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Theory and Application of Defensive Strategy

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My perspective is that of a marketing scientist. My goal is to study marketing phenomena and to develop theory and methodology which help managers better understand the environment in which they operate in order to use marketing strategies proactively to maximize profit. The research summarized in this chapter is defensive strategy, or more simply, how to achieve the best profit position when a competitive new product enters a market in which a defending firm now has a profitable product.

This problem is perceived as critically important to a large group of marketing managers, division managers, and CEOs. Each year, over one thousand new products are launched in the consumer sector and many times that number in the industrial sector. Many are minor innovations of little impact, but significant numbers are threats to highly profitable businesses.

For example, consider the analgesic market (worth $1.5 billion in annual sales) and the recent products Advil (from American Home Products) and Nuprin (from Bristol-Myers), based on the drug ibuprofen, which became available over-the-counter in May 1984. Both entries have the potential to impact substantially the dominant share and profitability of Johnson & Johnson's Tylenol brand, which is based on another drug, acetominophen. Johnson & Johnson can counter with changes in price, coupons, price-off deals, advertising budgets, advertising message, in-store promotions, trade deals, sales calls on doctors, new acetominophen products, or even a new ibuprofen brand when it comes off patent next year. But which combination of these marketing strategies is most effective and what level of investment (disinvestment) in each strategy will lead to maximum (after-attack) profit? Or, as a brand manager once told me, "Should we bomb them back to the stone ages or just hope they'll go away?"

In the past four years, my colleagues and I have made some initial progress in adressing this problem. This progress is summarized in three published papers (Hauser and Simmie, 1981; Hauser and Shugan, 1983; and Hauser and Gaskin, 1984) as well as seven confidential applications in the U.S. and Japan. I hope in this chapter to give an overview of what we have learned about the problem,

is quite reasonable to approximate preference-trade-offs as linear. (In other words, nonlinear indifference curves in characteristics space become approximately linear in perceptual space.)

We assume consumers vary in their tastes (making trade-offs between effectiveness and gentleness) and, since trade-offs are linear, we represent each consumer's tastes by the angle (α) his or her indifference curve makes with the vertical axis. As shown in figure 5–2a, consumer 1 ($\alpha = 90°$) will choose Tylenol, consumer 2 ($\alpha = 60°$) will choose Bayer, and consumer 3 ($\alpha = 0°$) will choose Excedrin. As shown in figure 5–2b, all consumers with taste angles between α_2 and α_3 will choose Bayer.

Finally, as shown in figure 5–3, the market share of Bayer is simply the area under the taste distribution, $f(\alpha)$, between α_2 and α_3. The market share of Tylenol is the area between α_3 and 90°.[1]

Three comments are in order. First, we have focused on market share. This assumes that the impact of a price change on category volume is small relative to the impact on share. For large price changes we must extend the model to category volume.

Second, the analytic mechanism of using polar coordinates, α, for tastes is powerful because (1) the domain of tastes is closed and bounded, (2) the interpretation is symmetric in the two taste dimensions, and (3) the expression for market share, $\int f(\alpha)d\alpha$, is analytically tractable.

Finally, we can easily extend this model to three or more perceptual dimensions by defining the appropriate taste angles. (See Hauser and Gaskin, 1984.)

