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**MOBIUS — A Procedure for Identifying
Mobility Barriers Based on Dynamic
Strategic Grouping Analysis**

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ABSTRACT

The Mobility Barriers Paradigm has strongly influenced much recent work in strategic management research, particularly that of strategic group research. In this note we propose a procedure that enables the identification of those variables that act as mobility barriers in an industry. We also propose a classification of mobility barriers based on the degree of observed mobility and the extent to which change is desired on these variables. Our procedure is demonstrated in the context of the pharmaceutical industry.

MOBIUS--A Procedure for Identifying Mobility Barriers Based on Dynamic Strategic Grouping Analysis

Introduction:

The concept of strategic groups has become an important unit of analysis in developing theories of competition in the field of strategic management. The commonly accepted definition of a strategic group, due to Porter (1980: 129), states that "a strategic group is the group of firms in an industry following the same or a similar strategy along the strategic dimensions." McGee and Thomas (1986) provide a thorough review of both the conceptual framework and current research work in this area while Harrigan (1985) proposes the application of clustering procedures for strategic group analysis using the "Mobility Barriers Paradigm" (p. 56). To quote Harrigan (1985, p. 57) "Mobility Barriers are structural factors that protect successful firms from invasions by adjacent competitors (Caves and Porter, 1977). They are internal (to the industry) entry barriers which delineate boundaries between different strategic groups, and they may be contrasted with the external entry barriers discussed in traditional economic theory which deter outside firms from entering any part of the industry (Harrigan, 1981)." Further, according to both Harrigan (1985) and McGee and Thomas (1986), it is important not only to identify the presence of inter-group mobility barriers, but also to examine how, and to what extent, these barriers influence competitive activity.

Several strategic grouping studies (e.g., Dess and Davis (1984)) have used cluster analysis to form strategic groups. Typically, cluster analysis leads to the development of strategic groups by

grouping the companies in an industry based on their "scores" on a set of important strategic variables. However, such grouping for any one time period does not in itself provide sufficient information to either identify the strategic variables that act as barriers to intergroup mobility or to infer the heights of such barriers. This is because no information is provided by such a single period grouping about movement between groups (which clearly requires at least two grouping periods).

Therefore, this note presents a procedure for identifying the strategic variables that act as mobility barriers in an industry. The discussion of the procedure and its rationale is followed by an application of this procedure to the pharmaceutical industry. This procedure is called MOBIUS--an acronym for Mobility Barriers Identification Using Strategic Grouping.

The MOBIUS Procedure

The essential idea behind MOBIUS is very simple. Its objective is to identify strategic variables that act as barriers to movement of companies from one strategic group to another. If a mobility barrier is defined in terms of certain strategic variables, then there should be very little shift in the structure (group membership and number of groups) of strategic groups (characterized by these variables) over time. On the other hand, if another set of strategic variables is not a mobility barrier, then, considerable shifting in strategic group structure over time, is a likely occurrence. However, it is also possible that little or no shift in group structure may be observed for a certain set of factors (variables) because there is no motivation

on the part of companies to change group affiliations by framing strategic policy shifts in terms of these variables. While this may happen, we still define any such set of variables as a mobility barrier. Figure 1 provides a simple diagram of the possible combinations of observed structural change and desire to change. The case just discussed is identified as Mobility Barrier (Type B) in this figure (that is, Low Density to Change, Low Observed Structural Changes). Mobility Barrier (Type A) involves those sets of variables which provide strong barriers but also strong motivations for a company to change group affiliations. Clearly, the mobility barriers A and B are quite different in character. For example, considering Type B, it is unlikely that significant structural changes in strategic groups will involve variables which companies perceive to have little or no influence on their desire to change group affiliations. Thus it is perhaps quite safe to say that those strategic variables which lead to considerable structural shifts are those in the left hand upper quadrant of Figure 1 (on which better company-environment fits are obtainable by such shifts).

The MOBIUS procedure defines a measure of structural change which uses the output of strategic grouping analyses undertaken for different time periods. An index called a "Match Ratio" (MR) captures structural change and its rationale is explained below. (Table 1 shows the computational formula for this index.)

