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Strategy and Structure: Extending the Theory and Integrating the Research on National and International Firms

Abstract

In this paper, we seek to extend and integrate national and international strategy-structure theory. We use an information-processing approach to model the relationship between both national and international elements of strategy and macro structure. We test our hypotheses with data from 156 German firms. The inclusion of new elements of strategy (type of competitive strategy, degree of internationalization, and type of international strategy) produces a model that is superior to existing models in explaining the newer and more complex forms of strategy and structure.

JEL-Classification: L1, L2, M1.

1 Introduction

Research on the strategy and structure of firms is divided into two rather separate literatures. One group of studies deals with the relationship between general (i.e. not internationalization-specific) strategy elements (e.g. size, product diversity) and the macro structure of the whole firm[1]. A second group of studies examines the relationship between strategy and structure in the international operations of a firm[2]. Since international operations have become a major part of the overall strategy of many firms[3], this paper questions whether this separation is still useful.

The "national" strategy-structure research has focused on a rather narrow set of strategy elements and a few types of macro structure[4]. Generally, strategy has been operationalized in terms of firm size and product diversity. However, since

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1 See, e.g. *Chandler* (1962); *Channon* (1973); *Rumelt* (1974); *Fligstein* (1985); *Whittington/Mayer/Curto* (1997, 1998).
2 See, e.g. *Stopford/Wells* (1972); *Franko* (1976); *Daniels/Pitts/Tretter* (1984, 1985); *Egelhoff* (1982, 1988).
3 See *Wolf* (2000).
4 See *Chandler* (1962); *Channon (*1973); *Rumelt* (1974); *Armour/Teece* (1978); *Steer/Cable* (1978); *Whittington/Mayer/Curto* (1997, 1998).

size and product diversity often co-vary, this stream of research has found it difficult to separate the individual effects of each element on structure[5]. In examining structure, some of the leading studies include matrix and mixed structures, but they do not extend their theorizing into such structures[6]. Instead, the detailed arguments of most studies deal only with the elementary structures, primarily the transition from a functional structure to a product division structure. As a consequence, theory about matrix and mixed structures is minimal[7], despite the fact that these structures often exist in the real world[8].

Although national and international strategy-structure-relationships have been extensively studied in U.S. firms, such relationships have rarely been studied in German firms. German firms have appeared in wider samples[9], but studies that have focused exclusively on German firms[10] tend to be more than 20 years old. Indeed, only one of the 60 studies included in *Schewe*'s[11] reexamination of strategy-structure-studies focused on German firms.

The present study attempts to extend and improve on existing strategy-structure theory in four ways. First, it adds three new elements of strategy (type of competitive strategy, degree of internationalization, and type of international strategy) to the two traditional elements of strategy (product diversity and size of firm). The addition of these elements introduces a more qualitative view of strategy. Second, by adding new strategy variables, the study also explores the possibility of integrating national and international strategy-structure research. It uses strategy variables from both the national and international domains to explain a firm's macro structure. Third, the study examines in more detail the strategies of firms that use matrix and mixed structures. And fourth, it examines these relationships in a sample which focuses exclusively on German firms.

The study uses an information-processing perspective to relate strategy and structure. Here information processing between organizational subunits is considered an important aspect of macro organizational behavior and performance. Each of the various types of structure is seen as facilitating certain types of information processing between the subunits of an organization while restricting other types of information processing. On the other hand, the elements of a firm's strategy are seen as posing different requirements for information processing between the subunits of a firm. If we can describe strategies in terms of the kind and amount of information processing required to implement them, then we can create a general framework for hypothesizing fit or congruence between structure and strategy. There is good fit between structure and strategy when the information-processing

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5 See the long-lasting Donaldson-Grinyer-debate during the 80s; *Donaldson* (1982); *Grinyer* (1982); *Child* (1982); *Donaldson* (1986).

6 See, e.g. *Chandler* (1962); *Channon* (1973); *Rumelt* (1974); *Fligstein* (1985); *Hill* (1985); *Hill/Hoskisson* (1987).

7 See *Egelhoff* (1988).

8 See *Hill/Pickering* (1986); *Habib/Victor* (1991); *Pugh/Clark/Mallory* (1995); *Wolf* (2000).

9 See *Franko* (1976); *Pugh/Clark/Mallory* (1995); *Whittington/Mayer/Curto* (1997, 1998).

10 See *Thanheiser* (1972); *Poensgen* (1973); *Bühner/Walter* (1977).

11 See *Schewe* (1998).

requirements of a firm's strategy are satisfied by the information-processing capacities of its structure.

This information-processing model of strategy and structure has been operationally specified in considerable detail in *Egelhoff*[12]. In the present study, information-processing requirements and capacities are specified along five dimensions: "environment", "synergies between environments", "product", "synergies between products", and "company". The view that strategies determine information-processing requirements that have to be addressed by the information-processing capacities of structure is useful, since a recent meta-analysis has shown that with respect to macro structure there is a "strategic imperative"[13].

2 THE INFORMATION-PROCESSING CAPACITIES OF STRUCTURE

This subsection considers the five types of structure commonly used by firms: functional structure, product structure, regional structure, matrix structure, and mixed structure. Since some German firms have established three-dimensional structures, we will extend the spectrum to a sixth structure, the tensor structure[14]. The general model uses relative organizational distance (or closeness) through the formal organization structure to define where communication will be facilitated and where it will be hindered between organizational subunits. In addition to organizational distance, which specifies interconnected subunits, macro structure also influences what type of information (in terms of subject and perspective) can be processed between interconnected subunits. Horizontal differentiation (or specialization) largely determines in which subunits certain types of knowledge reside, just as vertical differentiation is the major determinant of the levels at which tactical and strategic perspectives of the business can be taken. How parent headquarters are differentiated (functions, products, geographical regions) and which subunits are directly linked through the hierarchy largely determines what types of information processing a structure will provide.

