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Product Positioning Strategies for  
Segment Pre-emption

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## Abstract

This paper deals with marketing strategy decisions regarding the number of products a firm may need to introduce at a segment in order to prevent competitive entry, as well as the positioning of such products. Our analysis considers conditions of changing segment size either through growth or decline in demand. We illustrate that fewer properly-positioned products are necessary for pre-emption than the segment can support. We also show that, if uncertainty is present, risk-averse managers will have more products in the segment than necessary. Further, our results are generalized to an extremely broad class of consumer demand functions.



## 1. Introduction

The majority of the analytical marketing strategy literature is oriented towards 1) helping a marketing manager's decisions at the level of choosing either a differentiated strategy or a concentrated strategy, 2) providing models for choosing the optimal new product concept for entry into an existing market and 3) helping a manager choose the optimal allocation of resources to various marketing activities to support either an existing brand, or a new brand. But there are important decisions other than these that are faced by a marketing strategist. The decisions that we deal with in this paper are (i) How many products should a firm introduce for (at) a segment in order to prevent competitive entry? (ii) Where should such brands be positioned? (iii) When faced with growth in consumer demand is it sufficient to reposition existing brands, or should new brands be entered? and (iv) When faced with waning consumer demand, is it sufficient to reposition existing brands or should brands be deleted (if so, when?)?

This paper deals with these decision questions by developing a model of a market where the objective of the marketing managers is to maximize profits as well as to monopolize the demand of a segment. In doing so, we extend theoretical understanding of product-market structures and provide insights useful to managerial decision making.

We begin with a brief description of the theoretical literature (Section 2) upon which we build our work. We then describe our model

of segment level strategy. Section 3 describes our model of the segment level market structure and consumer behavior. Our analysis based on this model is presented in Section 4. This analysis is first shown for some specific segment sizes followed by our rules for more general cases. Section 5 discusses and demonstrates generalizability of our results beyond some assumptions of Section 3. This paper then concludes with a summary of our major results and a statement of some possible questions for further research.

## 2. Brief Review of Literature

In the literature on competitive marketing strategy, choice of the pattern of market coverage (viz., the product/market concentration, product specialization, market specialization, selective specialization, full coverage patterns of Abell (1980, Ch. 8, pp. 13-17)) has been a key issue. This literature assumes that while a firm may have several brands in a market, it should (implicitly stated) have no more than one brand targeted at any specific segment. The market segmentation literature (e.g., Winter (1979), Moorthy (1984), Wind (1978)) aids a manager in the design of specific marketing-mix strategies for segments--allowing no more than one product per segment.

Brand proliferation (multiple products aimed at the same segment) is a strategy that has been long practiced by some very successful firms, e.g., Procter and Gamble and Coca-Cola. In fact, Mitsubishi recently introduced three brands at the small car segment simultaneously!

The literature on dominant firms, on the other hand, does focus on multi-product strategies as non-price competitive options. The state of the art (White, 1983) here provides very general guidelines to managers, which are very useful, but does not provide a rigorous theoretical basis.

In summary, the existing marketing literature does not currently have an analytical framework within which a marketing strategist can assess the segments of a new market, determine the number and positions of new brands that would be needed to completely dominate a pre-specified market segment. Further, as such a market segment grows or shrinks, the decisions of whether to reposition (and if so, how?) existing brands or to introduce/delete brands (where/which?) become important, and an analytic basis for such is needed.

The facility location problem in economics seems to be the original source of analytic positioning theories. The famous duopoly location model of Hotelling (1929), and the plant location model of Lösch (1954) form the basis of much of the subsequent work in location or positioning in economics, including that of Prescott and Visscher (1977), Schmalensee (1978), and Eaton and Lipsey (1979). Prescott and Visscher (1977) construct an equilibrium model of firms in which the firms locate themselves sequentially in a market. Once positioned they are not allowed to reposition. Further, all firms are assumed to be able (with perfect foresight) to correctly predict the influence its decisions will have on the firms yet to enter. Their solution shows the equilibrium positions that may be used by the first entrant to establish a monopoly. They, however, do not allow for product repositioning or for market

growth. Neither do they derive the minimum number of brands a firm needs to enter to pre-empt the market.

An application of competitive spatial location modeling is provided in Schmalensee (1978). In the context of the 1970 ready-to-eat breakfast cereal industry, he shows that brand proliferation was an effective entry deterring strategy. His analysis, however, does not provide the marketing strategist with guidelines for choosing the minimum number of products and their positions for pre-emption.

Eaton and Lipsey (1979) consider a spatial market with increasing market demand. Under such conditions, they show that existing firms should pre-empt the market by establishing new plants before the time when it would pay new firms to enter. Given that they study plant location, they also do not allow for repositioning.

