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Benchmark Strategic Groupings for Formulating Future Competitive Strategy

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Abstract

Strategic group analysis is attracting considerable interest in the fields of economics and strategic management. The studies to date have focused on relatively simple industries, such as airlines, brewing and major home appliances, and have generally been static in nature. That is, they produce a picture of strategic groupings at a particular point in time. However, they rarely address the theoretical questions of how these strategic groups arise and where they might lead to in the future.

In this study, the notion of benchmark strategic groups is developed using a theoretical model and game theoretic concepts. Benchmark groups represent long-run strategic positions available within an industry and can be used by a representative firm as reference points in formulating its competitive strategy. By considering its current resources/skills and also the current state of the industry, a firm can decide on its target benchmark in order to achieve a sustainable long-run competitive position. An example for an industry with three important strategic dimensions is presented as well as a sample analysis linking these benchmarks with the formulation of competitive strategy.

1.0 Introduction

Conceptually, there is agreement on the definition of strategic groups: "A strategic group is the group of firms in an industry following the same or a similar strategy along the strategic dimensions." (Porter, 1980: 129). Procedurally, there is great diversity amongst researchers who have tried to identify strategic groups. The differences arise mainly from their choice of strategic variables which represent the elements of the firm's strategy. With many different strategic dimensions advanced by researchers, the use of cluster analysis typically leads to different strategic groupings (firm clusters).

The objectives in existing empirical studies, which are briefly reviewed in section 2, have been one (or a combination) of the following: the identification of current strategic groups, the specification of the relationship between performance and strategic group membership and the examination of movements between strategic groups. Most studies demonstrate the existence of strategic groups at a particular point in time but rarely address the theoretical questions of how these strategic groups arise and where they might lead to in the future. The relatively few dynamic group studies have concentrated primarily on the stability of strategic groups and the nature of mobility barriers from the viewpoint of industry structure rather than as an aid to strategic management.

In this study, the concept of benchmark strategic groups will be developed. Benchmark groups develop as industries evolve and represent long-run strategic positions available as the industry matures. A firm in a given strategic group can use the benchmark groups as reference points in formulating its strategy. By matching its current resources and skills with the requirements of each benchmark group, the firm can decide upon its target benchmark and thereby design a strategy to achieve a sustainable long-run competitive position.

It should be noted that these benchmark strategic groups are derived using the concept of dominated strategies--for instance, an average product cost/average quality strategy will be dominated by a below average product cost/average quality strategy, given that product cost and quality are the important strategic dimensions.

The paper develops the benchmark concept in the following manner. Section 2 briefly reviews the literature on strategic groups while Section 3 introduces the model, its assumptions and shows an example of its use. Section 4 discusses the relationship between the concept of efficient frontiers and strategic management. Finally, Section 5 summarizes the research conclusions and discusses further extensions of the model.

2.0 Literature Review

This section reviews the main studies on strategic groups by such writers as Hunt (1972), Newman (1973, 1978), Hatten (1974), Patton (1976), Porter (1976, 1979), Oster (1982), McGee (1984), McGee and Thomas (1984), Ryans and Wittink (1984), Hergert (1983), Primeaux (1983, 1984), Fiegenbaum and Primeaux (1983), Dess and Davis (1984), Hawes and Crittenden (1984) and Kumar et al. (1984). The review characterizes these studies with respect to their methodology, the environment of the study, the purpose of the study, and the strategic dimensions used to form viable strategic groups.

a) Methodology

Except for McGee (1984), McGee and Thomas (1984) and Kumar et al. (1984), all the studies are empirical in nature, using multivariate statistical analysis approaches such as factor analysis, cluster analysis and regression analysis, to justify the conclusions in the respective papers. McGee (1984) and McGee and Thomas (1984) suggest a taxonomy of dissimilarity sources among firms to aid in defining strategic dimensions. Kumar et al. model the competition in an industry as a market game and derive theoretical results.