Since both the elementary structures and their information-processing capacities have been specified in the existing literature[15], we summarize this specification in *Table 1*.

The information-processing profile of the matrix structure depends on the types of structure (function, product, region) used within the matrix. Thus, it can be argued that a matrix will provide the kinds of information processing that are associated with its structural elements. Therefore, a function x product matrix is strong in transferring firm and product-related information, a function x region matrix is strong in processing firm- and environment-related information, and a product x region matrix is strong in processing product- and environment-related informa-

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12 See *Egelhoff* (1982).
13 See *Schewe* (1998).
14 See *Bleicher* (1991).
15 See, e.g. *Williamson* (1975); *Hill* (1985); *Donaldson* (1987); *Habib/Victor* (1991); *Egelhoff* (1982, 1988, 1991); *Mintzberg* (1993); *Lamont* et al. (2000).

Table 1: Information-processing capacities of elementary structures.

Functional Structure	Firm's strategic apex is the firm's information bottleneck
	Low capacity to process environment-related information, because capacities are concentrated in functions such as procurement, marketing, or HRM
	Low capacity to process environment-synergistic information
	Low capacity to process product-related information, because capacities are concentrated in functions like R&D or production management
	Medium capacity to process product-synergistic information, because functional areas bridge gaps between product areas
	Relatively high capacity to facilitate firm-related information, because of concentration of functions like controlling or accounting
Product Structure	Top management is relieved of information processing that does not refer to strategic decisions
	Medium capacity to process environment-related information, because product managers are usually more specialized around products and markets than around the general environment
	Low capacity to process environment-synergistic information, because different product divisions usually interact with different sub-environments
	High capacity to process product-related information, because product managers are specialized around products and because the product divisions interact intensively with their markets
	Low capacity to process product-synergistic information because of divisional egotism
	Low capacity to process firm-related information, because functional areas like accounting are integrated into the product divisions
Regional Structure	Top management is relieved of information processing that does not refer to strategic decisions
	Relatively high capacity to process environment-related information, because the regional headquarters tend to support the firm´s familiarity with the peculiarities of the specific environments
	Relatively low capacity to process environment-synergistic information, because division egotism hinders a free flow of information between regional divisions
	Low capacity to process product-related and product-synergistic information, because regional managers are more environmentally experts than product experts
	Medium capacity to process firm-related information, because the regional head-quarters support standardization of firm-specific information systems within regions
Mixed Structure	Because of the use of different structuring criteria on the second hierarchical level, it is not possible to perform a general assessment of the mixed structure's information-processing capacities
	The mixed structure favors the flow of that kind of information that is represented on the second hierarchical level (see capacities of respective elementary structures)
	Overall information-processing capacity tends to be higher than that of standard elementary structures, because at least two types of structuring criteria are used

tion[16]. We can also argue that matrix structures are strong in processing synergy-related information (synergies between environments, synergies between products), since the second hierarchy can bridge the informational barriers that exist between the units of the first hierarchy, and vice versa. On the other hand, the "informational fabric" within a matrix is complex; this might decrease somewhat the structure's overall information-processing capacity[17].

In a tensor structure, the information-processing tendencies of the matrix structure are even more pronounced. Because of the network-oriented integration of the firm's subunits (they are subordinated to functional areas, product divisions, and regional divisions), a dense bundle of information-flows exist. The regional divisions process environment-related information, the product divisions facilitate the flow of product related information, and the functional areas transmit firm-specific information. In a tensor structure, there are two additional command systems that can handle the interface problems that arise between different functional areas, product divisions, or regional divisions. Yet, the tensor's information-processing system is very complex, so there could be information ambiguity and redundancy. Thus, the actual information-processing capability of the tensor structure may be lower than its theoretical capability.

3 THE INFORMATION-PROCESSING REQUIREMENTS OF TRADITIONAL AND NEW STRATEGIES

Two of the strategy elements (size and product diversity) used in the present study are traditional measures of strategy. We use them to test whether traditional strategy-structure patterns are evident in a recent sampling of German MNCs. Since there are already logic and empirical findings for specifying strategy-structure relationships for the two traditional elements of strategy[18], we summarize these in *Table 2*.

Hypothesis 1a (traditional): Size is lowest in firms with a functional structure.

Hypothesis 1b (traditional): Size is relatively high in firms with a product structure.

Hypothesis 1c (traditional): Size is relatively high in firms with a regional structure.

Hypothesis 2a (traditional): Product diversity is lowest in firms with a functional structure.

Hypothesis 2b (traditional): Product diversity is highest in firms with a product structure.

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16 See *Egelhoff* (1988).
17 See *Galbraith/Nathanson* (1978).
18 See *Chandler* (1962); *Lawrence/Lorsch* (1967); *Channon* (1973); *Rumelt* (1974); *Williamson* (1975); *Galbraith* (1977); *Chenhall* (1979); *Donaldson* (1982); *Egelhoff* (1982); *Hill/Pickering* (1986); *Burns/Wholey* (1993).

Table 2: *Information-processing requirements of traditional strategies.*

Size (Growth)	Size increases the volume of environment-, product-, and firm-related information processing
	Size increases the volume of multi-functional information processing
	In large firms, the interactions between top management and subordinates tend to be weak, and thus person-oriented information-processing is weak
	In large firms, top management tends to have limited information about lower managers' behavior, and therefore the latter might become "partisans" who follow their own selfish goals
Product Diversity (Diversification)	Diversification increases the number of different contexts, and thus it increases both the specialization of information processing and the amount of product-related information processing
	Related diversification increases the amount of product-synergistic information processing; unrelated diversification does not have this effect
	Diversification increases environmental complexity moderately, because product diversity refers more to product complexity than to environment complexity.
	Diversification increases requirements for information processing between interdependent subunits and thus the amount of firm-related information processing

Hypothesis 2c (traditional): Product diversity is relatively high in firms with a regional structure.