Using the rich analytical support provided by the economics literature, this paper provides an analytical theory base for practicing market strategists to consider in their product market planning process, and for researchers in the area of product management theory.

### 3. Model of Segment Level Market

In developing our analysis of segment level product positioning strategies we make some assumptions regarding competitive behavior, behavior of costs, and the nature of consumer demand distributions.

These assumptions are similar to those made in the literature previously cited. In Section 5 we treat the issue of relaxing these assumptions and their impact on our results.

Let us consider a marketing strategist pondering about a market segment. He has arrived at a segmentation of the market by aggregating consumers into various segments, each segment displaying relative

homogeneity of preferences on a set of salient product characteristics. Within a segment, consumers are heterogeneous with respect to certain other product characteristics.

He wishes to introduce a set of products for this segment that is both jointly "optimal" and will dissuade competitors from entering their products (by making such competitive entries unprofitable). The strategist is planning for a time horizon over which average total demand is assumed to be constant. When such demand changes the strategist is assumed to plan anew. We take the vantage point of the strategist who enters the first product(s) for this segment. Others are treated as followers, who react by positioning products (if at all) based on the actions of the leader.

Consumer demand is assumed to be a function of product characteristics. In our analysis we consider the case of a product class defined on one characteristic (or two related characteristics).<sup>1</sup> We assume that price is one of the salient market segmentation variables. An example is that of a theme park company which used price as a dimension for segmenting (Stumpf, 1976).<sup>2</sup> Each product has associated with it a fixed cost ( $L$ ). We assume that this fixed cost is the same for all firms (whether leader or follower) and for all products.

Without any loss of generality it is assumed that the range of characteristic values have been rescaled to be in  $[-\frac{KL}{2}, \frac{KL}{2}]$ . Consumers are associated with levels of this characteristic and are assumed to buy one unit each. The distribution of consumers is given by the rescaled density  $f(\alpha) = 1$ , where  $-\frac{KL}{2} \leq \alpha \leq \frac{KL}{2}$ . Each consumer buys the product positioned closest to him. The total demand for this segment is, therefore,  $KL$ .<sup>3</sup>

Profit for a product for a given period is given by  $\Pi = CM * a * KL - L$ , (where CM, the unit contribution margin, is assumed to be a constant, equal to one for ease of exposition, and a is the market share for that product).

For each period, the leader's strategist is assumed to estimate the segment demand KL. With L as the fixed cost per product, and a unit contribution of one, the maximum number of products that may be supported by this segment (i.e., its size) is K. The estimate of K that the leader obtains from his estimation of KL is  $K_1$ , termed estimate of segment size. We assume that such estimation is done for only one period at a time, and further allow for estimation errors causing  $K_1$  to be different from K.

The leader is assumed to have perfect foresight regarding the optimal positions chosen by the follower given its own actions (positions chosen). So, given its estimation of segment size  $K_1$  and the number of products it wishes to enter, the leader can compute both its optimal positions and those of the followers, who enter and then wish to pre-empt any further entry. Eaton and Lipsey (1979), Prescott and Visscher (1977), Lane (1980), Sudharshan and Kumar (1984) and Kumar and Sudharshan (1984) show how such computations may be performed. The profits that accrue to such positions are also known and it is further assumed that only products that would produce positive profits are feasible for entry.<sup>4</sup>

In the next section we show the entry-detering brand<sup>5</sup> positions for various sizes of the market and also analyze alternative positioning options that brand managers with varying perspectives are restricted to.



#### 4.0 Analysis

In this section, based on the modeling assumptions of the previous section, we analytically derive the entry deterring product positions, under varying market segment sizes ( $K$ ). We show that the number of such products necessary and sufficient for pre-emption is lesser than the segment size  $K$ . Specifically, when  $K$  is integral, it is equal to  $(\frac{K+1}{2})$  for odd values of  $K$ , and is equal to  $(\frac{K}{2})$  for even values of  $K$ . For non-integral values of  $K$ , the above rule holds using the next higher integer to  $K$  instead of  $K$ . We also analyze the change in brand positioning, as needed, as the segment demand changes. Brand managers are thought of as having one of the three following perspectives: (i) naive, i.e., that of not considering competitor action, (ii) competitive and assuming research information about segment size  $K$  to be perfect, and (iii) competitive and assuming only imperfect research information about  $K$ .

#### 4.1 Product Positions

We discuss the pre-emptive product strategies for five special cases with  $0 < K \leq 1$ ,  $1 < K \leq 2$ ,  $2 < K \leq 3$ ,  $3 < K \leq 4$ ,  $4 < K \leq 6$ , and two general cases with  $K = (2N-1)$ , i.e., odd, and  $K=2N$ , where  $N$  is any positive integer. The special cases are used to draw the reader's attention to the logic of our deductions, and to provide an intuitive feeling for the change in the pre-emptive product positions as  $K$  changes (segment demand grows)--thus providing a dynamic perspective to the discussion.