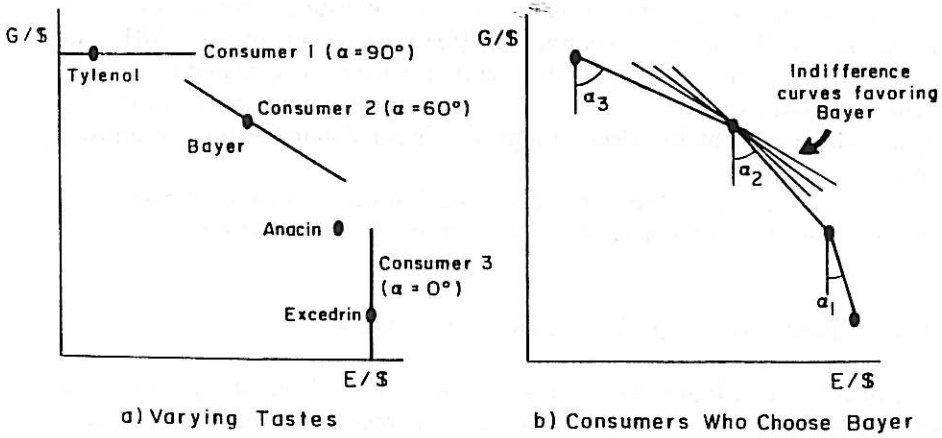


Figure 5–2. Preference Trade-Offs Imply Choice

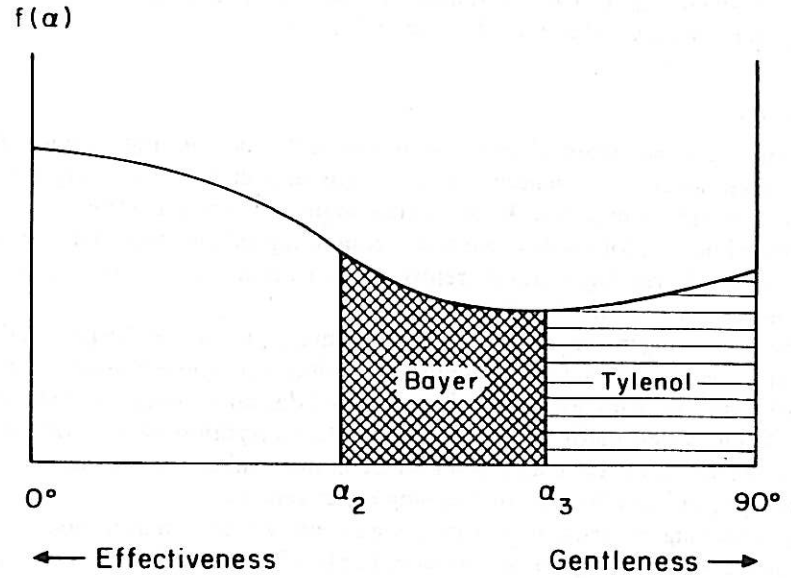


Figure 5–3. Distribution of Consumer Tastes

Information

In a typical product category, a consumer usually has good information on only a small fraction of the available products. (Of the 164 makes of automobiles, how many can you evaluate? Of the more than twenty-five deodorant brands, how many can you even name?) This phenomenon is well documented (for example, Silk and Urban, 1978) and quite prevalent in marketing models. We call the set of products a consumer can evaluate his or her *evoked set*. For example, for four analgesic products, there are fifteen possible nonnull evoked sets including {Tylenol, Bayer, Anacin, Excedrin}, {Tylenol, Bayer}, {Tylenol}, and so forth.

We also allow consumers to be heterogeneous in their information, that is, their evoked sets. Thus, if S_l is the proportion of consumers using evoked set l, $f_l(\alpha)$ is the taste distribution of consumers using evoked set l, and A_l are the angles favoring a product (say Bayer) for evoked set l, then the market share of that product is simply:

$$\Sigma_l S_l \int_{A_l} f_l(\alpha)\, d\alpha \qquad (5.1)$$

consumers between 60° and 90°. For the evoked set {Tylenol}, Tylenol will capture all consumers. When we sum together Tylenol's shares of the $f_i(\alpha)$'s, we are likely to get a region of $f(\alpha)$ that is large for taste angles favoring gentleness but tapers off more slowly than that shown in figure 5–3. Figure 5–4 is one such representation of Tylenol's consumers.

In the early 1970s, Tylenol had a reasonable share of the market even though it was not nationally advertised. (Its awareness came from doctors' recommendations which in turn were strongly influenced by detail forces of McNeil Laboratories, a division of Johnson & Johnson.)[4] Recognizing the opportunity for competition in gentleness, Bristol-Myers introduced an acetominophen-based product, Datril, nationally advertised as "just as good as Tylenol, only cheaper." Such a positioning puts them on the map as shown in figure 5–5a.