Hypothesis 2d (traditional): Product diversity is relatively high in firms with a matrix or a tensor structure.

The remaining three variables (competitive strategy, degree of internationalization, and type of international strategy) represent strategy elements that have not previously been related to structure. For the three new elements of strategy, we develop new hypotheses.

3.1 COMPETITIVE STRATEGY

In the present study, we use *Porter*'s[19] types of competitive strategy. The type of competitive strategy should have a strong influence on the structuring of the firm, since different competitive strategies require different coordinative, technical, and control-related tasks[20].

Firms with an overall cost leadership strategy can best realize cost advantages if management minimizes product change. Thus, the level of product-related infor-

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19 See *Porter* (1980).
20 See *Miller* (1988).

mation-processing requirements tends to be low. Although product changes are infrequent, production process related innovations occur more often in overall cost leadership firms. At the center of these innovations is a continuous rationalization of the production processes[21]. As a consequence, overall cost leadership firms face a rather high amount of firm-related information-processing requirements. The level of environment-related information processing is somewhat lower, since overall cost leadership firms tend to ignore marginal customers with special requirements, thus enabling the firm to concentrate on the mass market. Also, environment-related information-transfers are low, because overall cost leadership firms usually offer their customers only a low level of after-sales services. Thus, environment-related information-processing is concentrated on interactions with the firm's suppliers. The functional structure is the best fit for such a situation of internally oriented, highly specialized, mainly vertical information transfers. *Miller*'s study on competitive strategies supports this hypothesis: Laterally active boundary spanners and cross-departmental experts were seldom found in overall cost leadership firms[22]. Moreover, the functional structure is appropriate, since the overall cost leadership strategy is primarily used in markets that are characterized by low levels of product diversity, market growth, and change[23].

Hypothesis 3a (new): Firms that pursue an overall cost leadership strategy will tend to use a functional structure.

The main goal of firms that follow a differentiation strategy is to gain uniqueness within the market. *Miller*[24] shows that such uniqueness can be reached by both frequent and significant product innovations and by a complex system of customer care that includes an intensive cultivation of the firm's image ("intensive marketing and image management"). Both of these alternatives create information-processing requirements that are greater than those of the overall cost leadership strategy. The most significant increase occurs in the dimensions of environment- and product-related information-processing. There is a high level of environment-related information-processing, since this strategy requires all value-adding processes to be oriented towards market requirements. Differentiators' customers have special needs and these special needs are strongly reflected in the firm's business processes. If there is a product innovation strategy, product-related information processing levels should be high, since product innovation generally requires full knowledge and discussion of the advantages and disadvantages of old and new products. A strategy of intensive marketing and image management might need only a little less product-related information processing, since effective marketing and image building usually requires a thorough understanding of product attributes and their interaction with customer needs. Although a differentiation strategy might also demand a high volume of firm-related information processing, this volume should not be significantly different from the case of an overall cost leadership strategy.

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21 See *Frese* (1995).
22 See *Miller* (1988).
23 See *Corsten* (1998).
24 See *Miller* (1986).

Since the differentiators' environment-oriented information transfers refer primarily to the market environment and less to the general environment, both the product structure, which is strong in product-related information processing, and the regional structure, which is strongest in environment-related information processing, seem to be appropriate for differentiators.

Hypothesis 3b (new): Firms that pursue a differentiation strategy will tend to use either a product structure or a regional structure.

Since the focus strategy is conceptually more diffuse than an overall cost leadership or differentiation strategy (*Porter* distinguishes between a cost focus and a differentiation focus[25]), the information-processing requirements are difficult to estimate. However, we can point out that because of the limited size of a niche market segment, many focus firms can be in different niches simultaneously. Such focus firms would be confronted with numerous contingencies. Because focus firms are often rather small, they do not have the "critical mass" to divide the whole firm into several divisions. Instead, they must integrate the different market activities. In turn, this necessitates the intensive flow of environment-, product-, and firm-related information. Considering these information-processing requirements, the mixed, matrix, and tensor structures appear to be most appropriate.

Hypothesis 3c (new): Firms that pursue a focus strategy will tend to use mixed, matrix, or tensor structures.

3.2 DEGREE OF INTERNATIONALIZATION

Because international environments are associated with uncertainty, it follows that internationalization leads to a significant increase in environment-related information-processing requirements. Information processing that relates to synergies between environments also increases substantially during the internationalization process, since the international firm has to decide to what degree it can standardize its products and processes across different environments. Moreover, *Egelhoff*[26] has argued that as the relative size of the foreign sector increases, product interdependency, either within this sector or between it and the domestic sector, should also increase, because effective international firms seek to realize synergies and economies of scale on either a regional or worldwide basis. Thus, internationalization would require more product-related information-processing capacity. Internationalization's influence on the volume of firm-related information-processing requirements depends on the market entry mode used. Although pure export-oriented strategies will not greatly increase firm-related information-processing requirements, internationalizing production often demands a higher level of firm-related information transfer. Thus, we see that an export-oriented mode of internationalization will primarily increase the environment and product-related information-processing requirements, while a production-oriented mode will increase all types of information-processing requirements.

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25 See *Porter* (1980).
26 See *Egelhoff* (1988).

Since the present study operationalizes the degree of internationalization as the percentage of foreign sales (and not the percentage of international production), we expect that the most internationalized firms will probably have structures that are strong in environment and/or product-related information processing.

Hypothesis 4a (new): The degree of internationalization will be lowest in firms with a functional structure.

Hypothesis 4b (new): The degree of internationalization will be relatively high in firms with a product, regional, matrix, or tensor structure.