Case 1: Segment size:  $0 < K \leq 1$

Obviously, the segment cannot support any product. When  $K = 1$ , if only one product is entered, it captures  $L$  units of demand (i.e., that of the entire segment,  $K = 1$ ), with a contribution of  $\$L$ . Its fixed cost is  $\$L$ . Therefore, it is unprofitable to enter even one product.

Case 2:  $1 < K \leq 2$

Similar to the argument in Case 1, this segment can support at most one product profitably (if  $K=2$  and two products are entered "optimally," they will both share the market and make no profits). The position of this product can be deduced from the perspective of entry deterring behavior.

The entry deterring (profitable) positioning is to place the product anywhere in the interval  $(-d, d)$  such that  $d = (1 - \frac{K}{2})L$ . Figure 1 illustrates this solution.

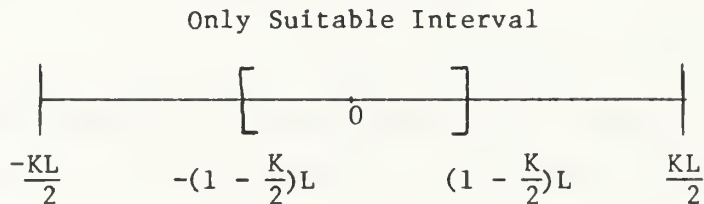


Figure 1: Case 2: Product Positions

Suppose the strategist positions his product at a point  $x < -(1 - \frac{K}{2})L$ , then the segment size to the right-hand-side of this product is greater than  $L$ , and hence a product positioned just to the right of this one will be profitable. The upper limit  $(1 - \frac{K}{2})L$  can be established similarly.

Intuitively, a strategist might under this case prefer, even without this analysis, to position his product at 0, i.e., the center of the segment. This symmetry preserving strategy is not the only entry deterring strategy since any product position in the range derived is also entry deterrent. Let us now denote the non central positioning as asymmetric strategy.

As the segment size ( $K$ ) grows from 1 towards 2, the entry deterring positioning interval shrinks towards the center. The limit of this interval ( $K=2$ ) is exactly the symmetric strategy--one of positioning at the center.

Any product position using asymmetric strategy involves repositioning the brand towards the center with segment growth. This repositioning may be either continuous or in discrete steps. The symmetric strategy involves no repositioning with market growth (as long as  $K \leq 2$ ).

Case 3:  $2 < K \leq 3$

The segment cannot support three products, but can it be pre-empted with just one product? The answer to this is no. Considering Figure 1, at the limit (when  $K=2$ ), the only pre-emptive strategy is positioning one product at the center (0). When  $K > 2$ , a product positioned immediately to the left or right of the center is profitable. This indicates the need for at least another product for segment pre-emption.

The entry deterring profitable positioning strategies with two products are:

i) Symmetric strategy of positioning two products, each at a distance  $d$  from the center, where  $d$  lies in the interval  $(L(\frac{K}{2}-1), L)$

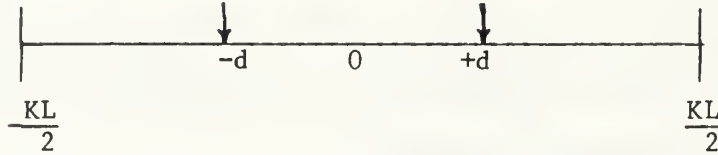


Figure 2: Case 3: Symmetry Strategy Positions

Suppose  $d < L(\frac{K}{2}-1)$ , then a new brand<sup>4</sup> positioned immediately to the left of brand at  $-d$ , or immediately to the right of the one at  $d$ , will be profitable. Therefore  $d < L(\frac{K}{2}-1)$  is not entry deterrent.

Suppose  $d > L$ , then a new brand if positioned immediately to the right of the one at  $-d$ , or immediately to the left of  $+d$  will be profitable. This implies  $d > L$  is not pre-emptive. Suppose  $d$  is in the interval  $(L(\frac{K}{2}-1), L)$ , then the positioning a new brand immediately to the left of the brand at  $-d$ , or immediately to the right of the brand at  $d$  leads to less than  $\$L$  of contribution and hence is unprofitable and thus infeasible. Similarly any new brand positioned in the interval  $(-d, d)$  will achieve a contribution of  $\$d$ . Since  $d < L$ , this is also unprofitable. This proves that the entry deterring symmetric positioning strategy is to choose a  $d$  such that  $d$  lies in  $(L(\frac{K}{2}-1), L)$ .

