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Positioning Store Brands Against National Brands: Get Close or Keep a Distance?

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POSITIONING STORE BRANDS AGAINST NATIONAL BRANDS: GET CLOSE OR KEEP A DISTANCE?

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ABSTRACT

A stream of academic research has suggested that retailers may be better off positioning their store brands close to the national brands by promoting their store brands as being similar to the national brands. Retailers also appear to have embraced this notion. In this manuscript, we investigate this strongly held belief and ask the question – should store brands always strive to be "like national brands?" Analysis of a game theoretic model identifies eight market conditions when positioning a store brand close to a national brand may be less profitable or unprofitable. In particular, we find that close store brand positioning may not be profitable in categories where the manufacturer can expand category demand through non-price marketing investments such as advertising, or when there is a significant "unserved" (by national brand) market that can be served by the store brand.

A follow-up empirical analysis, using data on 109 grocery products from two retail chains, reveals that positioning a store brand close to the national brand is less likely in categories whose sales are expandable and in highly advertised categories, but more likely in high-margin categories and where the national brand has a large market share. Together, the analytical model and the empirical findings enhance our understanding of a retailer's store brand positioning strategy. Future research can investigate the effect of store competition, price promotions, and other factors on store brand positioning.

Key Words: *Private Labels, Positioning, Marketing Strategy, Channels of Distribution, Game Theory*

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1. INTRODUCTION

Private labels or store brands have become a force to reckon with in the United States. Dollar sales of private labels in grocery products have grown 38% during 1997-2002, nearly twice the growth (19%) of national brands during the same time period (AC Nielsen 2003). As a result, the dollar share of private labels has grown from about 14% in 1996 to about 16% in 2001. The unit volume market share in the United States is about 20% (source: Private Label Manufactures Association website: www.plma.org).

Buoyed by this growth trend, or otherwise, there is a general tendency among retailers to increase the sales of private labels at the expense of national brands in several ways including "positioning" the store brand close to the national brand (A&P Annual Report 2001; www.plma.org, Lauhnor and Terhune 2003). In the context of national brand vs. store brand competition, store brand positioning is broadly conceptualized as the extent of similarity between that private label and the national brand. Retailers attempt to position their store brand close to the national brand in at least four ways: (i) increasing the quality of store brand and reducing the perceived quality gap between national brand and store brand, (ii) imitating national brand packaging (often called the copycat strategy), (iii) placing the store brand on the shelf right next to the national brand, and (iv) using shelf talkers with "compare and save" or similar slogans.

Academic research also tends to support the retailers' desire to position their store brands close to the national brand. Several researchers (e.g., Sayman, Hoch and Raju 2002, Morton and Zettelmeyer 2000, Raju, Sethuraman and Dhar 1995, Mills 1995, Sethuraman 1989) have directly or indirectly addressed the question of whether or not store brands should be positioned close to national brands. Details of this literature are provided in §2. These articles appear to

unanimously suggest that retailers would be better off (obtain higher category profits) by positioning their store brands close to the national brands, especially the leading national brand.

The purpose of this manuscript is to further investigate this strongly-held belief and explore the following questions:

(i) Is it always in the interest of the retailer to position the store brands close to the national brands?

(ii) If not, what are the conditions when it would be profitable *not* to position the store brand close to national brands, and why?

(iii) In the real world, we do find some product categories in which the store brands mimic the national brands and some categories in which they do not. Can we prescribe to the managers in what categories they should adopt the former and in what categories they should follow the latter strategy?

(iv) Alternately, can we explain retailers' store brand positioning behavior through theoretical analysis?

This manuscript addresses the above questions through an equilibrium analysis of the actions of a manufacturer selling a national brand and a retailer who sells both the national brand and the store brand. Our analytical model incorporates several factors not included in previous literature, viz., category expansion, unserved (by national brand) market, cost differences, and heterogeneity in reservation prices. The analysis identifies some market conditions when the conventional belief that retailers should position their store brand close to the national brand may not hold. In particular, we find that a retailer may not find it profitable to position its store brand close to the national brand in categories where the manufacturer can expand category demand through non-price marketing investments such as product improvements and advertising. Close store brand positioning may also not be profitable when there is a significant "unserved" (by national brand) market that can be served by the store brand.

We then empirically analyze data on store brand positioning collected from two supermarket chain stores across 109 grocery products and test some implications from our analytical model. In particular, we find that positioning a store brand close to the national brand is less likely in categories whose sales are expandable and in highly advertised categories, but more likely in high-margin categories and where the national brand has a large market share.

We believe the manuscript makes theoretical, empirical, and methodological contributions in the following ways. On the theoretical front, it prescribes eight market conditions when positioning a store brand close to the national brand may be less profitable (or unprofitable). On the empirical side, it identifies four category characteristics that influence store brand positioning in the real world. We believe the manuscript also makes a modest methodological contribution by developing an analytical model that incorporates variables such as category expansion, unserved market, and consumer heterogeneity, which have not been studied in previous marketing channels literature.

The paper is organized as follows. In §2, we review pertinent literature on store brand positioning and motivate the present research. §3 describes the analytical model. §4 presents the results from the basic equilibrium analysis. In §5, we test the robustness of the basic results as well as obtain additional insights. §6 presents the empirical analysis and results. In §7, we conclude by discussing the key results, limitations, and future research directions.

2. LITRATURE REVIEW

In an insightful modeling work on store brand positioning, Sayman, Hoch and Raju (2002) have provided several analytical results with useful implications for retailers and store brand managers. First, the authors show that it is profitable for retailers to position their store brands so as to increase the price competition with national brands. Second, if there are several

national brands, it is more profitable for a retailer to position its store brand against the leading national brand. Positioning is conceptualized in terms of the cross-price effect (price substitutability) between national brand and store brand, that is, positioning a store brand closer to the national brand implies that the cross-price effect between the two brands is increased.

Other researchers have also suggested that retailers gain by increasing the cross-price sensitivity between national brand and store brand. Sethuraman (1989, p. 91) showed that the category profits and the proportion of total channel profits garnered by the retailer increase as the cross-price sensitivity between national brand and store brand increases, i.e., as the store brand is positioned closer to the national brand. Raju, Sethuraman and Dhar (1995, Proposition 2) and Mills (1995, p. 520) also show that the retailer's profits are increasing with cross-price sensitivity. Taking a slightly different approach, Morton and Zettelmeyer (2000) employ a bargaining framework and argue that by positioning the store brand to mimic the national brand wielding monopoly power, the retailer can strengthen its bargaining position when negotiating supply terms with the national brand manufacturer. Thus, there is consistent theoretical support for the contention that retailers may be better off positioning the store brand close to the national brands, especially the leading national brand. Along similar lines, empirical researchers have also emphasized the importance of reducing the quality gap between national brand and store brand for achieving store brand success (Hoch and Banerji 1993, Richardson, Jain and Dick 1996, Sethuraman and Cole 1999).