3.3 TYPE OF INTERNATIONAL STRATEGY

Using the frameworks developed in *Perlmutter*[27], *Porter*[28], and *Bartlett* and *Ghoshal*[29], the present study recognizes four types of international strategy: the international, multinational, global, and transnational.

Firms with an international strategy[30] view the home country as their main market. Therefore, such firms make only minor adjustments to products which are placed in foreign markets. These firms tend to centralize their information flows, since their foreign subsidiaries are typically small and relatively dependent on the head-quarters. As a result, the information flows are vertical and sequential. Since the majority of these firms have only a few foreign operations and give limited attention to the specific conditions of foreign markets, there is only a limited need to process environment- and environment-synergy-related information. Likewise, the level of firm-related information-processing requirements is not much higher than it is in a national firm. Since foreign operations are small, and since such firms tend to concentrate the core elements of their value chains in the home country, they frequently use person-oriented rather than structure-oriented coordination instruments[31]. Given these limited information-processing requirements, it is clear that the matrix structure and the tensor structure are not necessary for firms pursuing an international strategy.

Hypothesis 5a (new): Firms with an international strategy will tend not to have matrix or tensor structures.

Because firms with a multinational strategy offer products that are uniquely developed for the particular needs of each national market, their foreign subsidiaries tend to have complete value chains in each country. Therefore, the foreign subsidiaries must process more information with their local environment than with the headquarters. Thus, environment-related information transfers are very important. Since the host country markets are relatively independent of one another,

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27 See *Perlmutter* (1969).
28 See *Porter* (1986).
29 See *Bartlett/Ghoshal* (1989).
30 See *Bartlett/Ghoshal* (1989).
31 See *Franko* (1976).

multinational firms are able to introduce their products successively into new foreign markets[32]. Therefore, their requirements for product-related information-processing are not very high. The requirements for firm-related information-processing are low, since only a few core functions might have a high level of internal integration. In such a situation, structures with a high level of environment-related information-processing are appropriate. Besides the regional structure, the matrix and the tensor structure appear to make a good fit.

Hypothesis 5b (new): Firms with a multinational strategy will tend to have a regional, matrix, or tensor structure.

The products of firms with a global strategy are created to meet the homogeneous needs of the world market. Usually, multinational firms face immense pressures to realize economies-of-scale-advantage, and they specialize their domestic and foreign units on specific parts of the value chain. Between these units, there are dense and reciprocal information flows. Because the firms' products relate more to a single world market than to the respective host countries' environments, information transfers are likely to be stable and to contain standardized data. Thus, global firms' environment-related information-processing requirements are rather low. Given the high level of standardization of global firms' products, the level of product-related information processing is not higher than medium within global firms. In contrast, the requirement for firm-related information-processing is very high. This demand results from the division of the value chain which causes numerous interdependencies between the direct and supporting value activities.

Because of these requirements, the functional and the product structure seem to be most appropriate for global-strategy firms. The product structure is suitable, since decisions and actions need not to be centralized at top managements' level; they can also be centralized at the level of product divisions. Because some firms can face both high product- and firm-related information-processing requirements, the matrix and the tensor structure may also be structural alternatives.

Hypothesis 5c (new): Firms with a global strategy will tend to have functional, product, matrix, or tensor structure.

Because a transnational firm's subunits must respond to both globalization and localization pressures, a transnational strategy requires all subunits to participate in the firm-wide diffusion of knowledge. The headquarters is only one point in a complex, fluid network of subsystems. In transnational firms, the external and internal context is dynamic and extremely complex. Therefore, such firms' information-processing requirements tend to be greater than with other types of strategy. Such firms need to process environment-related information, since transnationally oriented firms continuously monitor and anticipate the environments that surround the home and host country units. Furthermore, transnational firms try to influence their environments, either to align the customers' needs to the products offered by the firm, or to dismantle administrative restraints that may exist in the environment. Transnational firms also face high product-related information-pro-

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32 See *Colberg* (1989).

cessing requirements, because they design and manage products that fit both local and standardization requirements. Because of the need to learn collectively, transnationals also face a high level of firm-related information-processing requirements. Since transnational firms face high information-processing requirements along different dimensions at the same time, the matrix structure, tensor structure, and mixed structure seem most appropriate.

Hypothesis 5d (new): Firms with a transnational strategy will tend to have a matrix, tensor, or mixed structure.

4 RESEARCH DESIGN

4.1 SAMPLE

We chose our sample for testing the hypotheses to represent all German firms. The sample combines two subsamples. The first subsample (96 firms) is representative of Germany's largest 500 firms, and the second (60 firms) is drawn from Germany's smaller firms. *Table 3* describes the (sub)samples' structures and representativity. *Table 4* shows the distribution of the 156 companies by industry, size, and type of structure. Since our goal is to test the influence of national and international strategy elements on the firms' macro structures, our sample contains both national and international firms. Further, contrary to leading strategy-structure research in international firms[33], we will not restrict the study to firms which have a specific volume of foreign sales.

Table 3: Sample and test of representativity.

	Germany's largest 500 (1995)	Subsample of larger firms (n=96)	Significance of difference	Subsample of smaller firms (n=60)	Total sample (n=156)
Size (sales)	6780.79 million DM (S.D.=11982.60)	8930.33 million DM (S.D.=16455.34)	T=-1.2193 p=0.2252	486.12 million DM (S.D.=378.06)	4915.71 million DM (S.D.=12389.03)
Size (number of employees)	17529.85 (S.D.=40502.18)	29492.54 (S.D.=69142.19)	T=-1.6409 p=0.1037	1982.50 (S.D.=1885.84)	16263.49 (S.D.=52486.14)
Product diversity (number of 5-digit-Hoppenstedt categories)	2.4077 (S.D.=1.8301)	2.7660 (S.D.=2.4819)	T=-1.3321 p=0.1855	1.7500 (S.D.=1.3356)	2.3701 (S.D.=2.1631)

The sample reflects considerable variation in size of firm, from 14 million DM to 104 billion DM in annual sales, with a mean of 4.9 billion DM and standard deviation of 12.4 billion DM. In this respect, the sample differs significantly from the samples which have been previously used to establish existing strategy-structure theory. Previous samples have typically represented the largest firms (e.g., the Fortune 500). An extension of strategy-structure research to smaller firms is impor-

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33 See *Stopford/Wells* (1972); *Egelhoff* (1988).