(ii) Asymmetric Strategy of positioning two products is to position one at a distance  $d_1$  to the left of the center, and the other at a distance  $d_2$  to the right of the center, where  $d_1, d_2$  satisfy the following conditions:

$$d_1 > \left(\frac{K}{2} - 1\right)L, \quad d_2 > \left(\frac{K}{2} - 1\right)L$$

and

$$d_1 + d_2 < 2L.$$

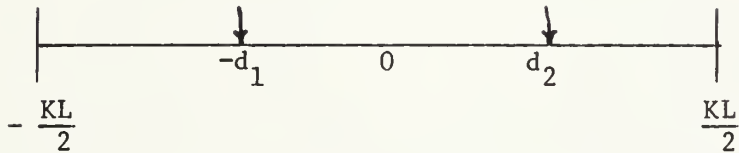


Figure 3: Case 3: A Symmetric Strategy Position

The first two conditions ensures that entry to the left of  $-d_1$  and to the right of  $d_2$  will be infeasible. The third condition ensures the infeasibility of an entrant in the interval  $(-d_1, d_2)$ .

Note that even as  $K$  increases to its upper limit 3, both symmetric and asymmetric strategies are feasible and distinct from one another.

Case 4:  $3 < K \leq 4$

The segment can theoretically support three but not four products. The question is, "Do we need three products for pre-emption?" The answer is no--two properly positioned products suffice. The arguments used in Case 3 for both the symmetric and asymmetric strategies hold for this case also, and thus, there exist symmetric and asymmetric entry deterring positions. These positions are the same as derived in Case 3.

Case 4 strategies are distinguished from those of Case 3 in that as the segment size grows to the limit ( $K=4$ ), the asymmetric strategy

positions converge to the symmetric ones. At  $K=4$ , the entry deterring positions are unique and are such that each product is positioned at a distance  $L$  from the center.

Case 5:  $4 < K \leq 6$

Three products are necessary and sufficient to pre-empt entry by another product for this case. The symmetric strategy is to position a product at the center, and the other two products, each at a distance  $d$  on either side of the center where  $d$  lies in the interval  $(L(\frac{K}{2} - 1), 2L)$ .

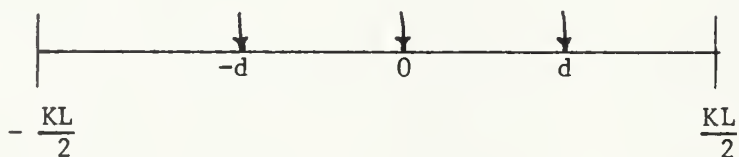


Figure 4: Case 5: Symmetric Strategy Positions

The asymmetric strategy is to position the three brands as per Figure 5, such that  $d_3 > d_2 > d_1$ , and  $\frac{KL}{2} - |d_3| < L$ ,  $\frac{KL}{2} - |d_1| < L$ ,  $(d_2 - d_1) < 2L$ , and  $(d_3 - d_2) < 2L$ .

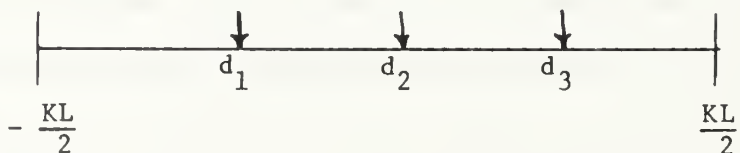


Figure 5: Case 5: Asymmetric Strategy Positions

The rationale for these positions, as in Case 3, is to pre-empt entry to the sides of the extreme brands and in between any pair of adjacent

brands. Once again, as in Case 4, the limiting asymmetric positions coincide with the limiting symmetric positions as  $K \rightarrow 6$ . This unique pre-empting strategy is positioning one brand at the center, and the other two each distance  $2L$  away from the center on either side of it.

General Case 1:  $K = (2N-1)$ ,  $N$  any positive integer<sup>6</sup>

The maximum number of products that can theoretically be supported by this segment is  $(2N-2)$ . But, it is both necessary and sufficient to enter only  $N$  products to pre-empt this entire segment.

The entry deterring product positions, whether symmetric or asymmetric, need to satisfy the following conditions: (i) the distance between the corresponding end point of the segment should be  $\leq L$ , and (ii) the distance between any two adjacent brands should be  $\leq 2L$ .

In this case, both asymmetric and symmetric strategies are feasible and distinct. The positioning rules are similar to those in Prescott and Visscher (1977, example 2).

General Case 2:  $K = 2N$ ,  $N$  any positive integer

While  $(2N-1)$  products can be apparently supported by this segment, only  $\underline{N}$  are needed for segment pre-emption. The pre-emptive positions must satisfy the conditions (i) and (ii) of General Case 1.