Datril now has the potential to impact Tylenol's share dramatically. Even national advertising would not reach all of Tylenol's consumers, but it will reach some Bayer, Anacin, and Excedrin consumers. Furthermore, Datril is now positioned better than Tylenol to compete with Bayer, Anacin, and Excedrin. Had Tylenol done nothing, Datril might have captured the area shown in figure 5–5b.

In top-level strategy meetings, Johnson & Johnson decided to fight back strongly. Literally over a weekend, they mobilized the Johnson and Johnson

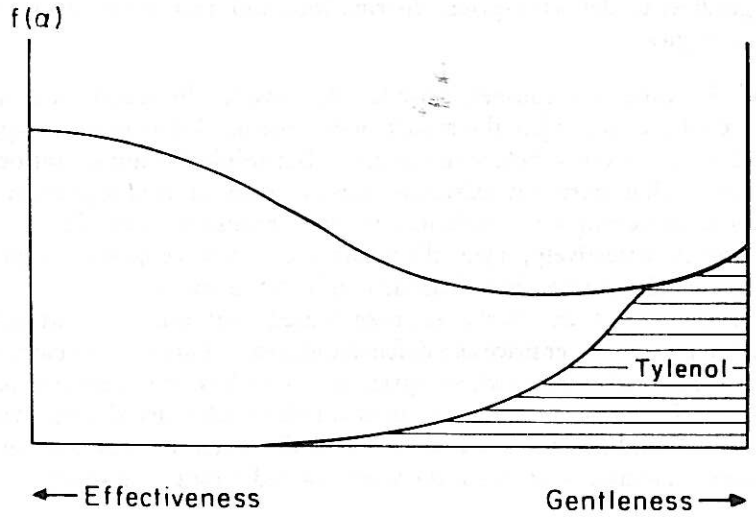


Figure 5–4. Consumers Who Favor Tylenol When We Consider Evoked-Set (Information) Effects

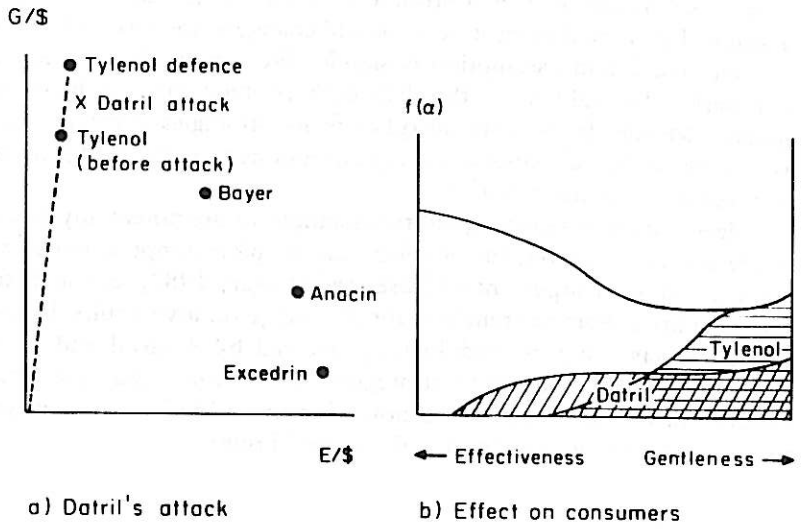


Figure 5–5. Interpretation of Tylenol–Datril Case

sales force (not just the McNeil division's sales force), matched Datril's price. persuaded the television networks that Datril's price advantage was now false advertising, and began other defensive measures. The result was that Tylenol, with its strong image from years of detailing, leap-frogged Datril and successfully trumped Bristol-Myers' challenge.

