A PHENOTYPE INTERPRETATION OF ISOMORPHISM AND DIVERSITY: CORPORATE STRUCTURES AND STRATEGIES IN THE INTERNATIONAL DATAPROCESSING INDUSTRY

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Abstract

This paper provides an empirical interpretation of organizational isomorphism and diversity in global industries. We will consider how the ongoing internationalisation process has affected leading multinational enterprises from various home-countries. Our main aim is to investigate whether leading multinational enterprises have gradually lost their national characteristics and have become similar in terms of their strategies and structures. Empirical research is directed towards a number of leading enterprises in the international dataprocessing industry.

In this paper we will focus on companies participating in global markets. We will consider how leading enterprises from a number of different home-countries are affected by the globalisation of their environment. Our main aim is to detect whether companies that face the same environmental conditions will become increasingly similar to each other. In other words, at the most abstract level we raise the issue: whether a homogeneous competitive environment creates a homogeneous group of companies.

The concept of homogeneity among organizations has received widespread attention in both the strategic management and organizational literature (see for instance Hawley, 1968; Meyer and Rowan, 1977; Hannan and Freeman, 1977; Dimaggio and Powell, 1983). Homogeneity among organizations is often referred to as organizational ’isomorphism’. The concept of isomorphism was first described by Hawley (1968, p.334) who suggested that "... units subjected to the same environmental conditions, or to environmental conditions as mediated by a given key unit, acquire a similar form of organization." According to this line of thinking also organizations that are active in the same global environment would tend to become increasingly similar in terms of their structure and strategies.

In organizational literature the emergence of isomorphism is discussed in terms of two fundamental forces: adaptation and selection. Adaptation to certain changes in the environment materializes as firms try to increase their fit with the environment (Burns and Stalker, 1961; Lawrence and Lorsch, 1967). A better fit increases the profitability of companies which enhances their survival chances in the long run. Also, less successful firms try to mimic the structures and strategies of their more successful competitors. Adaptation to changes is however not always possible. Companies are often characterized by strong inertial pressures that make it very difficult to achieve the desired adaptation. In a rapidly changing environment it is doubtful whether organizations are changing quickly enough to increase their fit with a specific environmental state. In the literature this relatively slow process of adaptation is referred to as ’relative inertia’, i.e. relative in comparison to fast environmental changes. Sometimes changes in the environment are so radical that adaptation to these changes is impossible (see Hannan and Freeman, 1977). One of the most important determinants of such inertia is size. Small, young firms are often able to change their behaviour much more rapidly than their larger competitors because of their simple structures and the fact that internal power is concentrated within one or a few people. On the other hand, large multi-national enterprises are often equipped with large buffers against temporary setbacks, whereas small firms are often not capable of dealing with stagnation during periods of transformation. This aspect can be seen as one of the explanations of the liability-of-newness phenomenon (Stinchcombe 1965), which asserts that mortality rates of organizations decline exponentially with age. Other explanations of this phenomenon can be found in the time-consuming process of legitimation and the ability of older firms to reproduce their common routines. Because adaptation to changing environmental circumstances is often slow in relation to the speed of change, selection forces are granted time to develop. Inspired by the Darwinian conception of ’natural selection’ many authors in the population ecology tradition (Aldrich, 1979; Caroll, 1987,1988; Hannan and Freeman, 1977, 1989; Singh & Lumsden, 1990) contend that organizations that are best adapted to a specific environment survive, while other less adapted organizations die. This notion closely resembles the orthodox economic neo-classical perception of competitive forces that establish a static equilibrium in which successful firms achieve their optimal size and unsuccessful firms disappear. Under these conditions isomorphism among organizations implies that only those having acquired a good ’fit’ with their environment will survive.

In general the concept of isomorphism assumes a rather deterministic relationship between the environment and the individual organization in the sense that organizations are strictly contingent on their environment. Although this might hold for a number of small organizations, advocates of resource dependence and strategic choice (Child, 1972; Pfeffer, 1972; Pfeffer and Salancik, 1978) have, in our opinion, appropriately argued that it would be very unrealistic to view powerful multi-national enterprises as such. In line with, for instance, oligopoly theory in economics large multi-national enterprises do not have to be considered as merely passive recipients of environmental pressures, but they are primarily seen as active organizations that are well capable of influencing their own environment (Pfeffer and Salancik, 1978). Under these conditions, variations among organizations occur partly as a result of strategic decision making within organizations.