In this case, as different from the previous one, only symmetric strategies are pre-emptive.

As has been shown in the special cases 1 through 5, the pre-emptive brand positions change as the segment size changes. Figure 6 shows a plot of the number of products needed for pre-emption for various values of  $K$ .

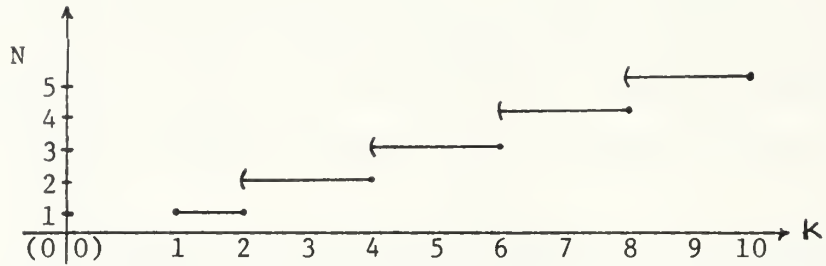
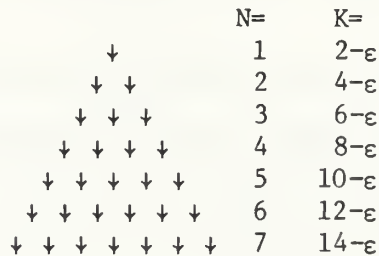


Figure 6: N vs. K

As can be seen, the number of products needed jumps at even values of K, which we will term critical stages of the segment size. When the number of products N changes, the corresponding pre-emptive positions also change. When N is odd, there is always a product positioned at the center of the segment. When N is even, there is no product at the segment's center. This seems to suggest a cyclic pattern of product positioning at size (K) interval limits as shown in Figure 7. As can also be seen



where  $\epsilon$  is a very  
small positive scalar.

Figure 7: Positioning Cycle

from Figure 7, as the segment's size moves from one critical stage to the next, one additional product becomes sufficient and necessary for pre-emption. Further, with such movement, this additional product can be at the center with a spreading out (repositioning outwards) of the



existing products (for odd values of  $N$ ), or, the deletion of the central product, and addition of two extreme (at the flanks) products, along with a squeezing in (or repositioning) of the existing products (for even values of  $N$ ).

Given these entry-detering product positions possible for various segment sizes, let us now consider the possible choices of strategists with differing perspectives.

#### 4.2 Managerial Choices Under Varying Perspectives

We consider three types of brand managers and analyze the dynamic positioning choices they will make. We proceed expecting the incumbent strategist to have the incentive<sup>7</sup> and the capability to introduce/withdraw products as the segment size changes.

Case A: The "strategist" is assumed to be of the naive type (an unlikely situation) using one of two decision rules in positioning the maximum number of products supportable by the market segment. Rule 1 stipulates that he randomly position these products. Rule 2, that he uniformly distribute these products across the segment.

Following the first rule, he may or may not pre-empt the segment. If by chance a subset of his products occupy all the pre-emptive positions, his other products will suffer losses, but in the aggregate he is making profits. Following Rule 2, he always pre-empts entry into the segment.<sup>8</sup>

In both cases it must be noted that the strategy followed is suboptimal, since fewer products correctly positioned are necessary for pre-emption.

Case B: This strategist is assumed to actively seek pre-emptive positions (i.e., pre-emption of competitive entry). The information

needed by him is segment size  $K$ , which he assumes to be perfectly known. His choice of pre-emptive positions follows the general rules discussed in Section 4.1.

In a segment with changing size  $K$ , he has the option of choosing between two positioning strategies:

1) Repositioning his brands when size  $K$  passes through the critical stages as dictated by the general rules, as well as when size changes without crossing any critical limits. For example, in Case 2 of Section 4.1, the strategist positions the product (only one is required) asymmetrically and has to constantly reposition it as  $K$  approaches the upper critical stage (at  $K=2$ ). As  $K$  crosses this critical stage, he has to introduce the second product, and choose corresponding pre-emptive positions as per Case 3.

This strategy runs the risk of allowing competitive entry every time it calls for repositioning. This arises due to the risk of underestimation of  $K$ .

2) Repositioning his brands only when critical stages are crossed, and positioning for the next expected critical stage if the segment is growing, and for the critical stage just crossed if the segment is contracting. For example, in Case 2 ( $1 < K \leq 2$ ) this strategist would have positioned his product at the center, which becomes the limit as  $K$  tends to 2; in other words he opts to position for the critical stage next to be crossed for a growing segment. When this critical stage is passed, he would opt to choose the positions appropriate for the next critical stage, i.e.,  $K=4$ . On the other hand, in a contracting segment, starting with  $2 < K \leq 4$  (i.e., he has positioned appropriately for the

critical stage  $K=4$ ), when the segment contracts and passes critical stage  $K=2$ , he would position appropriate to  $K=2$ , the critical stage just crossed.