b) Environment of the Study

Almost all the studies concentrate on intra-industry analysis since a strategic group, as defined by Hunt (1972), is:

> A group of firms within the industry that are highly symmetric ... with respect to cost structures, degree of product differentiation, degree of vertical integration and the degree of product diversification ... formal organization, control systems and management reward, and punishment ... (and) the personal view and preferences for various possible outcomes. (pp. 8-16, emphasis added)

The only exception appears to be Newman (1973, 1978) who defined strategic groups on the basis of relationships which firms had outside the industry.

c) Objectives of the Studies

With the exception of Kumar et al. (1984), all the studies assume the existence of strategic groups. However, they research a number of different issues. Most studies link performance with strategic group membership [Hatten (1974), Hergert (1983), Newman (1973, 78), Oster (1982), Patton (1976), Porter (1976, 1979), Dess and Davis (1984), Hawes and Crittenden (1984)]. Some more recent studies model interactions between strategic groups over time (to indicate evolution, mobility and stability) [Oster (1982), Hergert (1983), Fiegenbaum and Primeaux (1983)]. More recently, from a game-theoretic perspective, Kumar et al. (1984) use theoretical constructs to show existence of strategic groups and prove, given model assumptions, the existence of a linkage between the number of strategic groups and the number of strategic dimensions. They also characterize industry structure by measuring differences between strategic groups and propose similar measures to characterize individual strategic groups by measuring differences between firms in a given group.

d) Strategic Dimensions Chosen

The choice of strategic dimensions has varied from single measures, such as relative size (Porter, 1976, 1979), security price movements (Ryans and Wittink, 1984), market share (Fiegenbaum and Primeaux, 1983), investment behavior (Primeaux, 1983, 1984), to multiple measures, such as degree of product differentiation, vertical integration and product diversification (Hunt, 1972), variables corresponding to marketing, finance and manufacturing (Hatten, 1974), firm size and scope (Patton, 1976), and finally, managerial input, product complexity and buyer diversity (Hergert, 1983). Only Hatten (1974) and Kumar et al. (1984) categorized the strategic variables as being controllable (i.e., firm level) and uncontrollable (i.e., environmental); Kumar et al (1984) characterized the uncontrollable variables as being industry aggregate statistics of controllable variables while

Hatten (1974) used industry aggregates as well as elements of market structure as uncontrollable variables.

This brief review points to several limitations and characteristics of past research in this area:

1) Most of the studies are snapshots in time except for Oster (1982) and Fiegenbaum and Primeaux (1983), who conduct studies across time, and Hergert (1983), who links strategic groups to product life cycle stages.
2) None of the studies look at forecasting future strategic groups or even strategic directions, which firms may pursue, to anticipate the long run evolution of the industry structure. Oster (1982) and Fiegenbaum and Primeaux (1983) attempt to establish stable strategic groups over time but they do not use this information to predict future structure.

From a strategic management perspective, it would be clearly desirable to predict the possible "benchmark" strategic groups which will emerge as the industry evolves. Given these benchmarks, a firm could formulate strategies directed towards the achievement of more favorable (to the firm) strategic groupings in the future. Whether it is successful or not would depend on technology, competitive reactions and the implementation efficiency of the firm.

The model formulated in the next section is a step in this research direction.

3.0 The Model

From a managerial point of view, the brief literature review showed that past research offers few clues as to how or why a particular firm is where it is (in a particular strategic group) and also how it may move into a position or grouping that is more favorable to itself. In other words, past research has been more of a stationary descriptive kind, picturing the status quo. This indicates a need for theoretical research into the formation and evolution of strategic groups in an industry.

Kumar et al. (1984) propose a game-theoretic model of a monopolistic competitive industry and show how strategic groups may arise even though firms are identical in cost structures and preferences.[1] This model is very similar to those developed by Karnani (1982, 1984) in the strategy literature. In the Kumar et al. model, the identification of strategic groups requires the explicit knowledge of the firms' utility functions in terms of strategic controllable and uncontrollable variables [as is the case in Karnani (1982, 1984)]. Unfortunately, the estimation of utility functions is an immensely difficult task and consequently the game-theoretic model has minimal practical significance from a strategy formulation perspective.