These analytical and empirical results have led retailers and store brand managers to believe that an effective way to earn more profits is to increase the price substitutability between national brand and store brand. Retailers attempt to accomplish this objective by narrowing the quality gap and/or otherwise impressing upon the consumers that there is little difference

between national brand and store brand – so, why pay more? For instance, the Private Label Manufacturers Association (PLMA) website proclaims that, in a 1999 Gallup study, 75% of consumers ascribed similar levels of product quality to national brands and store brands. *The Wall Street Journal* (July 15, 1993) reports that, frequently, private labels are designed and packaged to signal close substitutability with national brands.

The objective of this paper is to explore the basic question – should retailers always strive to be "like national brands" as analytical modelers and empirical researchers appear to suggest? Almost all the analytical models that recommend close store brand positioning:

(i) assumed demand is linear in price,

(ii) were based on aggregate demand function that did not evolve from individual consumer behavior,

(iii) did not explicitly incorporate consumer heterogeneity,

(iv) assumed marginal cost of national brand and store brand to be equal and set it to 0 without loss of generality,

(v) did not explicitly consider category expansion,

(vi) did not incorporate non-price variables such as advertising, and

(vii) did not consider store competition.

The question then arises as to whether the conventional result that a store brand should be positioned close to the national brand will hold if these assumptions are relaxed. Our analytical model attempts to investigate this question by relaxing assumptions (i) – (vi), but we do not consider store competition.

3. ANALYTICAL MODEL

We focus on the competition between one national brand and one store brand. This focus is adequate in our case for highlighting the conditions when positioning a store brand close to the national brand may increase or decrease retailer profits. As Shugan (2002) states, simpler models (e.g., monopoly models) are useful for gaining insights, even if they don't exactly mirror

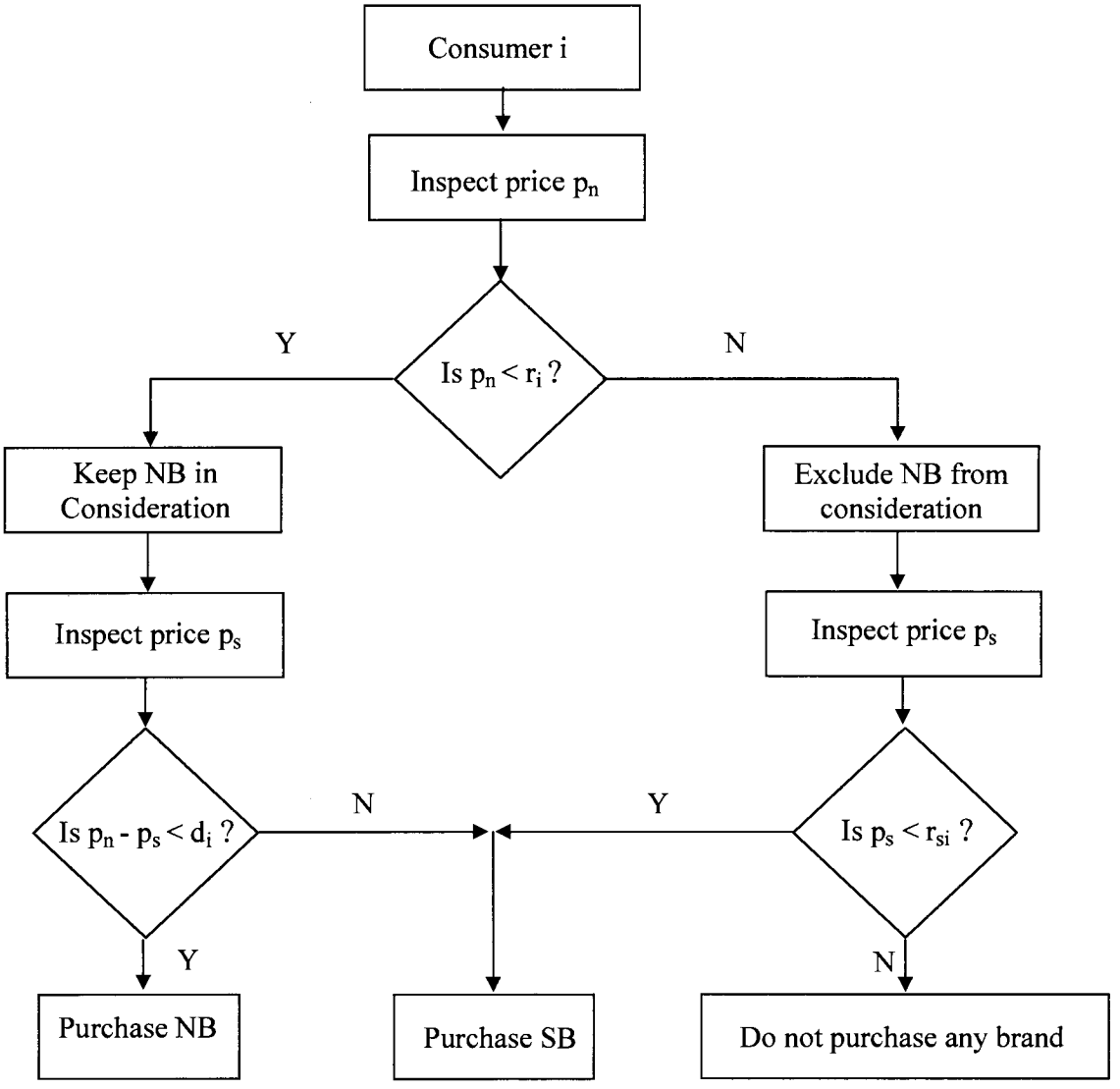
the real world. Furthermore, in about 40% of the product categories in the two supermarket chain stores we collected data from (discussed later in §6.2), the store brand competes with just one national brand. In categories where there are multiple brands, the national brand can be deemed as the leading brand, the one often targeted by the store brand (Sayman, Hoch, and Raju 2002). We first present the consumer behavior assumptions used to develop the demand function studied in our analytical model and then describe the game structure.