In this paper we contend that multi-national enterprises are neither perfect adapters nor completely contingent on their environment. The attention in the present contribution for the international context of the competitive environment of firms not only reflects the growing importance of the internationalization of firms itself, it also intends to contribute to the ’imprintment’ line of theory. Stinchcombe (1965) argued that social, cultural, technological and competitive conditions under which a company is established will have a continuing effect on an organization’s strategy and structure. Although the inprintment hypothesis is discussed elaborately in the literature (see for instance Aldrich, 1979; Hannan and Freeman, 1977, 1984, and 1989; Tolbert & Zucker, 1983) there is, to the best of our knowledge, no empirical research on, for instance, the continuing effects of the domestic background of companies on their behaviour and organization in an international competitive environment.

RESEARCH STRATEGY, METHODOLOGY AND DATA

The main question we will deal with in this paper is whether in a global environment isomorphism takes place among multinational enterprises from different home-countries. As described above, the degree of isomorphism is above all dependent on the impact of two fundamental drivers, i.e. adaptation and selection. The impact of these drivers is related to the degree of competition within a specific organizational field. Increased competition raises the importance of both selection and adaptation. Under conditions of strong competition less ’fit’ organizations will decline and eventually be excluded from the market. From an adaptation perspective, increasing competition raises the need for firms to adapt their structures and strategies to the specific demands of their environment. The degree of isomorphism is therefore positively related to the degree of competition in the market. Competition is however not the only important factor of isomorphism. Whether isomorphism takes place or not is also dependent on the specific characteristics of the environment. Hawley (1968) asserted that homogeneity of organizations reflects the homogeneity of their environment. Global markets, as opposed to multi-domestic markets, are typical examples of homogeneous environments. Thus, if isomorphism takes place at all, we should be able to detect these patterns of isomorphism in highly competitive global markets. Therefore we hypothesize:

Hypothesis 1: Patterns of isomorphism amongst companies, in terms of their structural and strategic features, are likely to be found in highly competitive global markets where companies compete under identical, international conditions.

The ability of firms to respond to certain changes in the environment is often dependent upon patterns of behaviour they tended to exploit in the past (Nelson and Winter, 1982). As argued in the first section, large enterprises often suffer from inertia. Because of these inertial pressures, we expect that it is very difficult for companies, even for large multi-national enterprises, to loose their domestic characteristics in favour of a truly global orientation. Following Stinchcombe's (1965) 'inprintment' theory, firms are expected to be particularly affected by their national backgrounds as experienced during the first stage of their organizational life cycle when they are learning 'the tricks of the trade' and the rules of competition in their domestic markets. As a consequence these conditions become imprinted in their organizational structure (Boeker, 1988). This coincides with the ideas of Hu (1992) and Porter (1986 and 1990) who argue that in spite of their international activities, multinational enterprises can often still be identified by their national backgrounds. These arguments lead to the following hypothesis:

Hypothesis 2: The structures and strategies of enterprises operating in a global environment can still be identified with regard to their original domestic backgrounds.

The two basic hypotheses as formulated above will be evaluated on the basis of structural and strategic (dis)similarities among a number of multinational companies that are participating in a highly competitive global environment. We decided to focus on leading companies in the international dataprocessing industry because this industry is characterized by global competition among a number of large multi-national enterprises that are well known for their international market orientation and their globally dispersed R&D and production facilities (Flamm, 1988; Forester, 1993; Leban, R., Lesourne, J., Oshima, K., Yakushiji, T, 1989). The second reason to study the computer industry is its highly competitive nature (Forester, 1993, Harper, 1986, IDC, 1988). Competition in the computer industry has always been particularly intense and cuts across national boundaries. A more practical reason to choose the computer industry is the availability of reliable data on a relatively large number of enterprises operating in international markets. The strategic and structural variables analyzed below together indicate the organizational properties of companies.

To analyze isomorphism and diversity world-wide we have chosen to evaluate the strategies and structures of firms from three different regions, i.e. Europe, Japan, and the USA. In order to guarantee the 'global' character of our sample we have incorporated only leading companies in the international dataprocessing industry. The population of companies includes 22 US companies, 6 European companies and 11 Japanese companies, see Appendix A for details. Statistical techniques such as discriminant analysis and analysis of variance (ANOVA) allow us to generate more systematic insight in structural (dis)similarities between companies from different international economic regions and the major determinants of such patterns.