An alternative model for prediction of the possible set of strategic group structures in an industry is presented in this section. The model base is essentially similar to that of Kumar et al. (1984) but drops the stringent requirement of specific functional forms. The results derived from this model provide possible strategic groupings which are called theoretical benchmarks. These benchmarks signify generic structures which could emerge in the process of industry evolution. Recognizing these generic structures and the current industry structure, a firm can choose strategic directions to move into one of the generic structures that is most favorable to itself.

Using the model provided by Kumar et al. (1984), the basic elements used to capture the strategic behavior of firms include goals/objectives (personified by a utility function), possible actions or resource decisions (involving controllable strategic variables say, in the areas of marketing, finance and manufacturing) and environmental constraints (in the form of non-controllable variables) chosen to describe the competitive nature of the industry. For the sake of exposition the strategic controllable variables will be assumed to be marketing strategy MK, measured by the sales to marketing expenditure ratio, manufacturing strategy MF, measured by the sales to invested capital dollars, and financial strategy FN, measured by the inverse of the weighted average cost of capital.[2] It is also assumed that they can be computed and controlled by firm level strategists. The non-controllable variables, depicting competition, will be assumed to be industry average marketing strategy AMK, industry average manufacturing strategy AMF and industry average financial strategy AFN.

A reasonable behavioral assumption for the controllable variables is that strategists should exhibit increasing preference over the strategy variables, i.e., they prefer a higher value for the sales to marketing expenditure ratio, a higher value for the sales to invested capital dollars ratio and a higher value for FN since a lower weighted average cost of capital value is required. It is also assumed that each of these variables is measured on an ordinal scale, relative to the corresponding uncontrollable variable or industry average variable.

More specifically, the number of classes on the ordinal scale will be restricted to 3, namely, above average, average, below average. [See Hall (1980) for an application of this type of measurement.]

3.1 Valid Efficient Frontiers or Benchmark Strategies

Given the above assumptions, a strategy for a firm is defined by the triplet (MK, MF, FN) where the values of MK, MF and FN are measured as belonging to one of three classes: 1) below average, 2) average and 3) above average. For example, (3,1,3) is a strategy denoting above average marketing and financial strategies and below average manufacturing strategy.

The above definitions dictate that every firm choose a point in a cube, each lattice point referring to a unique strategy. Given the assumption of monotonic firm preferences over the strategic variables, (3,3,3), which represents above average strategies in marketing, finance and manufacturing is the ideal strategy at any given point in time.

The next assumption is that the viable strategies, in any strategic grouping structure, must be those on the efficient or current technology frontier. Essentially, this implies that the frontier strategies are not dominated by others on the frontier while, at the same time, the frontier forms a dominated pair with every other strategy not on it. To make these concepts precise,

Definition: Strategy i, namely (MK_i, MF_i, FN_i), is said to be superior to strategy j, namely (MK_j, MF_j, FN_j) if and only if

$$MK_i \geq MK_j, \quad MF_i \geq MF_j, \quad FN_i \geq FN_j$$

with, at least, one strict inequality. In this case, strategy j is said to be inferior to strategy i. The pair of strategies (i,j) is said to form a dominated pair.

Definition: Two strategies are mutually compatible (non-dominated) if neither one is superior (or inferior).

Definition: An efficient or current technology frontier F is a set of strategies $\{(MK_1, MF_1, FN_1), \ldots, (MK_\ell, MF_\ell, FN_\ell)\}$ such that

Condition a) each strategy in F is mutually compatible with every other strategy in F.

Condition b) all the strategies not in F are either superior or inferior to some strategy in F, i.e., for every strategy not in F, there is, at least, one strategy which forms a dominated pair.