Insert Table 1 about here

Consider a comparison between strategic groups for two time periods, T_1 and T_2 . Let there be m strategic groups in period T_1 and n strategic groups in period T_2 . If the same companies belong to the same groups in both time periods (and, therefore, $m=n$) then there is no mobility between these two time periods (i.e., no change in group structure or membership). If either m is very different from n , or if there are considerable differences in group membership between the two time periods, then there is relatively high mobility between the two time periods, and the corresponding MR is high. The entry corresponding to row i and column j , in Table 1, is the number of companies that were in group i in period T_1 which moved together to group j in period T_2 . Clearly if the off-diagonal entries of this table all have zeros, then there is a perfect match between groupings in the periods T_1 and T_2 . If, on the other hand, all the diagonal entries are zeros, it is implied that no group retains the same members. The MR corresponding to this condition is 0. The MR corresponding to perfect match between T_1 and T_2 is 1. All other realizations of Table 1 will result in MR between 0 and 1. Thus the index MR is bounded between 0 and 1, and increasing mismatch between groups gives rise to higher off-diagonal entries which in turn leads to higher MR. It is, therefore, an elegant and informative index of mobility. This index would thus allow the comparison of observed mobility (or immobility) on different sets of strategic variables. Mobility barrier strategic variables may thus be identified.

The complete MOBIUS procedure consists of the following steps

- 1) Identification of relevant sets of strategic variables.
- 2) Identifying companies constituting the industry under study.

- 3) Obtaining appropriate measures for each company for all relevant strategic variables across time.
- 4) Forming strategic groupings for each time period for every set of strategic variables.
- 5) Computing the MR for each pair of consecutive time periods for every set of strategic variables.
- 6) Inferring of Mobility Barriers from the MR results.
- 7) Obtaining industry expert opinions to throw light upon the differences between Type A and Type B Mobility Barriers.

This procedure is demonstrated for the pharmaceutical industry.

Empirical Example: Pharmaceutical Industry

The strategic variables considered here encompass both scope and resource deployment activities. These variables constitute a union of those typically used to capture strategic behavior in the strategic management literature. The details of the extensive procedure involved in choosing these variables is described in Sudharshan, Thomas, and Fiegenbaum (1985).

A total of 22 companies, representing 90 percent of the sales in this industry were selected. Data were obtained on Marketing Strategy, Financial Strategy, Production Strategy, and Scope variables for the 22 companies for the period 1974-1980 from COMPUSTAT® tapes. (Descriptions of the specific variables chosen are shown in Table 2.)

Insert Table 2 about here

For each variable type (i.e., Marketing, Financial, Production Strategy and Scope) MRs were computed between strategic groups

(obtained by cluster analysis, as in Harrigan (1985)) for every pair of adjacent years. These MRs are shown in Table 3. From this table

Insert Table 3 about here

it is evident that there is considerable stability in strategic grouping structure, in terms of Scope (MR=0.97) and Financial Strategy (MR=0.93) variables. On the other hand, the strategic group structures based up on Marketing Strategy variables (average MR=0.54, minimum MR=0.36, maximum MR=0.81), and Production Strategy variables (average MR=0.64, minimum MR=0.31, maximum MR=0.81) change considerably. Thus it appears that Scope and Financial Strategy variables act as mobility barriers in this industry, whereas, Marketing and Production strategy variables do not.

Discussion:

The foregoing example illustrated the first six steps of the MOBIUS procedure. Thus, Scope and Financial strategy were identified as mobility barriers. It is not clear based solely on this data whether these are Type A or Type B mobility barriers. Expert opinion should enrich the identification of the nature of individual mobility barriers. Further, the same variable set may be a Type A barrier for some companies and Type B for others. Thus even more detailed analysis would be necessary. However, in spite of the absence of the seventh step of the MOBIUS procedure, our illustration demonstrates its usefulness in analytically identifying mobility barriers in an industry.