3.1. Consumer Behavior

Consumers' behavior with respect to purchase of national brand and store brand postulated in this paper is presented in Figure 1. There are K consumers in the market. Each consumer (i) has a reservation price (r_i) for the national brand. If price of national brand (p_n) is less than the reservation price (r_i), s/he considers the national brand. Then s/he inspects the price of the store brand (p_s). If the actual price differential ($p_n - p_s$) is less than the reservation price differential (d_i), i.e., the price premium that consumers are willing to pay for the national brand over the store brand, then the consumer purchases the national brand; if not, the consumer purchases the store brand.

Those whose reservation price for the national brand is less than the national brand price, i.e., those who are unwilling to pay the (high) price for the national brand, inspect the price of the store brand (p_s) and compare it with their reservation price for the store brand, given that it is the only brand in their consideration set. If the store brand price is less than its reservation price, the consumer purchases the store brand; if not, s/he does not purchase any brand. We assume that a consumer's reservation price for the store brand is less than or equal to his/her reservation price for the national brand, consistent with previous models on store brands (e.g., Lal 1990, Rao 1991) and general empirical observations (e.g., Abe 1998, Sethuraman and Cole 1999).

Figure 1
Consumer Behavior Model



Key

p_n = price of national brand (NB)
p_s = price of store brand (SB)
r_i = Consumer i's reservation price for national brand
r_{si} = Consumer i's reservation price for store brand when it is the only available option
d_i = reservation price differential between national brand and store brand

3.2. Demand Function

Let f(r) represent the (continuous) distribution function of the reservation price (r_i) across the K consumers and f(d) represent the corresponding distribution of reservation price differential (d_i). When national brand price (p_n), is greater than the reservation price (r_i), the consumer is left with the option of either purchasing the store brand or not purchasing any brand. Faced with this situation, consumers may set their reservation price for the store brand in different ways. On the one hand, some consumers who desire to purchase a brand, rather than not purchasing any brand, may simply decide to purchase the store brand if the price of the store brand is less than their original reservation price for the national brand (r_i). In this case, $r_{si} = r_i$. On the other hand, some consumers may still not be willing to pay the national brand reservation price for the store brand even if the store brand is the only one affordable. In this case, $r_{si} < r_i$.

To account for these possibilities, we adopt the following approach. Suppose all consumers have reservation price for store brand when they can not afford the national brand to be the same as reservation price for national brand, i.e., $r_{si} = r_i$. In this case, r_i can be deemed as the reservation price for the category. Then, for any set of prices p_n, p_s, all consumers whose reservation prices are below that of the national brand but above that of the store brand will purchase the store brand. In other words,

> Maximum (potential) market unserved by the national brand at price p_n that can be served by the store brand at price p_s
>
> = all consumers whose reservation prices are between p_n and p_s, i.e., $p_s < r_i < p_n$.

Let v ($0 \leq v \leq 1$) be the fraction of the above potential market that is actually served by the store brand. Then,

Market actually served by the store brand at price p_s

= v * (number of consumers whose reservation price is between p_n and p_s).

Based on the above notations, we can write the demand function for national brand as:

$$(1) \qquad q_n = K\left\{\int_{p_n}^{\infty} f(r) \int_{p_n - p_s}^{\infty} f(d)\right\}.$$

The demand function for the store brand can be represented as follows:

$$(2) \qquad q_n = K\left\{\int_{p_n}^{\infty} f(r) \int_{o}^{p_n - p_s} f(d) + v \int_{p_s}^{p_n} f(r)\right\}.$$

The first term in the RHS of Equation (2) represents store brand sales through competitive encroachment of national brand market; the second term represents the market that is unserved by the national brand at price p_n, that is tapped by the store brand at price p_s.

3.3. Distribution Assumptions

We assume that the reservation price (r) is normally distributed with mean μ_r and standard deviation σ_r, i.e., $r \sim N(\mu_r, \sigma_r)$. Hierarchical Bayes models (e.g., Allenby and Rossi 1999, Kim, Blattberg, and Rossi 1995) have been shown to capture market level heterogeneity quite well. These models typically assume that brand preferences (a measure of reservation price) and price sensitivities are normally distributed (Sethuraman and Srinivasan 2002).

In a similar vein, the reservation price differential (d) is assumed to be distributed normally with mean μ_d and standard deviation σ_d, i.e., $d \sim N(\mu_d, \sigma_d)$. Using scanner data, Abe (1998) estimated the reservation price difference (RPD) between national brands and store brands in several product categories and found that normal distribution was a reasonable approximation for the distribution of RPD across consumers. In a study using survey data,

Sethuraman and Cole (1999) obtained self-reported reservation price differential measures (premium willing to pay for national brands over store brands) from 132 consumers across 20 product categories. In many categories, the distribution of RPD was unimodal. Though the distribution was not exactly symmetric and there were product differences, on aggregate, normal distribution appears to be a reasonable representation of the heterogeneity across consumers.

Finally, we assume that r_i and d_i are uncorrelated. There is some empirical evidence that the relationship between the two may be weak. For example, Fitzell (1992), Sethuraman and Cole (1999) note that the relationship between income (a potential surrogate for reservation price r_i -- higher the income, higher is the r_i) and store brand proneness (a possible surrogate for reservation price differential because store brand prone consumers tend to have lower d_i) is either non-significant or at best marginally significant. Later, in §5, we relax this assumption.

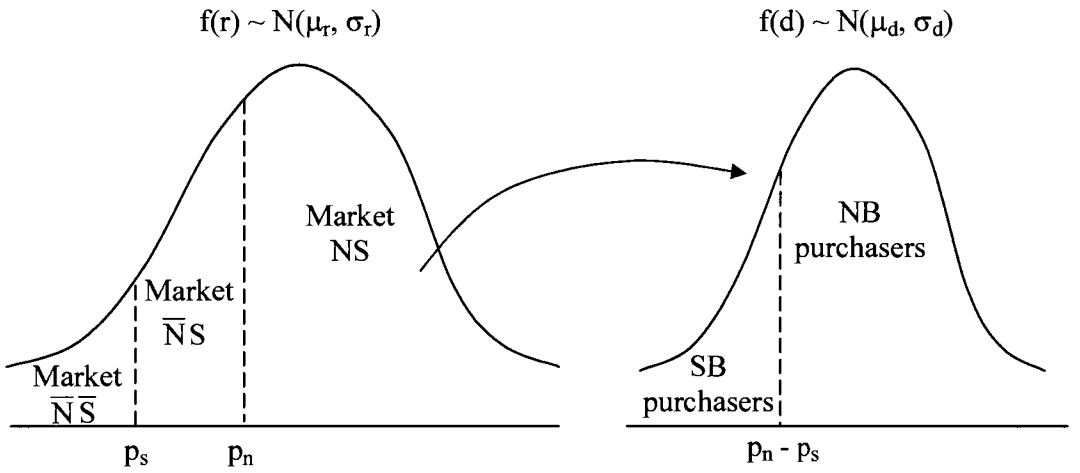
Based on the above distributional assumptions, we rewrite the demand functions as