Condition a) represents the idea that only those strategies that are preference-comparable, from the firm's perspective, can survive in any strategic group structure. Condition b) ensures that all the other available strategies for the firm form dominated pairs with the efficient frontier, i.e.,

(i) if an available strategy is inferior to one in F, then obviously it cannot be on that efficient frontier.

(ii) if an available strategy is superior to any strategy in F, then, assuming F is the current state of the technology, strategy j is not yet achievable and cannot be on that efficient frontier.

These two conditions a) and b) are similar to the definition of the stable set solution concept used by Von Neumann-Morgenstern in game theory (Owen, 1968: 166).

It should be noted that, for example, strategy (3,3,3) is an efficient frontier set (consisting of one strategy) but it cannot be considered a valid frontier since if this is what the entire industry chooses, then this is also the industry average--it cannot be above average in all the strategies! Therefore, to make the concept of industry averages compatible with efficient frontiers, we define:

<u>Definition</u>: A valid efficient frontier F* is an efficient frontier that satisfies

Condition c) each variable represented in F* must, at least, take on the values of above average and below average in F*.[3]

Each of the strategies in F* are considered to depict a strategic group and the entire set F* is considered to be a proxy for an equilibrium. The rationale behind this is that the market demand may be distributed among the various strategies (in F*) in such a way as to allocate equal utility to each strategy in F*. In such an event, no firm has any inclination to change its strategy (or its membership in any group) to another one in F* which makes F* a self-sustaining equilibrium strategy frontier. This equilibrium concept is a close approximation to the notion of Nash equilibrium used by Karnani (1982, 1984) and Kumar et al. (1984).

It must be noted that F* is a local equilibrium in the sense that each firm is indifferent between the strategies in F*. There is an incentive for all firms to achieve a strategy which dominates those in F* since, then, the other strategies may become dominated leading to higher gains to the firm achieving the dominant strategy.

3.2 Examples of Benchmark Concepts

Let us consider some examples of these concepts. The set $\{(3,2,3),(3,3,2)\}$ is an efficient frontier but does not satisfy condition c) and hence is not a valid efficient frontier. The set of strategies $\{(1,1,3),(1,3,1),(3,2,2)\}$ is a valid efficient frontier with three strategic groups. The first strategic group of firms, using strategy (1,1,3), adopt above average financial strategy (while being below average in the other two); the second group, using strategy (1,3,1), adopt above average manufacturing strategy (while being below average in the other two) and the third strategic group, using strategy (3,2,2), adopt above average marketing strategy while achieving the industry average in the other two. Notice that no group dominates any other group and the concept of average is maintained. If the market allocates values to the three strategic variables in such a way that the utility achieved by each of the strategies is the same, then the valid efficient frontier is a local strategic group equilibrium, i.e., no firm has any incentive to move to another strategic group. However, there is an incentive to break out of this equilibrium to a more dominant position, e.g., a firm using strategy (3,2,2) could direct its resources to increasing its manufacturing competence, i.e., move to strategy (3,3,2). If it does achieve this, then it will eventually eliminate any firm using its previous strategy (3,2,2) since it is dominated. It also effectively dominates the group using strategy (1,3,1) but strategic group (1,1,3) is not dominated. However, notice that {(1,1,3),(3,3,2)} is an efficient frontier but not a valid one (since all firms have average or above average financial competence). This clearly implies that, with the exit of firms and changes in associated strategic group positions, new averages have to be computed and a redistribution of firms within the strategy cube becomes necessary.

3.3 Results

Since the strategic space defining the domain of feasible strategies, i.e., the cube, is finite (in fact, 27 possible strategies) and the frontier is clearly defined, the valid efficient frontiers can be completely enumerated. This was done using a computer program and the entire list appears in the Appendix. The following characterization emerges from analyzing the list:

> Result 1: There are 113 possible valid efficient frontier sets F*. Of these, 6 have cardinality 3, 40 have cardinality 4, 57 have cardinality 5, 9 have cardinality 6 and 1 has cardinality 7.