The use of discriminant function analysis enables us to assess whether and to what degree isomorphism takes place, see the first hypothesis. If high levels of isomorphism can be found among the companies from different home regions, this would support the view that globally operating companies have converged into similar structures and strategies. If on the other hand companies can still be clearly identified by their national or regional background, then this would indicate that organisations are still influenced by their 'local' environment. In that case, isomorphism is only found at the 'regional level' and our second hypothesis would be supported. If low levels of isomorphism can be found in both the regional and international context then the strategic choice or resource dependence models seem to be most appropriate to describe the situation in the international computer industry.

For our empirical analyses we make use of a number of structural and strategic variables. Two basic operational constructs are used to detect differences or similarities in the structure of organizations: size and diversification. Apart from size we also included diversification as a standard indicator of organizational structure. It is also important to consider both the width of corporate activities in terms of operations and general technical capabilities that possibly generate economies of scope (diversification) and the degree to which companies concentrate their activities in dataprocessing (specialization). Apart from structural characteristics we will also focus on more strategically motivated characteristics. In high technology industries such as the dataprocessing industry a firm's competitive strategy is to a large degree dependent on its technology strategy. Therefore we decided to focus on measures related to the technology strategy of the various companies. In this paper we will measure the concept of technology strategy by means of three basic indicators: patents, R&D expenditures and indicators related to the strategic technology partnering behaviour of the various firms. Combined, these indicators provide an appropriate description of the various technology strategies of the companies in our sample. All data for the analysis are taken from the MERIT-CATI data bank, see Appendix B.

Size of companies is measured by the average of corporate revenues that companies realized during the period 1986 - 1990. We have chosen revenues as an indicator instead of the more frequently applied employment indicator to account for quasi-integration. It is well-known that Japanese companies have fewer employees than their US and European competitors due to the Japanese lean production practice and sophisticated customer - supplier networks. However, their size in terms of revenues, which roughly equals turnover, is in our opinion a better indicator of their economic magnitude in comparison with companies from other regions. Differences in size between European, Japanese and US companies are analyzed by means of two specific indicators. The first indicator is the average total revenues of companies for the yearly average of the period 1986 - 1990 (SIZE). The second indicator of size (DPSIZE) is related to the dataprocessing activities of these companies, i.e. their average dataprocessing revenues during the same period.

Diversification is first measured as the average number of information technology segments from a total of twenty segments in which companies were engaged during 1989. The degree of specialization is a different measure indicating the share of dataprocessing sales in total corporate sales during the period 1986 - 1989. These two variables suggest an inverse relation which, although plausible, is not logically binding because the statistical basis of both measures is quite different. We have combined our findings on diversification and specialization in one measure, i.e. the overall degree of diversification. Factor analysis, in particular principal component analysis, is applied to reduce our data set to arrive at one composite variable (DIV). Principal component analysis provides us with a tool to generate a single composite variable from several variables by reducing the data by means of the factor scores that are produced in the initial analysis, see Hagedoorn (1989).

The technology strategy variable (TECH) is based on a number of innovation and technological strength related indicators. The absolute innovative strength of companies is indicated by their number of sector relevant US patents, granted in the period 1980 - 1988. We have taken US patents because we expect the US market to be the most advanced in terms of the combination of competition, openness and technological sophistication, in particular in information technology. The absolute number of patents granted was taken to have at least one indicator of absolute strength next to a number of more relative indicators. Also, we found that the correlation between R&D intensity, alliance related variables and patenting intensity is extremely weak, whereas the correlation with the absolute number of patents is significant. The other, more relative, indicator of innovative capabilities that we apply is the R&D intensity of firms, i.e. their total R&D expenditures as a percentage of total corporate sales during the period 1986 - 1990. Apart from these two ’standard’ innovation strategy indicators we will also look at two measures that are related to strategic technology partnering behaviour of firms during the eighties. One of these indicators is the so called T-M ratio which indicates if the strategic technology alliances of companies made in the period 1980-1989 are primarily related to R&D or whether these alliances are more closely related to marketing and market entry activities. We have included this indicator because Hagedoorn and Schakenraad (1994) found that in particular in information technology R&D inclined strategic linkages are associated with improved economic performance. The other partnering related indicator is the generation-to-attraction ratio which indicates the degree to which the strategic partnerships of companies generate technology to their partners or absorb technology from them. We assume that the more a company generates technology to its partners the stronger the technological position of this company. We have standardized both these ratio’s at a $\log_{10}$ scale. Technology-to-market ratio’s between 0 and +1 indicate an R&D inclination of the alliances of companies, scores between 0 and -1 refer to a stronger market orientation of the alliances made by companies. Generation-to-attraction ratio’s between 0 and +1 indicate a technology generating effect through the alliances of companies, scores between 0 and -1 show an absorbtion tendency in the alliances of companies. In order to construct a combined indicator of strategic technology partnering behaviour of companies we applied principal component analysis in a similar way as for the measure of overall diversification.