$$(3) \qquad q_n = K\left[1-\Phi\left(\frac{p_n-\mu_r}{\sigma_r}\right)\right]\left[1-\Phi\left(\frac{p_n-p_s-\mu_d}{\sigma_d}\right)\right], \text{ and}$$

$$(4) \qquad q_s = K\left[1-\Phi\left(\frac{p_n-\mu_r}{\sigma_r}\right)\right]\left[\Phi\left(\frac{p_n-p_s-\mu_d}{\sigma_d}\right)\right] + Kv\left[\Phi\left(\frac{p_n-\mu_r}{\sigma_r}\right)-\Phi\left(\frac{p_s-\mu_r}{\sigma_r}\right)\right].$$

Φ is the cumulative density of a standard normal distribution, N(0,1). Figure 2 provides a pictorial representation of the sources of national brand and store brand demand.

Figure 2
Representation of Demand



NS = Competitive market served by both national brand (NB) and store brand (SB)
$\overline{N}S$ = Market unserved by national brand at price p_n that can be served by store brand at price p_s.
$\overline{N}\overline{S}$ = Market unserved by both national brand and store brand

The bell curve on the left hand side represents the distribution of reservation price, f(r). For any given prices p_n and p_s, three markets are delineated: (i) competitive market (NS), consisting of consumers who consider both national brand and store brand because their reservation price is greater than p_n, (ii) market ($\overline{N}S$) unserved by national brand but potentially served by store brand, consisting of consumers whose reservation price is below p_n but above p_s, and (iii) market ($\overline{N}\overline{S}$) that is unserved by both national and store brands, consisting of consumers whose reservation price is below p_s.

The competitive market (NS) is shared between the national brand and the store brand based on the distribution of reservation price differential, f(d) as shown on the RHS of Figure 2. Consumers whose RPD is greater (less) than $p_n - p_s$ purchase the national (store) brand.

Note that as μ_r *increases*, the bell curve f(r) in Figure 2 shifts to the right. Other things equal, for any given prices p_n, p_s, more consumers are served, and thus category demand (NS +

$\overline{NS}$) increases. Hence, we call μ_r as the *category expansion parameter*. We assume that the national brand manufacturer can increase μ_r through investments in non-price marketing investments such as advertising, product improvement, publicity, or other promotions.

As μ_d *decreases*, the bell curve f(d) in Figure 2 shifts to the left. Other things equal, at any given prices p_n and p_s, sales of store brand increases and sales of national brand decreases, i.e., more consumers switch from national brand to store brand. In this regard, μ_d is analogous to the national brand – store brand cross-price sensitivity parameter (θ) used in traditional linear models (Mills 1995, Raju, Sethuraman and Dhar 1995, Sayman, Hoch and Raju 2002 – low μ_d => high θ => close store brand positioning). μ_d is thus an indicator of the positioning of store brand against the national brand and we call it the *store brand positioning parameter*. Retailer can influence μ_d with marketing activities that include enhancing perceived quality of store brand, positioning the store brand on the shelf next to the national brand, and/or imitating national brand packaging. Parameters σ_r and σ_d are measures of heterogeneity in reservation price and reservation price differential, respectively.

3.4. Game Structure

In this market, decisions are assumed to take place in the following order:

Retailer sets store brand positioning, μ_d

↓

Manufacturer sets μ_r

↓

Manufacturer sets wholesale price, w_n

↓

Retailer sets retail prices, p_n and p_s

Ultimately, we seek to understand how equilibrium store brand positioning might be influenced by market conditions. To solve for the subgame perfect equilibrium, we first consider the retail

pricing game (Stage 1), then the manufacturer wholesale price game (Stage 2), then manufacturer's category expansion decision (Stage 3) and finally, the retailer positioning game (Stage 4). These stages are described below:

Stage 1. In the first stage, retailer sets retail prices p_n, p_s to maximize its profits

$$(5) \qquad \underset{p_n, p_s}{\text{Max}} \; (p_n - w_n)q_n + (p_s - c_s)q_s,$$

where w_n is the wholesale price of the national brand and c_s is the marginal cost of the store brand (assumed constant). Fixed costs are assumed to be zero.

Stage 2. The national brand manufacturer sets wholesale price w_n to maximize its profits knowing the retailer's price setting behavior, i.e., manufacturer is the Stackelberg leader.

$$(6) \qquad \underset{w_n}{\text{Max}} \; (w_n - c_n)\, q_n,$$

where c_n is the constant marginal cost of the national brand.

Denote the manufacturer's and retailer's equilibrium profits from the above pricing game (Stages 1 and 2) as $\Pi_{mp}(\mu_r, \mu_d, \Omega)$ and $\Pi_{rp}(\mu_r, \mu_d, \Omega)$, respectively, where Ω represents the set of all other parameters, $\Omega \in \{K, c_s, c_n, \sigma_r, \sigma_d, v\}$

Stage 3. Manufacturer maximizes its profits over μ_r

$$(7) \qquad \underset{\mu_r}{\text{Max}} \; \Pi_{mp}(\mu_r, \mu_d, \Omega) - C(\mu_r),$$

where $C(\mu_r)$ is the cost of increasing μ_r .

Stage 4. Retailer maximizes its profits over μ_d, given the actions in all previous stages.

$$(8) \qquad \underset{\mu_d}{\text{Max}} \; \Pi_{r3}(\mu_d, \Omega) - C(\mu_d),$$

where Π_{r3} is the retailer's profits from Stage 3 and $C(\mu_d)$ is the cost of positioning the store brand close to the national brand.

4. BASIC EQUILIBRIUM ANALYSIS

Note that the demand functions represented by Equations (3) and (4) are non-linear. Therefore, closed form solutions are not possible even for the pricing game. We adopt a numerical approach to perform the equilibrium analysis. Where the models have been relatively complex and/or analytically intractable, a numerical approach has been used in a wide variety of situations (e.g., Raju, Sethuraman and Dhar 1995, Neslin, Powell, and Stone 1995, Tellis and Zufryden 1995).

