit cooperation among companies in the group or the inability to influence industry structure to selectively favor a particular company.

Based on these theories, Group 3 (which is the most homogeneous as measured by the mean squared euclidian distance between companies) can be expected to be the most profitable and least rivalrous of the groups identified. Conversely, Group 4 (which was the least homogeneous) can be expected to be more rivalrous and less profitable. These conclusions correspond with those based on strategic position differences.

Strategic Change

In addition to providing information concerning their present intended competitive strategies, responding companies indicated how they expected their strategies to change in the next five years. Figure 2 indicates the directions of changes that were found to be significant (i. e., present and predicted future group centroids were shown to differ using a T-test at the 0.10 level of significance). Group membership was unchanged.

With the exception of Group 3 (which is presently well positioned), all groups planned significant strategic changes. Companies in Groups 1, 4, and 5 planned increases in their emphasis on differentiation. In general, companies in Group 2 planned to increase both their focus and differentiation emphasis. As mentioned previously, such dual strategies can be problematic. However, dual focus/differentiation strategies can be appropriate for large companies with adequate resources (Wright 1987).

DISCUSSION

Companies in the hardwood lumber industry exhibit a variety of competitive strategies. The largest companies in the industry appear to be moving away from traditional cost- and production-oriented strategies toward strategies that emphasize product differences while maintaining a competitive price. Accordingly, these companies are adding value to much of their lumber production through additional processing such as kiln drying and planing.

Some companies in the industry are emphasizing either low cost production of undifferentiated products or the production of unique products while maintaining cost panty with the industry. Both of these strategic positions can be profitable if implemented successfully.

The smallest companies in the sample are likely to be most similar to the remainder of the industry. Perhaps because of resource limitations, these companies have not committed to a particular strategy. In Porter's (1980) terminology they are "Stuck in the middle." This strategic environment is predicted to be highly competitive and may result in price-based competition that erodes profitability.

A viable strategic alternative for these "Stuck in the middle" companies (and small companies not included in the study) is to develop a focus strategy. Wright (1987) supports this choice of strategy in stating that focus strategies are the only

logical choice for small companies because of the resources required to implement overall cost leadership or differentiation strategies.

This study found a lack of variation among large producers on the focus dimension and a general lack of plans to increase emphasis on this dimension. This further suggests that focusing on a particular market segment is a viable strategic opportunity for small companies since following this strategy may help to avoid direct competition with large companies.

In studying large U.S. wood-based corporations, Rich (1986) identified a trend toward the adoption of a differentiation strategy. A similar movement is predicted among large hardwood lumber producers as companies attempt to differentiate their products through techniques such as brand identification development, proprietary grading, increased customer service, and promotional activities.

There are indications that differentiation strategies have been utilized by companies in markets for certain wood-based products. Examples include consumer paper products, hardwood plywood, and oriented strandboard. However, products sold under industry-wide grading standards and purchased by knowledgeable buyers (such as hardwood lumber) do not lend themselves easily to differentiation (Irland 1976). In these markets differentiation based on a nonphysical aspects of the product (e.g., credit terms, product line depth, delivery times, seller's reputation) may be the most effective. Irland (1976) notes that emphasizing these aspects of the product has resulted in advantages for some large forest products companies.

A likely consequence of predicted strategic movement within the industry is increased competition. The strategic distance between groups approximates the height of mobility barriers protecting a group (Harrigan 1985a,b; Porter 1979, 1980). Consequently, if companies in groups 1, 4, and 5 are successful in implementing their intended strategic moves toward increased differentiation (and toward the positions of companies in group 3), this movement may be interpreted as overcoming the intervening mobility barriers. Such moves are likely to be viewed as threatening by companies in group 3 and may precipitate increased competition.

Significantly, no group planned movement (either increases or decreases) along the cost leadership strategic dimension. This may reflect the belief that competitive advantage in the future can best be obtained by alternative strategies or simply the realization that technological opportunities for production cost advantages are limited in hardwood lumber manufacturing. The lack of planned emphasis on cost leadership suggests that new production equipment acquisitions are likely to be made in order to maintain the company's cost position rather than as part of strategies designed to gain a competitive advantage through production cost advantage.

A limitation of this study is the lack of quantitative performance data for the sample companies. With such data, predictions of company performance based on group membership and strategic position could be tested. Rich (1986) was able to accomplish this when he used corporate-level data to compare the performance of companies that followed various generic strategies. Unfortunately, business-level performance data is extremely difficult to obtain (Porter 1979). Privately held companies do not commonly publish this information, and it is often difficult to separate corporate data in order to evaluate the performance of the business unit involved in hardwood lumber production.

When considering the results of the study, one should bear in mind its basis in intended competitive strategy. The study of intended competitive strategy involves several theoretical issues relating to the nature and measurement of strategy. Such issues are not within the domain of this paper. Readers are directed to Snow and Hambrick (1980) and Churchill (1979) for introductions to these and other issues involving strategy research.

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