Table 4: Industry, size, and type of structure of sample firms.

Industry	
Energy & mining	19
Chemical	14
Steel & nonferrous metals	6
Machinery	20
Automotive & transportation equipment	11
Electrical & optical equipment	6
Wood & paper	5
Textile	4
Food products	10
Construction	11
Trade	24
Transport	7
Other Services	15
Miscellaneous	4
	156

Size (sales in million DM)	
less than 500	38
501 to 1000	23
1001 to 2500	43
2501 to 10000	36
more than 10000	16
	156

Macro Structure	
Functional structure	59
Product structure	34
Regional structure	5
Matrix structure	29
Tensor structure	6
Mixed structure	21
Other structure	2
	156

tant, since in 1997 German firms with fewer than 500 employees were responsible for more than 53% of the gross national product[34].

As expected, the majority (63%) of the sample firms possess an elementary structure that is organized along one criterion: The structures are either functional, product, or regional. When we compare these results with other recent studies, the high frequency of the functional structure within the sample (38%) is surprising. *Pugh/Clark/Mallory*[35] found that in 1990/1991, only 23% of German firms had a functional structure. In their 1993 sample of German firms, *Whittington/Mayer/Curto*[36] report 17% of the firms use a functional structure. The inclusion of smaller firms in the present sample undoubtedly explains the high frequency of the functional structure in the present study. It is also noteworthy that a rather large group of firms (36%) uses a matrix structure, a tensor structure, or a mixed structure, since there is controversy in the literature about these structures[37]. Although there are some broad relationships between industry and type of structure, structure can be more meaningfully and powerfully explained with the hypothesized elements of strategy.

4.2 MEASUREMENT

The data used in this analysis come from questionnaires which were mailed out in 1996/97. To explain the study and to identify which manager was most qualified to complete the questionnaire, we contacted all companies beforehand via telephone. We then sent questionnaires direct to these managers. After receiving the completed questionnaires, we again contacted the responding managers via telephone to discuss their answers. The Appendix describes the measurement of organizational structure and the five elements of strategy. *Table 5* shows the means, standard deviations, and correlations among the five strategy elements.

While there are many significant correlations, none are so large that any of the elements need to be combined.

5 FINDINGS

In the study, we used both bivariate and multivariate methods to test the hypotheses. We used bivariate methods because multivariate methods tend „to ignore" those relationships among variables that are weaker than other relationships, even if the direction of the first is in line with theory. We used multivariate methods to determine the relative influence of the strategy elements on structure and to test the paper's overall thesis that new and internationally oriented strategy elements help to improve the predictability of firms' macro structures. *Table 6* describes the results of the bivariate analyses.

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34 See *Institut für Mittelstandsforschung* (1999).
35 See *Pugh/Clark/Mallory* (1995).
36 See *Whittington/Mayer/Curto* (1998).
37 See *Drucker* (1974); *Larson/Gobeli* (1987); *Bartlett/Ghoshal* (1989).

Table 5: Descriptive statistics and correlations.

Strategy elements	Mean	S.D.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Size (sales)	4893	12352	1.00									
2. Product diversity	3.01	2.14	0.50***	1.00								
3. Competitive strategy: % overall cost leadership	45.60	40.10	0.07	-0.10	1.00							
4. Competitive strategy: % differentiation	44.95	37.35	-0.04	0.06	-0.91***	1.00						
5. Competitive strategy: % focus	9.40	16.55	-0.08	0.10	-0.36***	-0.05	1.00					
6. Degree of internationalization (% foreign sales)	26.28	26.62	0.21**	0.29***	-0.32***	0.26**	0.21*	1.00				
7. Type of international strategy: % international	38.20	40.89	-0.13	-0.18*	0.34**	-0.30**	-0.12	-0.28**	1.00			
8. Type of international strategy: % multinational	9.69	20.58	0.03	-0.03	-0.06	0.09	-0.06	0.08	-0.10	1.00		
9. Type of international strategy: % global	37.51	42.50	0.11	0.12	-0.25*	0.25*	0.04	0.26*	-0.67***	-0.26*	1.00	
10. Type of international strategy: % transnational	14.60	31.08	0.00	0.08	-0.06	0.00	0.14	-0.04	-0.34**	-0.17*	-0.31**	1.00

***: p<0,001; **: p<0,01; *: p<0,1

Table 6 shows the mean values of the five elements of strategy by the six different types of structure that appeared in the sample (We did not analyze the two firms labeled "other structure"). We use *t*-tests to determine the significance of the hypothesized differences. This straight-forward method of testing fits a priori hypotheses that are supported by independent underlying logics. It also provides the flexibility to combine categories for some of the tests.

Table 6 contains a summary of each hypothesis and the results of the associated *t*-tests. The sample data support the hypotheses on size, product diversity, and degree of internationalization. The hypotheses on the first two strategy elements include the key relationships of the traditional strategy-structure-research. The fourth element (degree of internationalization) is one of the strategy-structure-relationships that we have introduced and conceptualized to extend existing theory. Thus, it appears that highly internationalized firms tend towards the product, regional, or multidimensional structures, but firms with little or no internationalization tend towards the functional structure.