Result 1 lists all possible valid frontiers which may have the local optimum property, i.e., no firm will desire to move to another existing strategic group. This is very similar to the Nash equilibrium concept in non-cooperative game theory. Further refinements in this equilibrium position could be addressed in the following manner: which of these strategic group equilibria will persist even if the utility function (i.e., preferences, demand distribution, cost structures) is perturbed by a small amount? If the equilibrium persists following perturbation, then it is said to be structurally stable [similar to the continuous space version in Kumar et al. (1984)].

It is claimed that those valid efficient frontiers which have strategies which are identical in one dimension and perfectly inversely correlated in the other two strategies are not stable under perturbation. For example, consider $F^* = \{(1,1,3),(1,3,1),(3,2,2)\}$, in which the strategies (1,1,3) and (1,3,1) are equivalent in terms of marketing strategy and symmetric but inversely correlated [i.e., (1,3) and (3,1)] in terms of manufacturing and financial strategies. If F^* is to be an equilibrium, then the utility associated with these strategies is exactly the same or there is an imputed symmetric valuation of the manufacturing and financial strategies. If we perturb this valuation in favor of either of these dimensions, say manufacturing, then utility equalization can only be potentially regained (assuming only the lower utility group, i.e., (1,1,3) moves) by the configuration (1,2,3) and (1,3,1), i.e., an improvement in manufacturing strategy by the first strategic group. But, then $F^* = \{(1,2,3),(1,3,1),(3,2,2)\}$ is no longer efficient--it needs the strategy (3,1,3) to make it a valid efficient frontier. This shows that the nature of the strategic group completely changes with just a minor perturbation. This leads to Result 2, which indicates all the structurally stable valid efficient frontiers:

Result 2: The only structurally stable valid efficient frontiers (i.e., benchmark strategic group structures) F** are 12 in number and are:

(1) {(1,1,3),(1,2,2),(3,1,2),(3,3,1)}

(2) {(1,1,3),(1,3,2),(2,1,2),(3,3,1)}

(3) {(1,1,3),(1,3,2),(3,2,2),(3,3,1)}

(4) {(1,1,3),(2,3,2),(3,1,2),(3,3,1)}

(5) {(1,2,2),(1,3,1),(3,1,3),(3,2,1)}

(6) {(1,2,3),(1,3,1),(2,2,1),(3,1,3)}

(7) {(1,2,3),(1,3,1),(3,1,3),(3,2,2)}

(8) {(1,3,1),(2,2,3),(3,1,3),(3,2,1)}

(9) {(1,3,3),(2,1,2),(2,3,1),(3,1,1)}

(10) {(1,3,3),(2,1,3),(2,2,1),(3,1,1)}

(11) {(1,3,3),(2,1,3),(2,3,2),(3,1,1)}

(12) {(1,3,3),(2,2,3),(2,3,1),(3,1,1)}

A rationale for studying stable frontiers is that one might be looking at the mature stage of the industry life cycle, where there is potentially the stablest industry structure with relatively minor environmental perturbations. This model would, therefore, predict that for an environment of mature industries, given the three strategic dimensions of marketing, manufacturing and financial strategies, only the above stable frontiers F** can emerge.

Some features of the stable frontiers are worth mentioning:

(i) The cardinality of all the stable frontiers is exactly 4. This fits with the instability theorem in Kumar et al. (1984) which states that given 3 uncontrollable strategic dimensions, only 3 plus one or 4 strategies, at most, can occur. Further, it is conjectured that this result is independent of the arbitrary measurement of the dimensions in the 3 classes.

(ii) In all the stable frontiers there is always one strategic dimension which is present only in above and below average classes while the other two appear in all three classes.