In the basic equilibrium analysis presented in this section, the numerical approach consists of (i) developing a reasonable initial set of parameters, (ii) analyzing the profit maximizing problems in Stages (1)-(4), and (iii) obtaining qualitative insights. In §5, we vary the parameter values, test the robustness of the results from §4, and obtain additional insights.

4.1. Initial Set of Parameter Values

The initial set of parameter values are given in Table 1. Note that all parameters (except v and K) can be expressed in monetary units.

Table 1
Parameter Values used in Numerical Analysis

Description	Notation	Initial value (range) used in basic equilibrium analysis (§4)	Range investigated in extended equilibrium analysis (§5)
Cost of national brand	c_n	1 (wlog)	1 (wlog)
Cost of store brand	c_s	1	0.5 - 1.5
Mean reservation price	μ_r	3 (3 → 4) in stage 3	3 - 10
Mean reservation price differential	μ_d	1 (1 → 0.2) in stage 3, 4	1 - 5

Std. dev. of reservation price	σ_r	1.5	1 - 2
Std. dev. of reservation price differential	σ_d	0.5	0.25 - 0.75
Proportion of unserved market served by store brand	v	1 (0.6 - 1)	0.6 - 1
Market size - # of consumers	K	100 (wlog)	100-1000

wlog = without loss of generality

First, we start by normalizing the marginal cost of national brand and set c_n to be 1, without loss of generality. For instance, if unit cost of national brand is (say) \$5, we can treat \$5 as one unit of price. All other costs and prices will be divided by 5. Empirical evidence on the cost of store brand relative to the cost of national brand is not conclusive. Managers generally believe that store brand procurement costs are lower due to low promotional costs; on the other hand, national brand costs may be lower due to economies of scale derived from large-scale production and national distribution. Almost all prior literature on national brand – store brand competition (e.g., Sayman, Hoch and Raju 2002, Mills 1995) have assumed that the cost of producing national brand and store brand are equal. Consistent with this literature, we assume the cost of store brand c_s to be 1.

In general, there is a wide variation in manufacturer's margin ($\frac{w_n - c_n}{c_n}$), which can range from 20% to 200%. Assuming a high 100% margin on cost, the wholesale price would be \$2. Retailer gross margin ($\frac{p_n - w_n}{p_n}$) in grocery products is generally about 30% of retail price (Sethuraman and Tellis 2002). So, the retail price of national brand with these margins works out to approximately \$2.86. We center the mean reservation price (μ_r) around this value and assume $\mu_r = 3$. Sethuraman and Cole (1999) notes that, on average consumers are willing to

pay a premium of 30% for national brand over store brand. Accordingly, we assume $\mu_d = 0.3 * \mu_r (= 3)$, or rounding up, $\mu_d = 1$. Sethuraman and Cole (1999) also find that the standard deviation of the distribution of reservation price differential is 30% to 70% of the mean reservation price differential across the 20 product categories they investigated. We assume that the standard deviation is about 50% of the mean and set $\sigma_d = 0.5 * \mu_d = 0.5$. Similarly, we set $\sigma_r = 0.5 * \mu_r = 1.5$. The assumptions on σ_r and σ_d ensure that only a small portion of consumers (2.3%) have negative reservation price and negative reservation price differential, consistent with general market observations in grocery products. Finally, the proportion (v) of unserved by national brand market captured by the store brand is assumed to be 1 to begin with - that is all consumers who can not afford the national brand purchase the store brand if $p_s < r_i$, and then varied from 0.6 to 1.

4.2. Numerical Analysis Procedure

The numerical analysis procedure for solving the profit maximization problems represented in §3.4 consists of the following four steps.

Step 1. Investigating Characteristics of Demand Functions

We varied national brand price from 1 (= c_n) to 6 (= $\mu_r + 2\sigma_r$) in increments of 0.01. We varied store brand price from 1 to p_n in increments of 0.01. All other parameters were set at the initial values shown in Table 1 (Column 3). The demand functions for national brand and store brand are shown in Figures 3A and 3B, respectively.

Figure 3A
Demand Function – National Brand

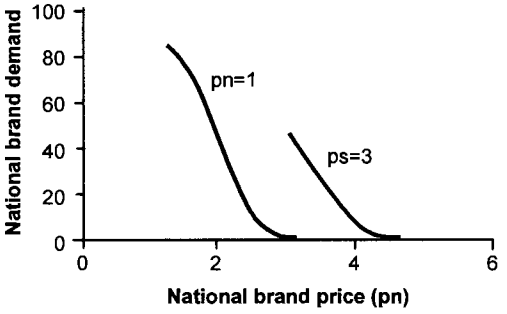
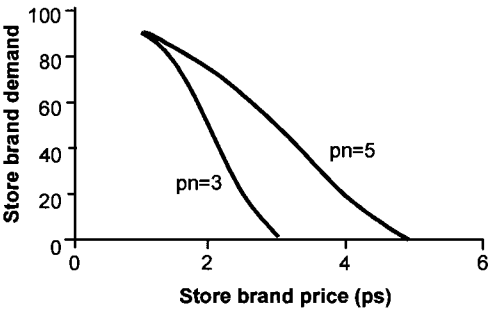


Figure 3B
Demand Function – Store Brand



The demand function for national brand (i) is smooth and downward sloping in own price, (ii) is higher when the competitive store brand price is higher, and (iii) appears to be s-shaped, with demand tending to zero when price of national brand is 2 ($=4\sigma_d$) units more than the store brand price. The third characteristic results from the assumption of normality of the distributions, especially f(d). When the price difference ($p_n - p_s$) is very low or very high, the market is operating in the tails of the normal distribution; any decrease or increase in national brand price does not switch many consumers in that region, and the demand function is flat.

The demand for store brand (Figure 3B) also (i) is smooth and downward sloping in own price, (ii) is higher when the competitive national brand price is higher, and (iii) appears to be s-shaped, with demand tending to zero when price of national brand equals the store brand price. In addition, the effect of national brand price on store brand demand (cross-price sensitivity) diminishes significantly when the price of the store brand is low relative to the price of the national brand. Again, this occurrence is a result of the market operating in the right-tail of the normal f(d) distribution. For example, when p_s=1, almost all consumers have switched to the store brand when p_n=3 so that the store brand demand is unaffected whether p_n=3 or p_n=5.

Step 2. Analysis of Stages 1 and 2 – Retailer and manufacturer price setting games.