The overall indicator of technological strength (TECH) consists of the combined variables for patenting, R&D intensity, and technology partnering by means of factor analysis.

PATTERNS OF DIVERSITY AND ISOMORPHISM

In order to reveal patterns of diversity and isomorphism we applied a discriminant function analysis using the country of origin of firms (COUNTRY) as a categorical, dependent variable. The weights of the discriminant function are estimated in order to obtain the largest discriminating power between the various countries. In order to evaluate our first hypothesis which suggests that isomorphism among companies is likely to be found in highly competitive global markets we will start with an evaluation of the mean scores on the individual variables of companies from different home countries. In order to determine the most distinguishing variables for the analysis, we start our examination of companies in the dataprocessing industry with an evaluation of the Wilks' Lambda and F values of the various variables see Table 1. The Wilks' Lambda statistic is concerned with the ratio between the within group variance and the total variance. A ratio close to 1 points at an equality of group means, whereas lower values are associated with large differences between the various group means. For each variable the F-ratios are calculated in order to see whether the group means of companies from different home-countries are equal on specific variables. The results indicate that group means are not equal in the case of the diversification (sign. 0.0006) and size (sign. 0.0085) variables. The remaining two variables, TECH and DPSIZE, show relatively high Wilks' Lambda values and significance levels; therefore, the group means for these two variables are not significantly different from each other.

Insert Table 1 about here

In order to achieve a better understanding of the two variables that most clearly distinguish between the major regions, we performed a ’one way’ ANOVA to asses whether group means differ significantly from each other. As our study refers to three groups (regions) a ’normal’ T-test study, which is only capable of dealing with two groups, could not be performed. A ’one way’ ANOVA implies only one independent variable (factor). The analysis is performed by the SPSS program ONEWAY. The advantage of using that particular program instead of SPSS’s ANOVA is that ONEWAY is able to provide complementary statistics such as the Scheffe test. This method is applied in our present analysis because the size of groups is not equal. The Scheffe test is a sort of F test that uses the differences between means to calculate an F ratio. This facilitates us to calculate which groups differ significantly from each other with respect to a certain variable.

The first ANOVA sub-table in Table 2 shows that the mean values of the variables measuring diversification for US dataprocessing companies significantly differ from European companies, as well as from Japanese companies. The second ANOVA sub-table clearly indicates that US firms differ significantly from their Japanese competitors with respect to their overall size. This indicates that isomorphism in the dataprocessing industry does not take place in two of our structure-related variables.

Insert Table 2 about here

After evaluating the discriminatory power of separate variables we continue with the assessment of the overall discriminatory power of the total set of variables. In order to do so we have to consider the ’goodness’ of the discriminant functions reflected in various indicators presented in Table 3. The first indicator is the eigenvalue which represents the relationship of the between group and the within group sum of squares. Higher eigenvalues can be associated with more discriminating functions. In this case the functions seems to have considerable discriminating power. Other important statistics include Corr (canonical correlation) which represents the proportion of total variance which is accounted for by differences among regions. In order to measure overall isomorphism in the dataprocessing industry (see hypothesis 1), the chi square value is of particular importance. In this case we find a chi square value of 19.621 and a corresponding significance of 0.0119 which implies that mean scores on the combined variables are not equal for companies from different home countries. Patterns of isomorphism as expected through in first hypothesis are, therefore, not be found in the dataprocessing industry.

Insert Table 3 about here

Although previous analysis indicates that companies from different home countries differ with respect to a number of variables, we will try to assess whether enterprises operating in a global environment can still be identified with regard to their original domestic backgrounds (see hypothesis 2). In order to test this hypothesis we classified all cases according to their scores on the combined discriminant functions. Whereas the prior probability of classification is 33.33%, the actual classification procedure results in a correct classification of 58.97% of the cases, see Table 4. This indicates that, although not in all cases, we can still identify the home region of a large number of organizations on the basis of their scores on the various indicators. Hypothesis 2 can therefore not be rejected on the basis of our analysis.