(iii) In line with (ii), the strategy (2,2,2) or average in all three dimensions is not a stable strategy. This implies that in any mature industry, firms probably have to specialize, i.e., be superior in at least one dimension, be it marketing, manufacturing or finance. This is consistent with Porter's (1980) argument about generic strategies.

(iv) There is equi-preference shown across the twelve stable frontiers. Therefore it is impossible to predict which strategic group structures may obtain in the future. However, these twelve strategies provide stable valid efficient frontiers and thus serve as benchmark group structures.

The relationship of Results 1 and 2 to industry analysis and strategic management will be discussed in the next section.

4.0 The Relationship between Efficient Frontiers and Strategic Management

In the previous section a specific model form was used to illustrate how the concept of dominated strategies could develop valid efficient frontiers F*. These frontiers were refined, using structural stability concepts, to derive the benchmark strategic group structures F**. This section shows how these frontiers can be useful in industry analysis and strategic management.

Once appropriate controllable strategic dimensions are specified, an analysis, as presented in Section 3, can be immediately conducted to identify the valid efficient frontiers and also the generic benchmark strategic group structures which could possibly arise in a structurally stable industry. Thus, this analysis gives researchers an idea of potential future strategic groupings which might emerge in the mature stage of the life cycle. It also gives managers the opportunity to identify those strategic groupings which are particularly suited to their firm's own accumulated expertise. It also indicates the possible strategic positioning tactics the firm may adopt in order to survive and thrive in the industry and not be a victim of any industry "shake-out" process.

The comments following the derivation of Result 2 in Section 3 imply that there is no preference ordering amongst the 12 stable frontiers. Therefore, in order to establish which one of them is going to be actually realized, it is necessary to perform an empirical analysis to identify the current industry status.[4] Since the measurement of strategic dimensions is based on discrete classifications, the strategy space defining the domain of all feasible strategies can be represented by the cells of a cube (or a hypercube, if more than 3 dimensions or 3 classes of measurement are used). Industry-level data can then be used to compute the cut-off points in the cube by clearly defining what is average, below average and above average (if there are 3 classes of measurement). For example, the marketing strategy cut-off points could be constructed by looking at a 90% confidence interval for the mean of the industry sales over marketing expenditure ratio. Those ratios falling within this interval are termed average and those falling below (above) this interval labelled as below (above) average marketing strategy. Given these cut-off points, a clustering procedure can now allocate each firm to a unique cell representing its current strategic position (see Hall (1980)). This clustering analysis gives the firm an idea of current industry structure and how it is positioned relative to other firms in terms of specified strategic dimensions.

The strategic management aspect of the analysis becomes apparent. The firm knows the possible generic strategic group structures which could arise in the future, and also its current status relative to the industry. By matching its strategic capability alongside the generic group positions, it can decide whether it wishes to maintain the status quo or move to another strategic group.

For example, suppose that the industry currently shows the following strategic group structure, namely, $\{(1,1,2),(1,2,1),(1,2,3),(1,3,1),(3,1,3)\}$. Consider a firm in the strategic group (1,2,1). Obviously, it is in a disastrous position (since it is dominated by firms using strategies (1,2,3) and (1,3,1). It needs to spend resources improving its position vis-a-vis its competition. Which position should it aim for, given its current position? It is clear that the groups (1,2,3), (1,3,1) and (3,1,3) do not dominate one another and represent stable positions in benchmark groups 6 and 7 of Result 2. The easiest (and probably least expensive) action would be to aim for strategy (2,2,1), which is the remaining element of benchmark group 6. This implies that the firm in group (1,2,1) has to improve its marketing strategy.

Continuing this analysis further, a firm in the strategic group (1,1,2) is in an equally disastrous position (being dominated by firms using strategies (1,2,3) and (3,1,3)). It may choose to adopt as its objective, the strategy (1,2,3) rather than strategy (2,2,1) since in the latter case it will have to worsen its financial strategy position while in the former case, it will be building on its strengths. After the decision has been made, it must attempt to improve its manufacturing and financial strategies.