The third strategy element (type of competitive strategy) and its hypotheses receive partial support. In ten of 15 tests, the predicted relationship is directionally confirmed, but at a significance level below 10%. In only one case does the relationship go directionally against the hypothesis. Since the hypotheses associated with each type of competitive strategy are supported at a similar level, we tentatively state that firms that are oriented towards the overall cost leadership strategy tend towards the functional structure, those with an orientation towards the differentiation strategy tend towards the product or regional structure, and those with an orientation towards the focus strategy tend towards matrix, tensor, or mixed structures.

The fifth strategy element (type of international strategy) and its hypotheses are also partially supported. In five cases, the tests are statistically significant and support the hypotheses. In ten cases the tests are not statistically significant but directionally support the hypotheses. In only one case does the data contradict the hypothesis. The highest levels of support exist for the international and global strategy firms. Thus, although we need to further test the logic, it appears that international strategy firms tend to avoid multidimensional structures, while global strategy firms tend to use the functional, the product, or the multidimensional structures.

We based the multivariate data analyses on logistic regression models, with structure as the categorical dependent variable. Logistic regression describes the relationship between a categorical dependent variable (structure) and a set of explanatory variables (strategy elements)[38]. We did not compute regression models for the regional and tensor structures, since the number of cases is too small.

Table 7 shows the logistic regression models that refer to the functional, product, matrix, and mixed structures. We set the dependent variable to one if the respective structure exists; and zero otherwise.

Table 7 shows that for each type of structure, five different models were calculated. In the first column, the model includes only the traditional strategy elements

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38 See *Stokes/Davis/Koch* (1995).

Table 6: Bivariate analysis – hypotheses and results of t-tests.

Hypotheses	Mean Values in Total Sample (156 firms)	Functional Structure (FS) 59	Product Structure (PS) 34	Regional Structure (RS) 5	Matrix Structure (MaS) 29	Tensor Structure (TS) 6	Mixed Structure (MiS) 21	Differences
1a. Size lowest in FS. 1b. Relatively high in PS. 1c. Relatively high in RS.	Sales: 4893 Mill. DM	1519	9164	3924	4813	1745	4093	FS<PS: 0.01; FS<RS: d. ok.; FS>MaS: 0.05; FS<TS: d. ok; FS<MiS: d. ok.; FS<all other: 0.00. PS>FS: 0.01; PS>RS: d. ok.; PS>MiS: d. ok.; PS>MaS: d. ok.; PS>TS: 0.01; PS>all other: 0.07. RS>(FS+MaS+TS+MiS): n. c.
2a. Product diversity lowest in FS. 2b. Highest in PS. 2c. Relatively low in RS. 2d. Relatively high in (MaS+TS).	Number of Hoppenstedt categories: 3.01	2.28	4.00	2.60	3.18	3.17	3.10	FS<PS: 0.01; FS<RS: d. ok.; FS<MaS: 0.07; FS<TS: 0.04; FS<MiS: d. ok.; FS<all other: 0.00. PS>FS: 0.01; PS>RS: d. ok.; PS>MiS: d. ok.; PS>MaS: d. ok.; PS>TS: d. ok.; PS> all other: 0.02. RS<(PS+MaS+TS+MiS): 0.02. (MaS+TS)>(FS+RS+MiS): 0.07.
3a. % Overall cost leadership highest in FS. 3b. % Differentiation highest in (PS+RS). 3c. % Focus highest in (MaS+TS+MiS).	Overall cost leadership: 45.60 % Differentiation: 44.95 % Focus: 9.40 %	53.18 % 38.92 % 7.78 %	39.46 % 52.53 % 8.00 %	22.50 % 73.75 % 3.75 %	40.97 % 48.60 % 10.39 %	64.17 % 33.00 % 2.83 %	41.68 % 40.00 % 18.32 %	Overall cost leadership: FS>PS: 0.12; FS>RS: 0.14; FS>MaS: d. ok.; FS>TS: n. c.; FS>MiS:d. ok.; FS>all other: 0.09. Differentiation: (PS+RS)>FS: 0.05; (PS+RS)>MaS: d. ok.; (PS+RS)>TS: d. ok.; (PS+RS)>MiS: 0.15; (PS+RS)>all other: 0.06. Focus: (MaS+TS+MiS)>FS: d. ok.; (MaS+TS+MiS)>PS: d. ok.; (MaS+TS+MiS)>RS: 0.04; (MaS+TS+MiS)>(FS+PS+RS): 0.11.
4a. Degree of internationalization (% foreign sales) lowest in FS. 4b. Highest in PS. 4c. Relatively high in RS. 4d. Relatively high in (MaS+TS).	Foreign sales: 26.28 %	14.84 %	35.91 %	50.15 %	36.05 %	33.05 %	17.33 %	FS<PS: 0.00; FS<RS: 0.01; FS<MaS: 0.01; FS<TS: 0.07; FS<MiS: d. ok.; FS<all other: 0.00. PS>FS: 0.00; PS>MiS: 0.01. RS>FS: 0.01; RS>Mi: 0.02. (MaS+TS)>FS: 0.00; (MaS+TS)>MiS: 0.02.
5a. % International strategic orientation lowest in (MaS+TS). 5b. % Multinational strategic orientation highest in (RS+MaS+TS). 5c. % Global strategic orientation highest in (FS+PS+MaS+TS). 5d. % Transnational strategic orientation highest in (MaS+TS+MiS).	Internat. orient.: 38.20 % Multinat. orient.: 9.69 % Global orient.: 37.51 % Transnat. orient.: 14.60 %	48.84 % 5.12 % 36.08 % 9.93 %	38.61 % 11.96 % 34.57 % 14.87 %	26.00 % 20.00 % 34.00 % 20.00 %	17.63 % 12.37 % 56.84 % 13.16 %	46.66 % 10.00 % 43.33 % 0.00 %	56.00 % 6.00 % 8.00 % 30.00 %	International orientation: (MaS+TS)<FS: 0.02; (MaS+TS)<PS: 0.13; (MaS+TS)<RS: d. ok.; (MaS+TS)<MiS: 0.02; (Ma+TS)<(FS+PS+RS+MiS): 0.02. Multinational orientation: (RS+MaS+TS)>FS: d. ok.; (RS+MaS+TS)>PS: d. ok.; (RS+MaS+TS)>MiS: d. ok.; (RS+MaS+TS)>(FS+PS+MiS): d. ok. Global orientation: (FS+PS+MaS+TS)>RS: d. ok.; (FS+PS+MaS+TS)>MiS: 0.00; (FS+PS+MaS+TS)>(RS+MiS): 0.02. Transnational orientation: (MaS+TS+MiS)>FS: 0.02; (MaS+TS+MiS)>PS: d. ok.; (MaS+TS+MiS)>RS: n. c.; (MaS+TS+MiS)>(FS+PS+RS): d. ok.