Awakened to the potential of the Tylenol brand, McNeil Laboratories became a national advertiser, added the Extra Strength Tylenol brand to capture consumers interested in effectiveness, and undertook a number of productive marketing strategies. Until the current ibuprofen challenge, McNeil's marketing has been so strong that identical physical products (Datril, Panadol, and generic acetominophen) had not been able to draw substantial share from Tylenol. Tylenol was even able to weather a tragic poisoning incident in 1982.

Theory: The Best Defense

Tylenol's price decrese was a successful defense. We wondered if this generalized and, and if so, under what conditions. Based on the consumer model of this chapter's second section, Steven Shugan (of the University of Chicago) and I published (1983) a series of theorems to summarize the qualitative implications for the best defense. We assume that before the attack the defending firm was behaving rationally (maximizing long-term profit) and that it

but not limited to, information, persuasion, service, financing, image maintenance, and delivery, as well as participating in negotiations on price. We focus here on one important aspect of that role, making the product available to the consumer. In particular, we examine the availability that can be obtained by investment in distribution. For availability, it is easy to show:

> Result 5. If the market size does not increase dramatically as the result of the new competitor, the best defensive distribution strategy is to decrease spending on distribution.

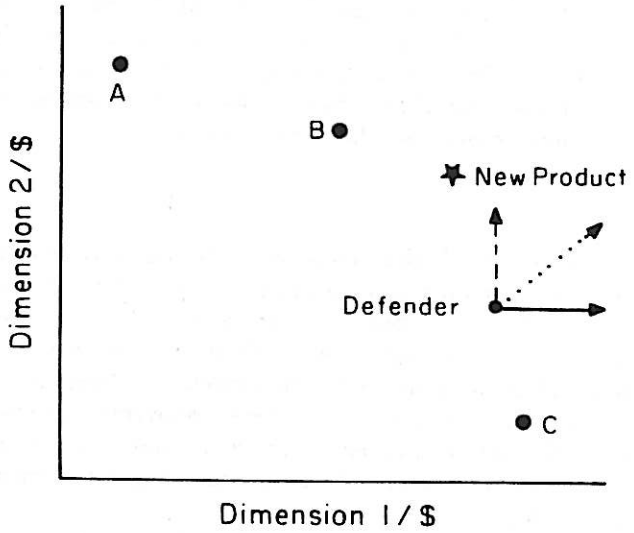
Many people find this result counterintuitive. But the logic is simple if [illegible] link of marginal revenue and marginal cost. Result 5 says that the competitive new product has made the market less profitable (see result 4), hence, [illegible] marginal profit for marginal retailers is less. If there is no change in the [illegible] ginal cost of persuading these retailers to make the product available, it [illegible] onger makes economic sense to invest in those marginal retailers.

Result 5 applies equally well to a multiplicative distribution index such as [illegible] common response analysis assumptions prevalent in marketing theory [illegible] example, Little, 1979). Moreover, if the brand is sold in several markets, result 5 holds for each market. Result 5 is also symmetric for competitive withdrawals. For example, if a newspaper withdraws from the market (as did the *Chicago Daily News* in the late 1970s), it makes economic sense to increase investment to capture your former competitor's channel of distribution. Indeed, both the *Chicago Tribune* and *Chicago Sun Times* fought competitively for the *Daily News*'s subscribers, newsboys, and so forth.

Product Improvement

We model product improvement as movements in the perceptual map. For example, consider an "upper-adjacent" attack as illustrated in figure 5–6. We call the attack "upper-adjacent" because the new product is above the defending brand and between the defending brand and its closest competitor. We assume the defender can improve its image by improving its physical product. Of course, such movements increase production cost and may or may not be profitable.

We model movements, such as the one illustrated by the dotted line in figure 5–6, by breaking those movements into their orthogonal components. For upper-adjacent attacks, we call improvements along dimension 1 "improvements away from the attack" as shown by the solid line in figure 5–6. Improvements along dimension 2 are "toward the attack" as shown by the dashed line. In reality, it is rare that a brand can move independently along just one dimension, but we gain valuable insight into the net movement (dotted line) by analyzing each component separately.