One implicit assumption in the above dynamic analysis is that the strategic dimensions do not change. This is not a very reasonable assumption and therefore the preceding analysis cannot be looked upon as a global analysis. But it is true that the strategic dimensions do not change in shorter time intervals and for these periods, such an analysis is extremely useful to guide strategy formulation. Until a theory becomes available to allow the prediction of changing strategic dimensions (which may depend on internal and external technology, R&D, consumer tastes and economic conditions), a more global analysis cannot be presented. However, some forms of sensitivity analysis could be undertaken with this model using strategic dimensions which industry experts predict to be important in the future. Comparisons can then be made between the two sets of benchmark groups; the one based upon the set of current key strategic dimensions and the other based upon predicted future key dimensions.

5.0 Summary and Conclusions

Past research in the area of strategic groups has concentrated mainly on describing the strategic group structure as snapshots in time. There has been no significant attempt (except in extrapolating stability results from Oster (1982) and Fiegenbaum and Primeaux (1983)) to predict the movement of industry strategic groups or even to aid the strategic management analyst in the formulation of dynamic strategies.

This paper is a step in this direction. The model base assumes controllable and uncontrollable strategic dimensions, which, once specified, can lead to the derivation of both valid efficient frontiers and stable valid efficient frontiers. The derivation of these frontiers is based on simple concepts of dominated strategies, stable sets in game theory and the idea of structural stability.

This paper also shows how these frontiers, when combined with a knowledge of current industry strategic groupings, can form the basis of strategy formulation for the future. The analysis is applicable to all industries and encompasses any time span, as long as the strategic dimensions do not vary over that time period; otherwise, this analysis can be thought of as a (fixed time period) local analysis to aid in strategic management.

The most important extension of this research would be to explain and predict movements in the key strategic dimensions over time.

Other possible areas of research include the use of stochastic processes to model the uncertainties in the groupings (through a relaxation of the efficient market assumption) and in developing the linkage between the industry life cycle and the evolution of strategic groupings.

FOOTNOTES

[1]The results of that paper, namely that the number of strategic groups is critically dependent on aggregated competitor strategies, remains valid when the stringent assumption of identical competitors (i.e., same form of utility function and parameters) is relaxed.

[2]The marketing and manufacturing strategy variables involve measuring sales. Since sales for the next period is unknown and normally uncontrollable (i.e., not directly controllable except in a monopoly), the figure used could be sales for the last period or even forecasted sales for the next period. The choice of the inverse of the weighted average cost of capital (WACC) rather than WACC itself, as the financial strategy variable, is to facilitate increasing preference over this variable.

[3]This condition also eliminates the possibility of all the strategies using the same average value for any variable. The reason for this is that this variable is no longer strategic, i.e., no firm differentiates itself from its competitors on this variable.

[4]Here we are assuming that the industry being studied or analyzed has been in existence for some period of time.

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Appendix

In this appendix, the problem formulation for the efficient frontier model is explained and also the listing of the valid efficient frontiers F* is given.

The problem formulation is as follows:

$$\text{strategy space } C \equiv \{(i,j,k) \mid i = 1,2,3,\ j = 1,2,3,\ k = 1,2,3\}$$

$$\text{strategy} = (i,j,k) \equiv (MK,MF,FN)$$

where marketing strategy MK

(or)

manufacturing strategy MF ≡

(or)

financial strategy FN

1, below average

2, average

3, above average

Enumerate

$$F^* = \{(i_1,j_1,k_1),\ \ldots,\ (i_n,j_n,k_n) \mid \text{they form valid efficient frontiers}\}$$

There are 113 such valid efficient frontiers and these are listed in Table 1.