In addition, the fact that considerable inter-group, inter-temporal mobility is noticed for the Marketing and Production strategy variables, is important for a planner in this industry. The time horizon for monitoring and forecasting competitive strategic changes in terms of these dimensions should be shorter than for mobility barrier variables.

It should be noted that the MOBIUS procedure does not formally provide for a measurement of the "height" of the mobility barriers. However, we suggest that this height not be measured as the distance between strategic group boundaries in the metric (or measurement space) used for clustering. We recommend that this distance be converted into an effort or cost measure (at least for the Type A barriers, for the Type B ones, of course, this measure is of no immediate consequence). This would make (a) mobility barrier heights on different barriers comparable, and (b) allow serious consideration of the feasibility of the scaling of such barriers by particular companies.

In conclusion, the MOBIUS procedure, by providing an analytical approach to identifying mobility barriers in an industry is likely to be useful (a) to practitioners in understanding their environment and in planning and (b) to academic scholars interested in empirically validating theories of competitive strategies within the paradigm of strategic grouping (mobility barriers). We also hope that this procedure will spark some new testing of theoretical insights such as, for example, the relationship between the number and types of mobility barriers and industry life cycles.

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Table 1: Match Ratio Computation

		Period T ₂ Groups				Total
		1	2	j	n	
Period T ₁ Groups	1	C ₁₁	C ₁₂	-----	C _{1n}	N ₁₁
	2	C ₂₁	C ₂₂	-----	C _{2n}	N ₁₂
	.	.	.	-----	.	
	.	.	.	-----	.	
	i	.	.	-----	C _{ij}	N _{1i}
	.	.	.	-----	.	
	m	C _{m1}	C _{m2}	-----	C _{mn}	N _{1m}
Total		N ₂₁	N ₂₂	N _{2j}	N _{2n}	N

C_{ij} = number of companies that belong to group i in Period T₁ and group j in Period T₂.

N_{1i} = total number of companies belonging to group i in Period T₁.

N_{2j} = total number of companies belonging to group j in Period T₂.

$$(1) \sum_{i=1}^m N_{1i} = \sum_{j=1}^n N_{2j} = N \text{ (the total number of companies)}$$

(2) $\sum_{i=1}^m N_{1i} \neq \sum_{j=1}^n N_{2j}$ means that at least one new company has entered or exited the industry.

$$MR = \frac{\sum_{i=1}^m \sum_{j=1}^n C_{ij}}{1/2(\sum_{i=1}^m N_{1i} + \sum_{j=1}^n N_{2j})}$$

TABLE 2: STRATEGIC VARIABLES AND MEASURES

Variable	Abbreviation	Measurement	Units
A) <u>Scope*</u>			
(V1) Asset	ASS	Gross book value of fixed asset	\$
(V2) Sales	SLS	Firm's total sales	\$
(V3) Advertising	ADV	Firm's total advertising expenditure	\$
(V4) R&D	RD	Firm's total R&D expenditure	\$
(V5) Inventory	INV	Firm's total inventory level	\$
B) <u>Resource deployment</u>			
1) <u>Finance</u>			
(V6) Current ratio	CR	Current assets over current liabilities	-
(V7) Quick ratio	QR	(Cash and short term recs) over current liability	-
(V8) Dividend payout ratio	DP	(Preferred and common dividend) over income before extraordinary items and discontinued operations	-
(V9) Time interest earned	TIE	Operating income before depreciation over interest expense	-
(V10) Debt equity ratio	DE	Debt over equity	-
2) <u>Production</u>			
(V11) Capital intensity	CI	Invested capital dollars over sales dollars	-
(V12) R&D intensity	RDI	R&D dollars over sales dollars	-
(V13) Inventory intensity	INVI	Inventory dollars over sales dollars	-
(V14) Cost efficiency	CE	Cost of goods sold over sales	-
3) <u>Marketing</u>			
(V15) Receivable intensity	RSI	Receivable dollars over sales dollars	-
(V16) Advertising intensity	ADI	Advertising dollars over sales dollars	-
(V17) R&D intensity	RDI	R&D dollars over sales dollars	-

*The scope variables are deflated for inflation. These deflators were taken from Business Statistics 1981 for producer prices in drugs industry.