Note: Brands A, B, and C are existing brands.

Figure 5–6. Defender's Options under an Upper-Adjacent Attack

It may be possible to obtain global results, but to date we have been only able to obtain clear results "at the margin," that is, for product improvements holding price and other variables constant. In particular:

> **Result 6.** If consumer tastes are uniformly distributed and the competitive brand attacks along attribute 2 (that is, an upper-adjacent attack), then, at the margin:
>
> 1. profits are increasing for product improvements "away from the attack" (along the defender's strength, dimension 1)
> 2. under certain conditions, profits are increasing for product improvements "toward the attack" (along the attacker's strength, dimension 2)

The technical conditions for part 2 are given in Hauser and Shugan (1983, theorem 9). They are interpretable, but not easily. Of course, symmetric results hold for attacks along dimension 1 (that is, lower-adjacent attacks) and result 6 can be extended to other distributions of consumer tastes. We interpret negative movements along either dimension as substituting less costly, lower-quality ingredients.

Result 6 turns out to be very useful in practice. In our experience to date, the defending product had obtained its share by being the dominant brand on

twenty or so semantic scales are elicited from consumers via qualitative research

consumers are asked to rate each product in their evoked set on these scales

after standardization of all ratings by individuals, the ratings are factor-analyzed where correlations are computed across subjects and stimuli

map positions are approximated by average factor scores for the brands on each factor dimension

Factor-analytic techniques appear superior empirically to similarity scaling and discriminant analysis of attribute ratings. The raw semantic scales themselves are too highly correlated to be useful. Typically, there are two to four factor dimensions.

Theoretically, factor scores are at best interval scales, but per-dollar maps require ratio-scaled data. Hence, per-dollar maps are quite controversial in maketing, with many researchers believing that such maps are infeasible to chart and may not even exist. In practice, we have found that consumers appear to anchor their perceptions on the worst brand along each dimension, hence, if we compute scores relative to the worst brand, the resulting map positions act as if they were ratio scales. Initial evidence is published in Hauser and Gaskin (1984), but more work needs to be done.

Consumer Taste Distribution

Standard economic techniques for consumer tastes, such as logit analysis, probit analysis, and ordinary least squares, implicitly assume unimodal taste distributions: double-exponential, normal, and normal, respectively. For many situations in marketing science these techniques are quite powerful. However, for defensive strategies, our qualitative results suggest that we need greater flexibility in estimating the consumer taste distribution. Restriction to a unimodal taste distribution could miss, for example, the complexities of price strategies (results 1 and 2).

We turn instead to the revealed-preference technique illustrated in figure 5–7. Here we focus on a single evoked set, {A, B, C}, in which the market shares in the evoked set are 30%, 20% and 50%, respectively. For that evoked set, the relative perceptual dimensions are such that all consumers with taste angles between 0° and 30° choose brand C, those between 30° and 60° choose brand B, and those between 60° and 90° choose brand A. Because 50% of the consumers choose brand C, we know 50% have taste angles between 0° and 30°. Similarly, 20% have taste angles between 30° and 60°, and 30% between 60° and 90°.