Table 1

Number	Cardinality	Valid Efficient Frontier Strategies				
1	3	113	131	322		
2	3	113	232	311		
3	3	122	313	331		
4	3	131	223	311		
5	3	133	212	331		
6	3	133	221	313		
7	4	113	122	212	331	
8	4	113	122	312	331	
9	4	113	131	222	311	
10	4	113	132	212	331	
11	4	113	132	221	312	
12	4	113	132	231	322	
13	4	113	132	322	331	
14	4	113	232	312	321	
15	4	113	232	312	331	
16	4	113	232	322	331	
17	4	122	131	221	313	
18	4	122	131	313	321	
19	4	122	213	231	311	
20	4	122	213	312	331	
21	4	122	231	313	321	
22	4	123	131	212	321	
23	4	123	131	213	322	
24	4	123	131	221	313	
25	4	123	131	313	322	
26	4	123	132	212	331	
27	4	123	132	221	313	
28	4	123	213	232	311	
29	4	123	232	313	321	
30	4	131	223	312	321	
31	4	131	223	313	321	
32	4	131	223	313	322	
33	4	132	223	231	311	
34	4	132	223	312	331	
35	4	133	212	221	311	
36	4	133	212	231	311	
37	4	133	212	231	321	
38	4	133	213	221	311	
39	4	133	213	221	312	
40	4	133	213	231	322	
41	4	133	213	232	311	
42	4	133	222	313	331	
43	4	133	223	231	311	
44	4	133	223	232	311	
45	4	133	223	313	332	
46	4	133	232	323	331	
47	5	113	122	131	212	321

Table 1 (continued)

Number	Cardinality	Valid Efficient Frontier Strategies				
48	5	113	122	131	221	312
49	5	113	122	131	312	321
50	5	113	122	212	231	311
51	5	113	122	212	231	321
52	5	113	122	231	321	321
53	5	113	131	222	312	312
54	5	113	132	212	221	311
55	5	113	132	212	231	311
56	5	113	132	212	231	321
57	5	113	132	222	231	311
58	5	113	132	222	312	331
59	5	113	122	131	212	321
60	5	113	122	131	221	312
61	5	113	122	131	312	321
62	5	113	122	212	231	311
63	5	113	122	212	231	321
64	5	113	122	231	312	321
65	5	122	131	213	221	311
66	5	122	131	213	221	312
67	5	122	131	213	312	321
68	5	122	213	231	312	321
69	5	123	131	212	221	311
70	5	123	131	213	221	311
71	5	123	131	213	221	312
72	5	123	131	213	222	311
73	5	123	131	222	313	321
74	5	123	132	212	221	311
75	5	123	132	212	231	311
76	5	123	132	212	231	321
77	5	123	132	213	221	311
78	5	123	132	213	221	312
79	5	123	132	213	231	322
80	5	123	132	213	322	331
81	5	123	132	222	313	331
82	5	123	132	231	313	322
83	5	123	132	313	322	331
84	5	123	213	232	312	321
85	5	123	213	232	312	331
86	5	123	213	232	322	331
87	5	132	232	313	322	331
88	5	132	223	231	312	321
89	5	132	223	231	313	321
90	5	132	223	231	313	322
91	5	132	223	313	322	331
92	5	133	213	222	231	311
93	5	133	213	222	312	331

Table 1 (continued)

Number	Cardinality	Valid Efficient Frontier Strategies						
94	5	133	213	232	312	321		
95	5	133	213	232	312	331		
96	5	133	213	232	322	331		
97	5	133	222	231	313	321		
98	5	133	223	231	312	321		
99	5	133	223	231	313	321		
100	5	133	223	231	313	322		
101	5	133	223	232	312	321		
102	5	133	223	232	312	331		
103	5	133	223	232	313	321		
104	6	113	122	131	212	221	311	
105	6	113	132	222	231	312	321	
106	6	113	122	131	212	221	311	
107	6	123	131	213	222	312	321	
108	6	123	132	213	222	231	311	
109	6	123	132	213	222	312	331	
110	6	123	132	222	231	313	321	
111	6	133	213	222	231	312	321	
112	6	133	223	232	313	322	331	
113	7	123	132	213	222	231	312	321