Table 3: Match Ratio by Strategic Variables Type

Strategic Variables Type	74/75	75/76	76/77	77/78	78/79	79/80	80/81	Aver. (Min.-Max.)
Finance	1.0	.95	.95	.95	.81	.86	.90	$\frac{.92}{(.81-1.0)}$
Production	.31	.54	.72	.72	.63	.81	.81	$\frac{.64}{(.31-.81)}$
Marketing	.81	.59	.40	.40	.36	.54	.50	$\frac{.51}{(.36-.81)}$
Scope	1.0	.90	.95	1.0	0.94	1.0	1.0	$\frac{.97}{(.90-1.0)}$
Overall	.95	.72	.95	1.0	1.0	1.0	.90	$\frac{.93}{(.72-1.0)}$

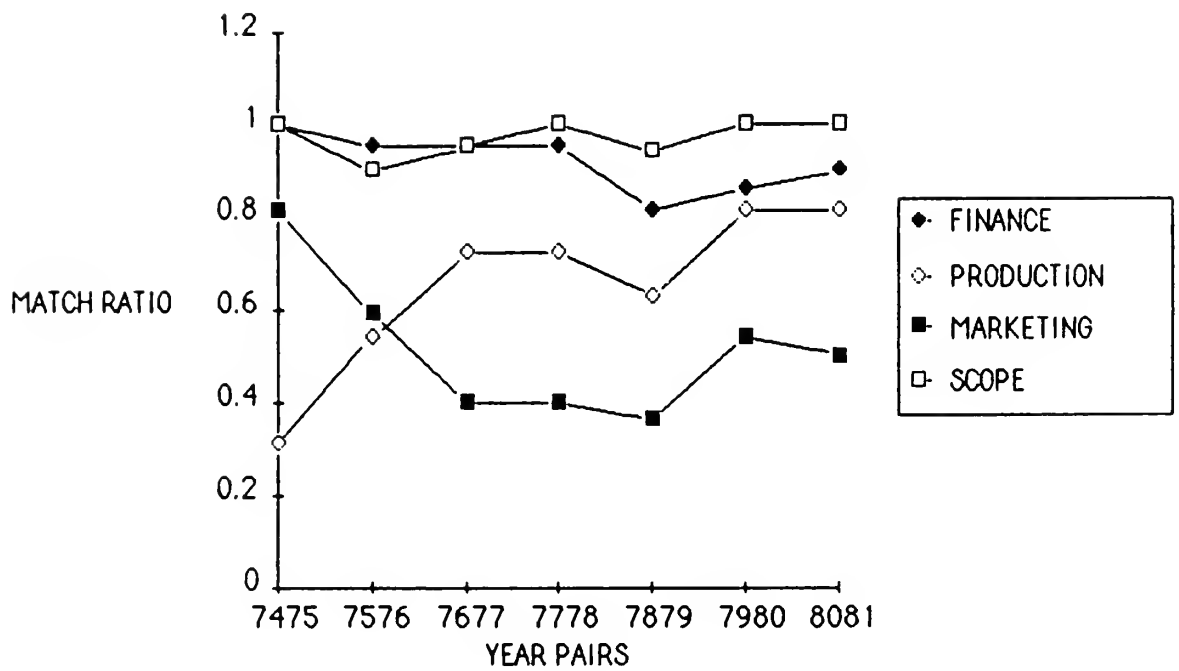
MR = 1 → no mobility → perfect stability

MR = 0 → full mobility → perfect instability

Figure 1: Mobility and Desire to Change

		Desire to Change	
		High	Low
Observed Structural Change	High	Not Barrier	Not Barrier (Unlikely to occur)
	Low	Mobility Barrier (A)	Mobility Barrier (B)
		Mobility Barriers	

FIGURE 2 : MOBILITY BARRIERS



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