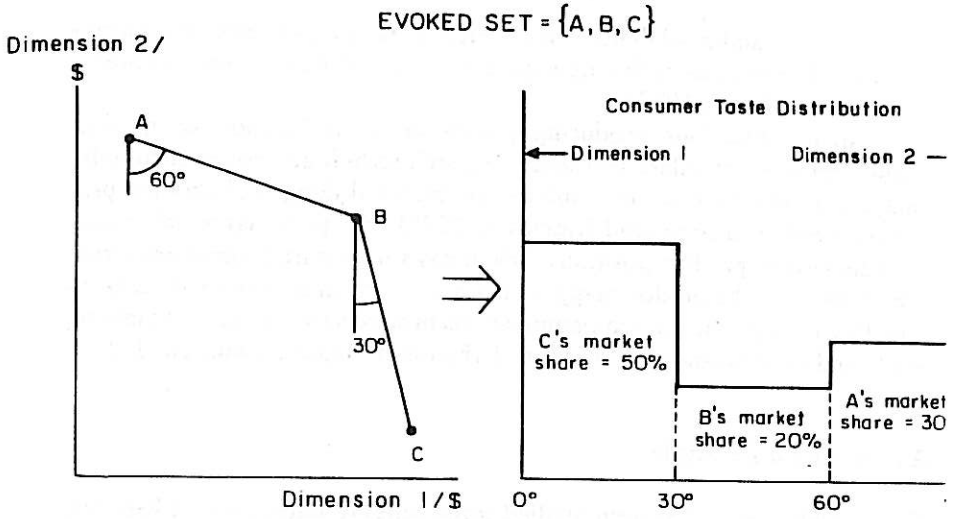


Figure 5–7. Revealed Shape of Taste Distribution for a Single Evoked Set (Using Piece-Wise Uniform Approximation)

There are infinitely many probability-density functions (PDFs) consistent with these market shares; for a single evoked set, we cannot distinguish among them. In the interest of parsimony, we choose the piecewise uniform PDF illustrated in figure 5–7. Fortunately, for most markets, there are many evoked sets possible; fifteen for a four-product market, thirty-one for a five-product market, and so forth. To describe the market-level PDF we use a weighted sum of evoked-set-level PDFs.[8]

Clearly, as the number of products in the market increases, the estimated PDF converges to the true PDF. Empirically, we have found this technique to produce reasonable PDFs which appear to predict the new brand shares quite well. (See predictive tests in Hauser and Gaskin, 1984).

Response Functions

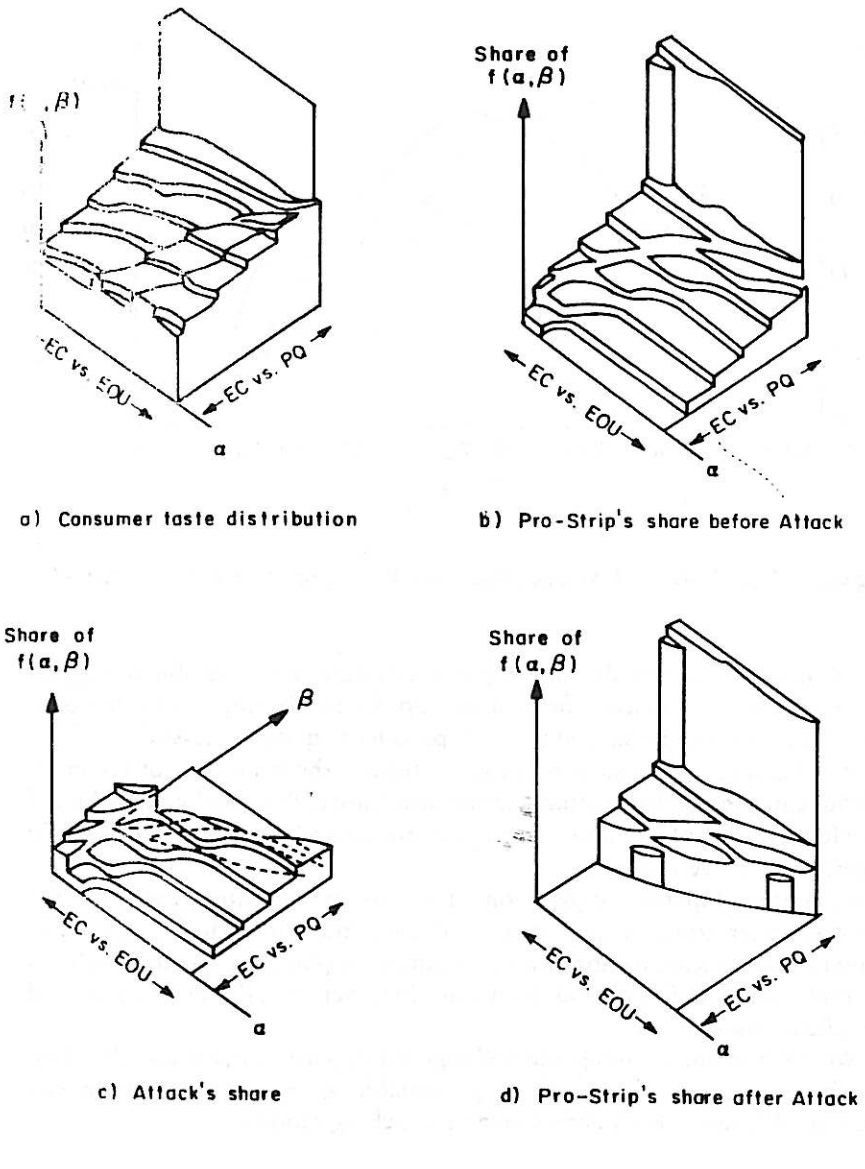
The full model requires three types of response functions:

awareness and availability as a function of dollar spending

product position as a function of features and/or ingredients

product position as a function of advertising spending on alternative messages

The first two types are well developed. The third type requires research.



Source: Hauser and Gaskin, 1984, p. 339. Copyright 1984, The Institute of Management Sciences and the Operations Research Society of America. Reprinted by permission.

Note: EOU = ease of use; EC = effective control; PQ = professional quality.

Figure 5–9. Consumer Taste Distribution and Shares for Pro-Strip and Attack (Disguised Brand Names)

quality segment but instead gets the area shown in figure 5–9c. Figure 5–9d projects the effect on Pro-Strip of Attack if it were to obtain full evoking. Attack would hurt Pro-Strip by drawing from Pro-Strip its more moderate customers. (At less than 100% evoking, we scale down figure 5–9d by Attack's evoking percentage and forecast Pro-Strip's share as a weighted combination of figures 5–9b and 5–9d).

Based on figure 5–9, Pro-Strip's defense is clear. To regain its share and/or preempt Attack, it must regain consumers with moderate taste tradeoffs. However, strategically, Pro-Strip must maintain a professional-quality image to preempt future attacks through repositionings by Attack.

Prescriptive Analysis

We analyzed many defensive scenarios for Pro-Strip. I illustrate here only the price analysis.

To compute the price response, we first compute the effect of a change in price on Pro-Strip's position, and use the new map and the estimated taste distributions to compute Pro-Strip's new share. Using accounting data on fixed and variable costs and response functions for advertising, we compute the optimal advertising budget and the resulting annual profit. Notice that Attack's position is held constant for this exercise. In practice, we also analyze competitive-response scenarios. Because competitive costs are well-guarded secrets, full-equilibrium analysis cannot be run.

Figure 5–10 shows Pro-Strip's profit and market share as functions of price (in 1982 dollars) prior to Attack's entry. Remember, each point in figure 5–10 is the result of an optimization on other marketing variables.

Profit rises rapidly as price increases until about $1.67, at which point it levels off until about $1.88. In this range, increases in margin roughly cancel decreases in market share. The rise again after $1.92 is the result of exploiting the professional-quality segment and is viewed as an unacceptable option for Pro-Strip. Since long-run strategy represents a trade-off among annual profit and market share, and since figure 5–10 is an estimate, and does not show exact values, Pro-Strip was using $1.69 as its average price.[9]

Based on Attack's entry, we recompute profit and share as shown in figure 5–11. Pro-Strip's share is now more sensitive to price. If the model's predictions are perfectly accurate, the best defensive price is just under $1.69. When measurement error is taken into account, the most we can say is that the best defensive price is in the range of $1.69.