Stage 1 analysis was performed in the following manner. We fixed the wholesale price to some value w. For this w, we computed retail profits using Equation (5) over the range of retail prices ($1 \le p_n \le 6$) and ($1 \le p_s \le p_n$). All other parameters are fixed at the values given in Table 1 (Column 3). Retailer's profit function was concave and relatively smooth over prices p_n, p_s leading to a unique interior global maximum at prices p_{n1}^* and p_{s1}^*. We repeated the exercise for different values of w ($1 \le w \le 5$) in increments of 0.01 to get the manufacturer's reaction function.

Stage 2 equilibrium analysis was performed in the following manner. For each value w, we substituted the retail prices p_{n1}^*, p_{s1}^* into the national brand demand function (3) to get q_n. We used this demand to compute manufacturer profits (Equation 6). The manufacturer's profit function over the range of wholesale prices was also found to be relatively smooth and concave. Thus we were able to identify a unique set of equilibrium prices within ±0.01 accuracy for the parameter values indicated in Table 1 (Column 3). They are $w_n^* = 1.57, p_n^* = 3.84, p_s^* = 2.85$. From these values, we can compute quantities sold and profits at the end of Stage 2.

Since category expansion coefficient μ_r and store brand positioning coefficient μ_d are the two key parameters of interest in this paper, which are to be investigated in Stages 3 and 4 of the game, it is useful to provide the effect of these parameters on equilibrium values from stages 1 and 2. First, we computed equilibrium prices (w_n^*, p_n^*, p_s^*) by varying μ_r from 3 to 4 in increments of 0.1. All other parameters were held constant at the values given in Table 1 (Column 3). The following are the findings.

For any given set of parameter values in Table 1 (Column 3), as μ_r increases,

F1. *manufacturer wholesale price and margin increase,*
F2. *retail price of national brand and retail margin on national brand increase,*
F3. *retail price of store brand and retail margin on store brand increase,*
F4. *quantity sold of national brand and store brand increase.*
F5. *manufacturer profits increase, and*
F6. *retailer profits on national brand, store brand, and total retailer profits increase.*

Findings F1-F6 are quite intuitive. An increase in μ_r increases the total number of purchasers at any given prices p_n, p_s, thus shifting demand outward. This outward shift in demand increases prices and sales of both national brand and store brand in equilibrium. Thus, both manufacturers and retailers are better off when μ_r increases.

The effect of store brand positioning μ_d on prices and profits was obtained by varying μ_d from 1 to 0.2 – all other parameters set at their initial levels. As μ_d decreases (i.e., as store brand is positioned closer to national brand):

F7. *manufacturer wholesale price and margins decrease,*
F8. *retail price of national brand and retail margin on national brand decrease,*
F9. *retail price of store brand and retail margin on store brand increase,*
F10. *price differential between national brand and store brand decreases,*
F11. *sales of national brand decreases while sales of store brand increases,*
F12. *manufacturer profits decrease, and*
F13. *retailer profits on national brand decrease while profits on store brand increase.*

Findings F7-F13 are consistent with results from aggregate linear models (e.g., Raju, Sethuraman and Dhar 1995, Sethuraman 1989, Sayman, Hoch and Raju 2002, Mills 1995). This convergence in results provides both a robustness check on the results from previous literature using linear models, as well as a validation check on the present model and analytical procedure. The

findings are also intuitive. When a store brand is positioned close to the national brand, it takes away more consumers from the national brand for a given price differential. This increased competition for national brand customers forces the manufacturer to reduce its wholesale price in equilibrium and the national brand retail price and sales also decrease. As a result, close store brand positioning decreases national brand profits for both the manufacturer and the retailer. The reverse takes place for the store brand. When μ_d decreases, store brand gains more consumers for a given price differential. So, its prices and sales, and thus retailer profits on the store brand increase in equilibrium.

What happens to total retailer profits when μ_d decreases? Conventional belief, supported by previous analytical models, would suggest that total retailer profits would increase as μ_d decreases (i.e., as store brand is positioned close to national brand). Our analysis reveals that the equilibrium retailer profits (excluding cost of positioning) increase or decrease with μ_d depending on v, the proportion of potential store brand market unserved by the national brand that can be served by the store brand, as shown in Figure 4. (The x-axis is converted to $1-\mu_d$ to indicate closer store brand positioning, moving from left to right.).

Figure 4
Effect of Store Brand Positioning on Retailer Profits (Stage 2)

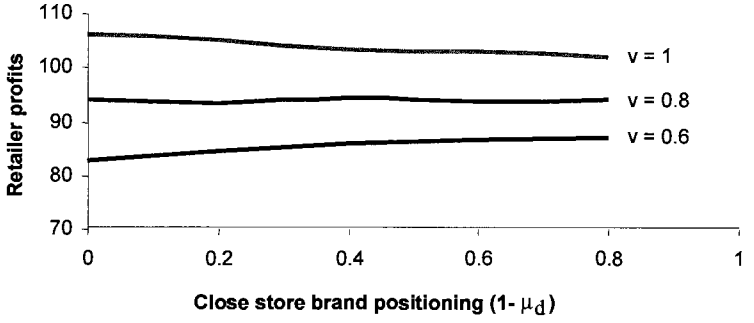


Figure 4 leads to the following result:

F14. *For a given set of parameter values as indicated in Table 1 (Column 3), when v is not large (about 0.6 in this analysis), retailer profits increase with close store brand positioning; however, when v is large (close to 1), retailer profits decrease with close store brand positioning.*

The first part of finding F14 is consistent with conventional belief that close store brand positioning benefits the retailer. The second part of F14 goes contrary to conventional belief and identifies a condition when close store brand positioning may not be profitable after all. An intuition for this somewhat surprising result is given below:

When μ_d decreases, retailer profits on national brand decreases but profits on store brand increases. But, does the increase in store brand profits more than compensate for the decrease in national brand profits? When v is not large, it may and when v is large, it may not. Why?

At any given prices p_n, p_s the total market can be divided into three regions based on the reservation prices – see also Figure 2 -- (i) the competitive market (NS) that can be served by both national and store brands ($r_i > p_n$), (ii) market ($\overline{NS}$) that is not served by the national brand that can be potentially served by the store brand ($p_s \le r_i \le p_n$), and (iii) market ($\overline{\overline{NS}}$) not served by both national and store brands ($r_i < p_s$). When a store brand is positioned closer (μ_d decreases), p_n^* decreases, p_s^* increases. As a result, the competitive market (NS) increases, but the market unserved by national brand ($\overline{NS}$), decreases as described in Table 2.