Insert Table 4 about here

In order to visualise the grouped cases we present a scatter plot which shows the dispersion of companies. The horizontal axis depicts function 1 whereas the vertical axis represents function 2. The standardised canonical discriminant function coefficients, see Table 5, indicate high scores on function 1 obtained by companies that are highly diversified and have a relatively large dataprocessing size. Function 2 on the other hand generates high scores for companies with a relatively small dataprocessing division but with a strong technological position.

Insert Table 5 about here

In the scatterplot we notice that by and large US firms are characterized by lower scores on the first function, i.e. high diversification and larger dataprocessing activities, with the exception of some more diversified firms of which AT&T and Motorola are clear examples. The second function shows more dispersion for US firms with on the one hand relatively small high technology firms such as for instance Sun and on the other hand less sophisticated, peripheral firms, for instance Seagate and Memorext. If we turn to the dispersion of the European dataprocessing companies we can see that the distribution of scores is quite scattered, which explains why as many as fifty percent of the European companies are misclassified by the discriminant functions. On the first dimension (function

1) we see large differences between large diversified firms such as Philips and Siemens and smaller specialized firms such as Groupe Bull and Olivetti. The second dimension (function 2) indicates the relatively strong technological base of Philips compared to a less developed technological base of Olivetti. In the case of Japanese dataprocessing companies where we find less dispersion, except for the outlier Amdahl, an American firm before it was taken over by Fujitsu. From this plot it appears that Amdahl is still different from most of its Japanese competitors with respect to its diversification pattern and dataprocessing size.

Insert Figure 1 about here

DISCUSSION AND CONCLUSIONS

Our findings suggest that divergence is still a major characteristic of companies in this global industry and that forces leading to isomorphism have not yet become apparent in the sense that they have led companies to acquire one identical or largely identical form of organization. In the dataprocessing industry companies are found to remain less global, still sharing regional or domestic strategic and structural features for an extended period of time after they have become internationally oriented.

Our analysis indicates a strong rejection of our first hypothesis which argued that in a highly competitive global industry such as the data-processing industry, firms would tend to become isomorphic to each other in terms of both structure and strategy. Companies from different regions were found to differ significantly on the structural variables size and diversification as well as on a combination of all indicators. Our second hypothesis which asserted that the structures and strategies of enterprises operating in a global environment could still be identified according to their original domestic backgrounds was tested by using a technique which classified the various companies in terms of economic regions according to their structural and strategic characteristics. Almost 60% of the cases were classified correctly. Because the prior probability of classification was 33% this indicates that a large number of firms can still be identified in terms of their region of origin. This suggests that neither adaptation nor selection forces have been strong enough to generate clear patterns of isomorphism among organizations in the international dataprocessing industry. Apparently national and internationally regional backgrounds are still to a large extend imprinted in leading multinational enterprises.

The variation in the population at large as well as within the three regions does not suggest a deterministic relationship between environment and the individual organization. Turning briefly to a more theoretical level of discussion we can point at an interpretation of external and internal influences on the formation of company characteristics that shares a number of major theoretical traits with evolutionary economic theory. Contributions from this line of theory pay more attention to intra-population variance than both the organizational population ecology theory and the orthodox economic theory of the firm (Nelson and Winter, 1982 and Winter, 1990). The perception of firm heterogeneity, for instance in terms of size and strategy, and differences in organizational fitness of companies are major theoretical building blocks in evolutionary economic theory. Following Winter (1990) we can interpret the observed variations in the international dataprocessing industry as partly reflecting the different environments they encountered in early as well as in later stages of their development. Also the variation in structure and strategy is not fully reflecting the inherited properties because there is also some degree of convergence or at least non-significant divergence with regard to for instance aspects of technological strategies that are so crucial to this high-tech industry. In that sense our findings, that reject a straightforward isomorphic, deterministic interpretation of organizational aspects of company behaviour, suggest a more phenotype-like interpretation of the variation among a population of companies. In such a non-deterministic and evolutionary understanding of organizational development and inter-firm heterogeneity within populations companies are jointly determined by their inherited properties and the environmental conditions which they face through competition in changing markets.