This strategy, again, could lead to competitive entry, if the true value of  $K$  is higher than that "known" by the strategist.

Case C: This strategist not only actively seeks pre-emptive positions, but also considers that his information regarding  $K$  is imperfect. Such a strategist would always position his brand(s) for the next critical stage to be passed if the segment is growing, and for the critical stage just passed for a contracting segment (just as in case B-2).

However, he is different from the Case B-2 strategist in that he considers the possibility of misestimating  $K$ . Let us say that his estimation of  $K$  is such that  $K$  lies (with a certain level of confidence) within  $K_1 \pm z\sigma_K$ . In a changing segment, whether expanding or contracting, new pre-emptive positions will be chosen only when  $K_1 + z\sigma_K$  crosses a critical stage. In other words, he will introduce a new product in a growing segment, earlier than necessary for pre-emption. And, in a contracting segment, he will delete a product only after it is no longer necessary. In following such a repositioning strategy, he foregoes some profits in return for security against competitive entry.

This phenomenon indicates that there may be periods for which such a pre-emptive strategist will have more products serving a segment than is necessary (the length of such periods is dependent on the risk that this strategist is willing to assume). This "excess-capacity" type observation is similar to the conclusions of Eaton and Lipsey (1979).

The results so far have been based on certain assumptions outlined in Section 3. We will next consider the robustness of our results when some of these assumptions are relaxed.

## 5.0 Extensions of Basic Model

In this section we consider three extensions--(i) the relaxation of the assumption of uniform distribution for the consumer density function, (ii) allowing for synergistic interactions between brands, and (iii) allowing the "potential entrant's" fixed cost to be different from the leader's.

### 5.1 Consumer density Function

In Section 3, we assumed that the consumer density function  $f(\alpha) = 1$ , i.e., uniformly distributed over the segment space  $[-\frac{KL}{2}, \frac{KL}{2}]$  (see footnote 1 for further clarification). Consider an arbitrary consumer density function  $F(\alpha)$ , such that

$$\int_{-\frac{KL}{2}}^{\frac{KL}{2}} F(\alpha) d\alpha = KL$$

i.e., the segment demand is still  $KL$ .<sup>9</sup>

Our results still hold for any such  $F(\alpha)$ . The interpretation of the pre-emptive positions change in this case. Previously (with  $f(\alpha)=1$ ) the rules for positioning the brands involved "distances" of multiples of  $L$  along segment space  $[-\frac{KL}{2}, \frac{KL}{2}]$  (see general cases in Section 4.1). Now, the product positions are given by those points in  $[-\frac{KL}{2}, \frac{KL}{2}]$  such that the corresponding areas under the consumer density distribution are the appropriate multiples of  $L$ . For example, let us consider a segment with demand  $1.5L$  (i.e.;  $K=1.5$ ). If the consumer

density function is  $f(\alpha)=1$  (i.e., uniform), the pre-emptive product can be positioned anywhere in the range  $(-0.25L, 0.25L)$ , as depicted in Figure 8A. If the density function is

$$F(\alpha) = \begin{cases} \frac{8}{3} & \text{if } -\frac{3L}{4} \leq \alpha \leq -\frac{L}{4} \\ \frac{4}{9} & \text{if } -\frac{3L}{8} \leq \alpha \leq \frac{3L}{4} \end{cases}$$

the pre-emptive product can be positioned anywhere in the interval  $[-\frac{9L}{16}, \frac{3L}{8}]$ . This is illustrated in Figure 8B.