Table 2
Effect of Close Store Brand Positioning on Store Brand Sales

Description	Current State (μ_d) → closer positioning state $(\mu_d - \Delta\mu_d)$
National Brand (NB) price	$p_n^* \rightarrow p_n^* - \Delta p_n$
Store Brand (SB) price	$p_s^* \rightarrow p_s^* + \Delta p_s^*$
NS market size	$Q_{NS} \rightarrow Q_{NS} + \Delta Q_{NS}$
Mkt share of SB from NS market	$m_{s(NS)} \rightarrow m_{s(NS)} + \Delta m_s$

$\overline{NS}$ market size	$Q_{\overline{NS}} \rightarrow Q_{\overline{NS}} - \Delta Q_{\overline{NS}}$
Mkt share of SB from $\overline{NS}$ market	$v \rightarrow v$
SB sales q_S	$Q_{NS} \cdot m_s + Q_{\overline{NS}} \cdot v \rightarrow (Q_{NS} + \Delta Q_{NS})(m_s + \Delta m_s) + (Q_{\overline{NS}} - \Delta Q_{\overline{NS}})v$

After simplifying, incremental store brand sales due to close positioning is given by

$$(9) \qquad q_s(\mu_d - \Delta\mu_d) - q_s(\mu_d) = \Delta Q_{NS}(m_s + \Delta m_s) + Q_{NS}\Delta m_{NS} - v \cdot \Delta Q_{\overline{NS}}$$

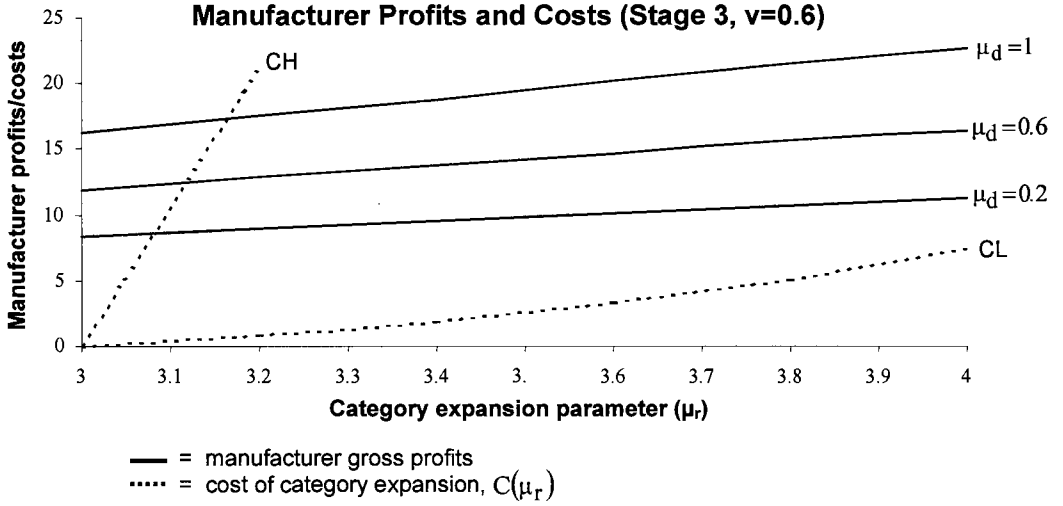
Net sales of store brand increases in general as μ_d decreases, i.e., RHS of Equation (9) is positive. However, if v is large, the incremental sales of store brand is less. In such a case, the incremental profits from store brand may not be adequate to meet the decrease in profits from the national brand, and net profits decreases with close store brand positioning.

In qualitative terms, when a store brand is positioned close to the national brand, it forces the national brand manufacturer to be aggressive on price. This decreased national brand price results in the loss of retailer's "monopoly" market ($\overline{NS}$) which could not earlier afford the national brand. If the retailer gets a significant portion of this market (high v), then this loss would result in a net decrease in retailer profits.

Step 3. Analysis of Stage 3

Stage 3 analysis was conducted in the following manner. We allow μ_r to increase from 3 (initial state) to 4 in increments of 0.1. For each value of μ_r, we perform Stage 1 and Stage 2 pricing game analyses as explained in Step 2 and compute equilibrium prices and profits. Figure 5 (continuous lines) represents the movement of manufacturer gross profits from pricing game (Π_{mp}) with μ_r for different values of μ_d.

Figure 5
Manufacturer Profits and Costs (Stage 3, v=0.6)



From these graphs, we state the following finding:

F15. *As μ_r increases, manufacturer profits from pricing game increases; the increase in profits is lower when μ_d is lower and higher when μ_d is higher.*

When μ_r increases, category demand and, in particular, the competitive market (NS) expands. This market expansion benefits both the manufacturer and the retailer. However, the share of the benefit is determined by the positioning parameter, μ_d. If μ_d is high, manufacturer gets a significant share of the market expansion and its profits increase significantly with μ_r. However, if μ_d is low (store brand is positioned closer), then the retailer gets the bulk of the benefit from demand expansion and the manufacturer obtains little benefit from increasing μ_r.

In stage 3, the manufacturer maximizes its profits ($\Pi_{m3} = \Pi_{mp} - C(\mu_r)$) over μ_r. The optimal μ_r^* depends on the cost of demand expansion, $C(\mu_r)$. If $C(\mu_r)$ is high, for example CH in Figure 5, then the manufacturer will not invest in μ_r and the optimal action will be continuation of the initial state at $\mu_r = 3$ for all values of μ_d (corner solution – see Figure 6A). If, on the other hand, the cost of demand expansion is not high (for example, CL) such that

demand expansion is profitable and there is an interior solution, then the optimal μ_r^* will always be higher when μ_d is lower than when μ_d is higher. For example, in the case of CL (designed for illustrative purpose), μ_r^*=3 when μ_d=0.2; μ_r^*=3.2 when μ_d=0.6; and μ_r^*=3.4 when μ_d=1 (see Figure 6B).