Like many brand managers, the Pro-Strip managers felt pressure to react immediately and did so prior to the Defender analysis. Their gut reaction was to raise margins by five cents to compensate for the loss of share to Attack. Their rationale was to protect the profitability of the brand. Unfortunately, based on the model, this was not the best move. Had they held price, they

Current Projects

Heterogeneous Perceptions. The consumer model in the second section of this chapter assumes heterogeneous tastes but homogeneous perceptions. This is but an approximation since perceptions, preferences, and even choice rules are known to be heterogeneous. In our applications, we have extended the model to incorporate heterogeneous perceptions. Following ideas in Hauser and Simmie (1981), we assume perceptions are distributed normally about their centroids such that for any taste angle the probability of choosing a product is given by a probit model. We then use a matrix extension to the procedure illustrated in figure 5–7.[10]

The matrix extension works well and has the theoretical advantage that a brand can be inefficient on average in an evoked set, yet have nonzero market share in the evoked set due to heterogeneity of perceptions. (See discussion in Hauser and Simmie, 1981, pp. 42–44).

The Poker Game. Anyone with managerial experience quickly realizes that competitive strategy is a real poker game with bluffs, gambles, and other complications. Our theorems and models provide guidance but do not model the phenomenon endogenously. Furthermore, simple equilibrium assumptions such as the Cournot assumption just do not seem to capture the flavor of managerial practice.

My colleagues and I are addressing this issue with a multifront research agenda. First, we are continuing applications to get a breadth of managerial experience. Second, we are undertaking qualitative interviews with each major player in key industries to determine what managers believe are their decision strategies. Third, we are developing simplified competitive models and sponsoring contests similar to the Axelrod and Hamilton (1981) iterated-prisoner's-dilemma contest. And fourth, we are developing analytical models based on the consumer model in this chapter's second section under a variety of equilibrium assumptions (e.g., Hauser, 1985).

Revealed Image. Following standard marketing-science paradigms, we have chosen to measure perceptions directly and estimate the taste distribution based on the measured perceptions and observed market shares within evoked sets. The consumer model in the second section is quite flexible; we can also estimate perceptions if (1) we assume a taste distribution and (2) we observe market shares under a variety of price scenarios. (See simple example in Hauser and Shugan, 1984, pp. 345–49.) My colleague at the University of Chicago, Steven Shugan, has applied these ideas to estimate perceptual maps from weekly market share and price data which were obtained from automated supermarket checkouts. Although he assumes a uniform distribution and is limited to two perceptual dimensions, his method looks promising and produces perceptual maps with good face validity.

Future Directions

Here are just a few of the topics we hope we explore as we further probe defensive marketing strategy:

full n-product equilibrium, extending or challenging the results to date

further understanding of the taste distributions which lead to price decreases

qualitative analyses of temporary price reductions (deals)

qualitative analyses of the dynamics of consumer response and profit optimization

qualitative analyses of nonconstant costs and/or costs leading to entry-barriers

qualitative analyses of how to enter a market with full foresight on the defensive response of existing products

empirical studies of how firms do respond and whether they are successful

intercategory or interdivisional interactions

Note that many of these topics require applied economics methodology. For example, one fruitful direction might be the analysis of the implications of the Defender consumer model with dynamic pricing games where the firm sets positioning strategy with full knowledge of the price equilibrium. Such an analysis would merge the empirically rich marketing models with the sophisticated analytic tools of applied economics.

Notes

1. For example, for uniformly distributed tastes, the market share of Bayer is simply $(\alpha_3 - \alpha_2)/90°$.

2. Specifically, a price decrease (increase) moves a product out (in) along a ray connecting a product to the origin.

3. Even for uniformly distributed tastes, where $\int f(\alpha)\, d\alpha = (\alpha_3 - \alpha_2)/90°$, the boundary angles, α_2 and α_3, are related by an arctan function to ratios of the differences between Tylenol, Bayer, and Anacin's positions.

4. A detail force is a sales force that calls on doctors to make them aware of a drug, stress its benefits, and encourage them to recommend it to consumers.

5. Formal proofs of all results are in the appendix to Hauser and Shugan (1983). All results are for two perceptual dimensions.

6. The result (theorem 6) is explicit for distribution, but readily extends to awareness advertising. See Hauser and Shugan (1983, pp. 337, 341).