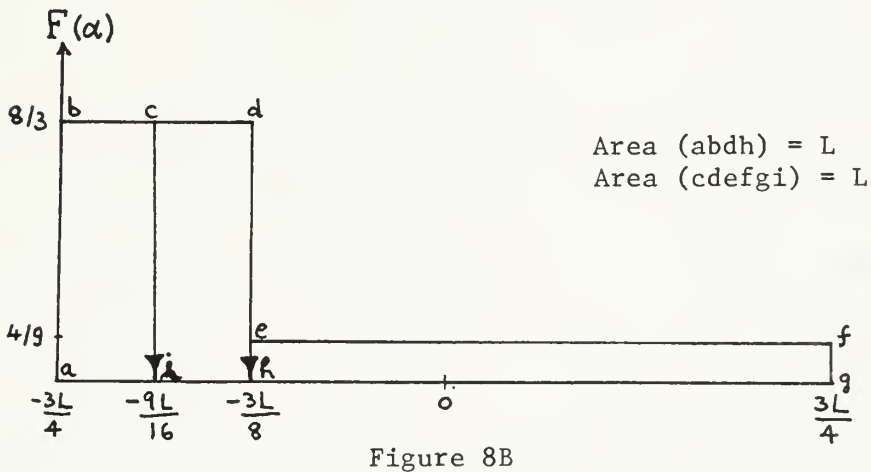
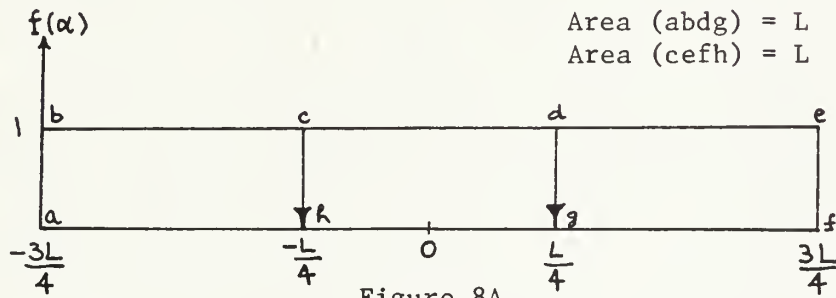


Figure 8: Positioning with Varying Density Function

## 5.2 Synergy

In Section 3, we assumed that every product that was positioned incurred a fixed cost of constant magnitude  $L$ . This may not be so if, for example, there exists some synergy between these pre-emptive products. Let this synergy be such that the closer two adjacent products are, the lesser the fixed cost incurred by each. In such a case, pre-emptive positioning should still follow the general rules of Section 4.1. In addition, the positions should be chosen to maximize the effects of synergy, i.e., reducing the adjacent brand distances to the minimum permissible under the general rules.

For example, consider Case 3, Section 4.1, where  $2 < K \leq 3$ . The corresponding symmetric strategy is shown in Figure 2. The two products could be positioned in any manner as long as the distance  $d$  from the center to either lies in the interval  $(L(\frac{K}{2} - 1), L)$ . With synergy, the leeway in choosing  $d$  disappears and a unique symmetric strategy with  $d=L(\frac{K}{2} - 1)$  is pre-emptive and optimal.

In return for the benefit from the effects of synergy, the strategist has to assume the responsibility for repositioning the existing brands, even when the segment size  $K$  does not cross any critical stages. Further, the strategist with a perspective as in Case C of Section 4.2, who could otherwise reposition his brands only at critical stages, is forced to constantly reposition to obtain the fruits of synergy. Such repositioning magnifies the risk of misestimating  $K$ . This strategist in repositioning will trade off some of the synergy benefits against the risk of competitive entry (due to misestimation of  $K$  and therefore non-pre-emptive positioning on his part).

### 5.3 Differential Fixed Cost for Entrants

We consider the case where the potential entrant may have a fixed cost  $L_1$  (per product) different from that ( $L$ ) of the pre-emptor. In this case, the pre-emptor, by modeling the total segment demand to be  $KL_1$  can still pre-empt by using the general rules of Section 4.1. The rules have to be modified, only to the extent that  $L_1$  should be substituted for  $L$ , wherever  $L$  occurs. The minimum number of products required for pre-emption are still the same as in Figure 6.

While such positions may pre-empt entry they need not be jointly profitable. The condition for profitability is that the total segment demand  $KL_1$  should support the  $N$  pre-emptive products each with a fixed cost  $L$ , i.e.,  $KL_1 - NL > 0$ . This implies that  $L_1 > (\frac{N}{K})L$  for both pre-emption and profitability. From Figure 6, it is clear that the ratio  $\frac{N}{K}$  has an upper bound of 1, when  $N=K=1$ , and a strict lower bound of  $\frac{1}{2}$  when  $K$  is even. This implies that when a competitor has a fixed cost  $L_1 \leq \frac{L}{2}$ , then no profitable pre-emptive positions exist. When  $L_1 \geq L$ , the pre-emptive positions are profitable. For any  $\frac{L_1}{L}$ , such that  $\frac{1}{2} < \frac{L_1}{L} < 1$ , there exists a unique segment size  $K^*$  beyond which pre-emptive positioning is profitable. For values of  $K < K^*$ , profitable pre-emption critically depends on  $K$  and the ratio  $\frac{L_1}{L}$ .