n. c. = not at all confirmed   d. ok. = directionally o.k.   ▯ = traditional strategy-structure-fits   ▮ = new strategy-structure-fits

Table 7: Multivariate analysis – Logistic regression models.

Macro structure / Strategy elements	Functional structure (1) vs. other structure (0) (59=1; 97=0)					Product structure (1) vs. other structure (0) (34=1; 122=0)				
	traditional model: size and product diversity in	new model: size and product diversity out; new variables in	new model: size and product diversity in; new variables in	new model: size in and new variables in	new model: product diversity in and new variables in	traditional model: size and product diversity in	new model: size and product diversity out; new variables in	new model: size and product diversity in; new variables in	new model: size in and new variables in	new model: product diversity in and new variables in
Size (sales)	-1,358**		-1.273**	-1.438***		0.085		0.117	0.226**	
Product diversity	-0,261**		-0,203§		-0.306**	0.222*		0.208*		0.275***
Competitive strategy: - % overall cost leadership										
- % differentiation		-0.106					0.176*	0.241**	0.253**	0.226**
- % focus										
Degree of internationalization (% foreign sales)		-0.400***	-0.374***	-0.400***	-0.366***		0.206**			
Type of international strategy: - % international										
- % multinational										
- % global										
- % transnational										
2 * Log likelihood	206.912	206.912	206.912	206.912	206.912	163.581	163.581	163.581	163.581	163.581
Model chi ²(df)	24.280 (2)	18.838 (2)	35.631 (3)	33.336 (2)	24.261 (2)	7.716 (2)	7.817 (2)	12.486 (3)	9.627 (2)	11.438 (2)
Significance	0.0001	0.0001	0.0001	0.0001	0.001	0.0211	0.0201	0.0059	0.0081	0.0033
Concordance (predicted probabilities and observed responses)	69.8 %	66.1 %	75.3 %	73.3 %	70.6 %	67.0 %	63.3 %	69.4 %	68.4 %	63.4 %

§: = 15 %; *: = 10 %; **: = 5 %; ***: = 1 % - all parameters standardized values

☐ = traditional strategy elements   ■ = new strategy elements

Table 7: Multivariate analysis – Logistic regression models (continued).

Macro structure / Strategy elements	Matrix structure (1) vs. other structure (0) (29=1; 127=0)					Mixed structure (1) vs. other structure (0) (21=1; 135=0)				
	traditional model: size and product diversity in	new model: size and product diversity out; new variables in	new model: size and product diversity in; new variables in	new model: size in and new variables in	new model: product diversity in and new variables in	traditional model: size and product diversity in	new model: size and product diversity out; new variables in	new model: size and product diversity in; new variables in	new model: size in and new variables in	new model: product diversity in and new variables in
Size (sales)	-0.041*		-0.067	-0.028		-0.084		-0.031	-0.024	
Product diversity	0.071		0.080		0.045	0.063		0.168		0.173
Competitive strategy:										
- % overall cost leadership										
- % differentiation										0.226§
- % focus		0.119					0.301**	0.320**	0.252**	0.377***
Degree of internationalization (% foreign sales)							-0.232	-0.287§		-0.352*
Type of international strategy:										
- % international										
- % multinational		0.165*	0.169*	0.162*	0.165*					
- % global		0.242**	0.253**	0.256**	0.251**		-0.454§	-0.480§	-0.541**	-0.517*
- % transnational										
2 * Log likelihood	149.519	149.519	149.519	149.519	149.519	123.261	123.261	123.261	123.261	123.261
Model chi² (df)	0.310 (2)	9.358 (3)	8.233 (4)	7.870 (3)	7.971 (3)	0.298 (2)	12.407 (3)	13.546 (5)	10.455 (3)	15.980 (5)
Significance	0.8565	0.0249	0.0834	0.0488	0.0466	0.8616	0.0061	0.0188	0.0151	0.0069
Concordance (predicted probabilities and observed responses)	50.3 %	38.1 %	64.4 %	46.5 %	61.5 %	50.3 %	62.1 %	70.4 %	39.3 %	73.9 %

§: = 15 %; *: = 10 %; **: = 5 %; ***: = 1 % - all parameters standardized values

□ = traditional strategy elements   ■ = new strategy elements

(size and product diversity) as explanatory variables of macro structure. In the second column, the model includes only the new elements (type of competitive strategy, degree of internationalization, and type of international strategy) as predictors of macro structure. These two models were computed in order to determine the relative power of the traditional and the new strategy elements on structure. Column three shows a full model containing all five explanatory variables. This model shows the extent to which the new strategy elements improve the prediction of macro structure. Since size and product diversity tend to be correlated with each another, two additional models have been computed. Model four is the full model without product diversity, and model five is the full model without size.