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APPENDIX A

Companies in the dataprocessing population

USA	Apple	Japan	Amdahl
	AT&T		Canon
	CDC		Fujitsu
	Compaq		Hitachi
	Data General		Matsushita
	DEC		Mitsubishi
	H-P		NEC
	IBM		NTT
	Memorext		OKI
	Motorola		Ricoh
	NCR		Toshiba
	Prime		
	Seagate	Europe	Bull
	Storage		Mannesmann
	Sun Microsystems		Nokia
	Tandem		Olivetti
	Tandy		Philips
	TI		Siemens
	Unisys		
	Wang		
	Xerox		

APPENDIX B

The Cooperative Agreements and Technology Indicators (CATI) data bank

The CATI data bank is a relational database which contains information on nearly 10,000 cooperative agreements involving some 3500 different parent companies has been collected. Systematic collection of interfirm alliances started in 1988. If available, many sources from earlier years were consulted enabling us to take a retrospective view. In order to collect interfirm alliances we consulted various sources, of which the most important are specialized journals which report on business events.

This method of information gathering which we might call ’literature-based alliance counting’ has its drawbacks and limitations:

- In general we have only come to know those arrangements that are made public by the companies themselves.
- Newspaper and journals reports are likely to be incomplete, especially when they go back in history and/or regard firms from countries outside the scope of the journal.
- A low profile of small firms without well-established names is likely to have their collaborative links excluded.

Despite such shortcomings, which are largely unsolvable even in a situation of extensive and large-scale data-collection, we think we have been able to produce a clear picture of the joint efforts of many companies.

The data bank contains information on each agreement and some information on participating companies. The first entity is the inter-firm cooperative agreement. We define cooperative agreements as common interests between independent (industrial) partners which are not connected through (majority) ownership. In the CATI database only those inter-firm agreements are being collected, that contain some arrangements for transferring technology or joint research. We also collect information on joint ventures in which new technology is received from at least one of the partners, or joint ventures having some R&D program. Mere production or marketing joint ventures are excluded.

We regard as a relevant input of information for each alliance: the number of companies involved; names of companies (or important subsidiaries); year of establishment, duration and year of dissolution; field(s) of technology; modes of cooperation. Depending on the form of cooperation we collect information on equity sharing; the direction of capital or technology flows; the degree of participation in case of minority holdings; some information about motives underlying the alliance; the character of cooperation, such as basic research, applied research, or product development possibly associated with production and/or marketing arrangements.

The second major entity is the individual subsidiary or parent company involved in one (registered) alliance at least. We ascertain its nationality and we determine the main branch in which it is operating and classify its number of employees. In addition to this time-series for employment, turnover, net income, R&D expenditures and numbers of assigned US patents have been stored.

TABLE 1

Wilks' Lambda (U-statistic) and univariate F-ratio with 2 and 36 degrees of freedom

Variable	Wilks' Lambda	F	Significance
DIV	.66225	9.180	.0006
TECH	.94071	1.134	.3328
SIZE	.76746	5.454	.0085
DPSIZE	.99175	.1498	.8614

TABLE 2

One way analysis of variance in diversification and overall size

Diversification					Size				
Mean	Group	USA	EUR	JAP	Mean	Group	USA	EUR	JAP
-.5079	USA				15.1958	USA			
.4915	EUR	*			16.2576	EUR			
.7414	JAP	*			16.4720	JAP	*		

TABLE 3

Canonical discriminant functions

Fcn	Eigenvalue	Variance	Pct	Corr		Fcn	Lambda	Chisquare	DF	Sig
					:	0	.5662	19.621	8	.0119
1*	.5539	80.23	80.23	.5970	:	1	.8799	4.415	3	.2200
2*	.1365	19.77	100.00	.3466	:					

TABLE 4

Results of the discriminant analysis for dataprocessing companies

Actual Group	No. of Cases	Predicted Group Membership USA	Europe	Japan
Group	22	13	3	6
USA		59.1%	13.6%	27.3%
Group	6	1	3	2
Europe		16.7%	50.0%	33.3%
Group	11	1	3	7
Japan		9.1%	27.3%	63.6%
Ungrouped	1	1	0	0
		100.0%	0%	0%

Table 5

Standardized canonical discriminant function coefficients

	FUNC 1	FUNC 2
DIV	.92902	-.19277
TECH	-.19965	1.43628
SIZE	.09941	.45610
DPSIZE	.31834	-1.32977

Figure 1

Scatterplot of US, European and Japanese dataprocessing companies