For example, when  $\frac{L_1}{L} = \frac{3}{4}$ , the condition for profitability becomes  $\frac{N}{K} < \frac{3}{4}$ . This is true for all  $K > 4$  (see Figure 6). In the interval  $2 < K \leq 4$ , where  $N=2$ , the profitability condition requires  $K > \frac{8}{3}$ . Therefore, for  $2 < K \leq \frac{8}{3}$ , pre-emption is not profitable. From Figure 6,  $N=1$  for  $1 < K \leq 2$  which implies that  $\frac{4}{3} < K \leq 2$  for profitable pre-

emption. Pre-emption is not profitable for  $1 < K \leq \frac{4}{3}$ . In this example, all segments of size greater than  $K^* = \frac{8}{3}$  allow profitable pre-emption. Under this critical size  $K^*$ , profitable pre-emption is possible only in disjoint ranges of segment size  $K$ .

## 6. Conclusions

In this paper we have developed an analytical framework to help strategists analyze segment level pre-emption of competitive entry. Using this framework, we have derived general rules for choosing the necessary and sufficient number of products and their positions for pre-emption. Our analysis considered changes in segment size and examined positioning strategies with both growth and decline in segment demand.

Three different strategic perspectives with respect to competitive entry and research information were identified and the resulting product positions were evaluated for both pre-emption and profitability.

Our results were shown to be generalizable to any consumer density distribution, to cases where synergistic effects of product positions apply, and to cases where potential entrants might have fixed costs of entry other than that of the pre-emptor.

Extensions of this research are required principally in (i) considering higher characteristic spaces, and (ii) considering multiple segments simultaneously.



Footnotes

<sup>1</sup>By two related characteristics, we mean the existence of a technological constraint of the form  $f(w,z) = 1$ , where  $w$  and  $z$  are the levels of the two characteristics of any product and  $f$  is a homeomorphism.

<sup>2</sup>Runyon (1982, pp. 355) states: "Many markets can be segmented on the basis of price; the automobile market is a prime example. Used in this way, pricing strategy is an effective device for appealing to a particular economic segment of the total market."

<sup>3</sup>In general the characteristic space (relevant for this segment) may be the interval  $[a,b]$  with a total segment demand  $KL$ , i.e., the consumer density function  $f(\delta) = \frac{KL}{b-a}$ . This is readily transformed by  $\alpha = (\frac{KL}{b-a})\delta - \frac{KL(a+b)}{2(b-a)}$  to a rescaled space  $[-\frac{KL}{2}, \frac{KL}{2}]$  with a consumer density function  $f(\alpha)=1$  and segment demand  $KL$ . This transformation is linear and uniquely invertible. Therefore, given a position  $\alpha$  in rescaled space the corresponding characteristic value can be uniquely and easily obtained.

<sup>4</sup>Gould managers are responsible for a 40 percent ROI in the first year of sales in a new market or of a new product (Kotler, 1984).

<sup>5</sup>We use the terms product and brands interchangeably throughout our discussion.

<sup>6</sup>For non-integral values of  $K$ , the general rules hold using the next higher integer to  $K$  instead of  $K$ .

<sup>7</sup>A heuristic argument demonstrating incentive is as follows: Consider a current segment size  $K_1$  and corresponding incumbent pre-emptive

products to be  $n_1$  in number. Let the segment size increase to  $K_2$  and the corresponding number of products for pre-emption be  $n_2$ . The difference in profits for incumbent between pre-empting any competitor and allowing competitors to enter only  $(n_2 - n_1)$  appropriately positioned products is

$$\{(K_2 - n_2) - (K_1 - n_1)\}L - \{(\beta K_2 - n_1) - (K_1 - n_1)\}L.$$

The first term describes profit change under incumbent pre-emption.

The second describes the incumbent's profit change under competitive entry and resulting incumbent market share  $\beta$ . Approximating  $\beta$  by  $\frac{n_1}{n_2}$ , this profit change can be expressed as  $(n_2 - n_1) \left[ \frac{n_2}{n_2} - 1 \right]$ . From Figure 6 it is clear that  $K_2 > n_2$ , implying that the incumbent has an incentive to pre-empt competition.

Eaton and Lipsey (1979) also show the existence of such an incentive to pre-empt in the context of a continuous time model with discounted cash flow.

<sup>8</sup>For a segment size  $K + \delta$ , i.e., with demand  $(K + \delta)L$  (where  $0 < \delta < 1$ ), this strategist will introduce  $K$  products, and the distance between any two adjacent products will be  $\left(\frac{K + \delta}{K + 1}\right)$ , as will be the distance from both segment ends to their corresponding closest product.  $\left(\frac{K + \delta}{K + 1}\right)L < L$ , which satisfies both conditions C1 and C2 of the general cases in Section 4.1.

<sup>9</sup>If  $F(\alpha)$  is continuous, then the integral is the usual Riemannian one. Otherwise, one could use the more general Lebesgue integral over the measurable space  $\left[-\frac{KL}{2}, \frac{KL}{2}\right]$ .

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