The first columns of *Table* 7 shows that – as postulated by traditional theory[39] – size and product diversity are strong predictors of a functional structure. This result means that German firms resemble other firms in terms of possessing this relationship. The functionally organized firm tends to be small with little product diversification. *Table* 7 shows that both size and product diversity are required to adequately explain the use of a functional structure. The first column also shows that product diversity is the main driver of divisionalization, as reflected in the use of product division structures. And yet, the traditional strategy elements do not explain this structure as well as they explain the functional structure. Further, the traditional elements are clearly inadequate to explain the use of matrix and mixed structures.

A look at the second column shows that the new strategy elements contribute meaningfully to the prediction of structure. This statement is less true for the matrix structure, although the direction of relationship follows the hypotheses (firms with a matrix structure tend to have a multinational or a global orientation). When we compare the first with the third column data support the view that new strategy elements increase the predictability of the traditional strategy-structure-model. This impression is especially true for matrix and mixed structures, which the traditional model cannot explain. Finally, because the parameters of the new strategy elements remain relatively constant, we see that the alternate use of size and product diversity in the model (columns four and five) supports the robustness of the influence of the new strategy elements.

6 DISCUSSION AND CONCLUSIONS

Several overall conclusions can be drawn from the present study. First, the study confirms the importance of traditional strategy elements as explanations of a firm's macro structure. Second, it develops and confirms the importance of several new strategy-structure relationships. The study supports our view that the macro structure of firms is best explained by an extended spectrum of both national and international and quantitative and qualitative strategy elements. Consequently, an extension of theory as well as an integration of national and international research is necessary and possible. Third, although the new strategy elements are meaningfully related to the functional and product structures, the new strategy elements

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39 See *Williamson* (1975); *Donaldson* (1982).

seem to be most important in explaining matrix and mixed structures. This is important, because up to now, the existing strategy-structure models have not adequately explained these structure models.

But why are the new strategy elements better predictors of matrix and mixed structures than the traditional strategy elements? When we seek an answer to this question, we must remember that matrix and mixed structures are organizational forms that have been created to manage higher levels of internal and external heterogeneity. For example, *Davis/Lawrence*[40] argue that the matrix design should be used when the situation requires high levels of information processing, a dual focus, and the sharing of resources between subunits. The matrix structure addresses these requirements with multiple types of management and a relatively dense network of information-processing channels. Although the mixed structure is less complex, it also provides more heterogeneous information-processing capabilities. Such capabilities are most appropriate for responding to a wider range of environmental requirements.

If we consider the strategy elements used in the study, we see that the new elements tend to measure the homogeneity versus heterogeneity of a firm's strategic environment. For example, researchers associated overall cost leadership strategies with low heterogeneity, and differentiation and focus strategies with higher heterogeneity. A low degree of internationalization implies lower environmental heterogeneity, and a high degree implies a more heterogeneous environment. International and global strategies lead to less heterogeneous environments than multinational and transnational strategies. Thus, the new elements of strategy reflect more of the conditions that require matrix and mixed structures than do the traditional elements of strategy. As a result, they can better explain these structures.

Our study supports another general observation, which is that the international, multinational, and transnational strategies have less clear structural relationships than does the global strategy. This observation suggests that structure may be more critical to the implementation of a global strategy, and that the logic here is more defined. The global strategy focuses on the standardization of products and processes, and its rationale is based on the economies of scale that these provide. To implement such well defined activities, a clear structuring and allocation of the firm's resources is required. Formal structure is an instrument for making such clear assignments of resources to the appropriate activities.

In contrast to this, the other three types of internationalization strategies have a less sharply defined focus. The international strategy is often used by firms when their foreign operations are relatively small. Thus, there is probably less reason to take international characteristics into account when management selects the macro structure of the firm. The multinational and transnational strategies emphasize diversity and flexibility. The former decentralizes and minimizes the need for information processing across countries, which makes the choice of structure a less critical issue. The latter requires high interdependency and coordination, but this occurs within dynamic and changing relationships. Although structure un-

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40   See *Davis/Lawrence* (1977).

doubtedly helps to address the more stable information-processing requirements, it might not provide as complete a solution here as it does for the global strategy. In fact, *Bartlett/Ghoshal*[41] argue that for coordination, the transnational solution relies less on formal structure and more on shared values and informal networking. These characteristics reduce the goodness of fit between formal structure and the information-processing requirements associated with a firm's strategy. This argumentation does not mean that structure is unimportant, but that it is not as complete an answer for fitting information-processing capacities to information-processing requirements as it is for a global strategy.

Finally, we note that both strategy and structure in German firms has been dynamic[42]. Fourty-four per cent of the sample firms have had at least one change in structure over the past ten years. Thus, structural fit with strategy in German firms is not the result of perpetuating some static fit from the past. Rather, such a finding suggests that firms consider formal structure important and that firms deliberately seek fit, as defined by current theory, when they change strategies and structures. This finding argues strongly for continuing research on international strategy-structure theory, so that this field remains an attractive alternative for understanding the international firm.

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41 See *Bartlett/Ghoshal* (1989).
42 See *Schewe* (1998).

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APPENDIX: MEASUREMENT OF VARIABLES

1. Organizational structure was measured by presenting respondents descriptions and simplified organization charts of the various types of structure and asking them to select that which best describes their organization. This variable represents the operating structure, which can be different from the legal structure of firms.

2. Size of firm was measured by firm's sales.

3. Product diversity was measured by the number of 5-digit product classes associated with the firm (taken from the Hoppenstedt classification system).

4. Competitive strategy was measured by presenting respondents descriptions of Porter's cost leadership, differentiation, and focus strategies and asking them to estimate the percentages of a firm's sales falling under each competitive strategy.

5. Degree of internationalization was measured by the percentage of a firm's sales occurring outside of the parent country.

6. Type of international strategy was measured by presenting respondents descriptions of the international, multinational, global, and transnational strategies and asking them to estimate the percentage of a firm's foreign sales falling under each type of international strategy.