Figure 6A
Manufacturer Net Profits (CH)

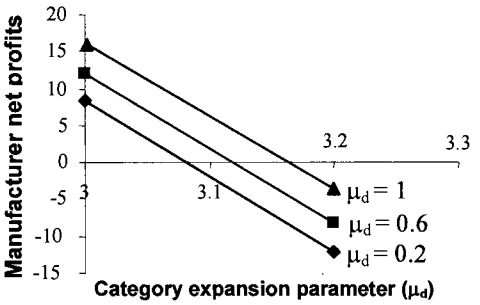
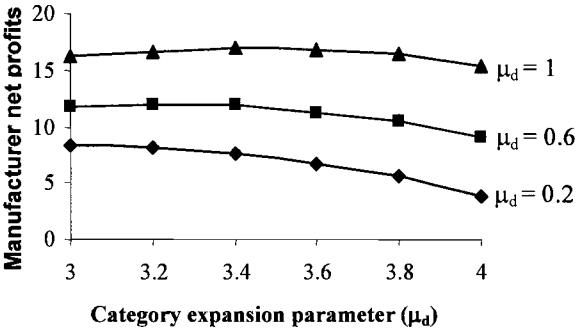


Figure 6B
Manufacturer Net Profits (CL)



We state the following finding:

F16. *The optimal* μ_r^* *will be the same or higher as* μ_d *increases. In particular,*

i. when the cost of demand expansion is high such that it is unprofitable to increase μ_r *from its initial value for all values of* μ_d*, then the optimal* μ_r^* *will be the same (equal to its initial value) for all values of* μ_d*.*

ii. when the cost of demand expansion is low to moderate such that demand expansion is profitable, then the optimal μ_r^* *will be higher for higher values of* μ_d*.*

Step 4. Analysis of Stage 4

Stage 4 is retailer's store brand positioning game. The analysis is conducted as follows. Analysis of stage 3 yields equilibrium values $(p_{n3}^*, p_{s3}^*, w_{n3}^*, \mu_r^*)$ for different values of v (0.6 to 1) and μ_d (0.2 to 1). Based on these values, retailer's profits from Stage 3 (Π_{r3}) is calculated using Equation (5). Retailer sets optimal μ_d^* to maximize $\Pi_{r4} = \Pi_{r3} - C(\mu_d)$.

Clearly, as Sayman, Hoch, and Raju (2002) also point out, if the cost of positioning $C(\mu_d)$ is high, then the retailer would be less likely to position the store brand close to the national brand. In addition, we do not know the characteristics of the cost function. Therefore, we exclude cost from consideration and inspect the movement of Π_{r3} as a function of μ_d.

Figure 7A graphs the movement of retailer profits against μ_d for the case corresponding to v=.6. When cost of category expansion is high (CH), retailer gross profits (excluding cost of positioning) increase with close positioning. However, when the cost of category expansion is low (CL), retailer profits decrease with close positioning. When v = 1 (Figure 7B), retailer profits decrease with close positioning for both cost functions CH and CL.

Figure 7A
Effect of Positioning on Retailer Profits
(Stage 4, v=0.6)

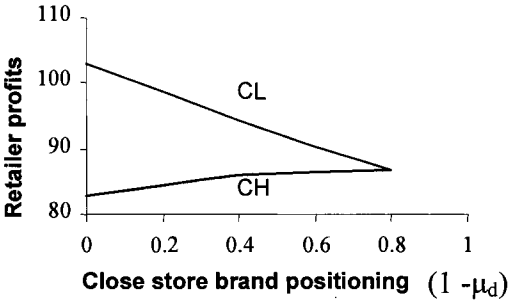
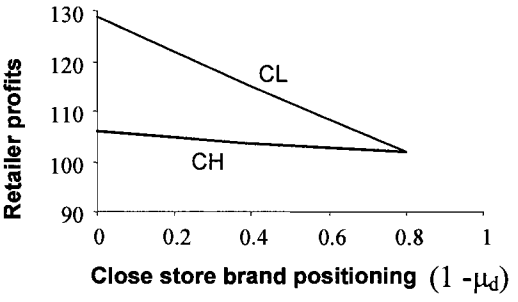


Figure 7B
Effect of Positioning on Retailer Profits
(Stage 4, v=1)



Based on these observations, we state the following finding:

F17: *When a store brand is positioned close to the national brand, retailer gross profits (excluding cost of positioning) increase when the cost of demand expansion $C(\mu_r)$ is high (CH) and proportion of unserved (by national brand) market served by store brand (v) is not high ($v \cong .6$). However, close store brand positioning decreases retailer profits when the cost of demand expansion is not high (CL) and/or when v is high ($v \cong 1$).*

4.3. Qualitative Insights from Basic Equilibrium Analysis

Finding F17 yields two possible conditions when the conventional belief that close store brand positioning is always profitable for the retailer may not hold. Note that low cost of demand expansion implies that the category is expandable and high "v" implies that consumers with low reservation price who cannot afford the national brand are willing to purchase the stare brand. On this premise, we state the following qualitative insights.

Qualitative Insight 1

> *Positioning a store brand close to the national brand may not be profitable for the retailer if the national brand manufacturer can significantly expand category demand through investments in non-price marketing activities such as advertising.*

The intuition for this insight is as follows. When a store brand is positioned close to the national brand, the national brand's market share is threatened. The manufacturer of the national brand is forced to compete on the basis of price. The resulting lower manufacturer price, and thus manufacturer margins, discourages the manufacturer from investing in category demand enhancing activities. If the category is indeed expandable, this lack of resource commitment to category expansion makes both manufacturer and retailer worse off in terms of profits.

Qualitative Insight 2

> *Positioning a store brand close to the national brand may not be profitable for the retailer if the store brand can garner a significant portion of the market with low reservation price consumers, who can not afford to purchase the national brand.*

The intuition for this result is similar to that for insight 1. If a store brand is positioned close to the national brand, national brand price is decreased. As a result some consumers who could not afford the national brand earlier start to consider the national brand. Thus the store brand loses consumers from its "monopoly" market, where it was the only brand under consideration, to the competitive market where both national brand and store brand are under consideration. To the

extent that the store brand was attracting a significant portion of its "monopoly" market, this migration of consumers to the competitive market may hurt retailer profits.

5. EXTENDED EQUILIBRIUM ANALYSIS

The purpose of the extended analysis is to conduct equilibrium analysis by (i) changing the values of parameters that were held constant in §4 and (ii) relaxing certain assumptions in the basic model, with the twin objectives of testing the robustness of qualitative insights 1 and 2, as well as obtaining additional insights.

5.1. Effect of Changes in Parameter Values

The set of parameters (Ω) that were held constant in the basic analysis (Table 1, Column 3) were: $\Omega \in \{c_n, c_s, \mu_r, \sigma_r, \sigma_d, K\}$. We continue to maintain c_n=1, without loss of generality. We changed all other parameters in the range indicated in Table 1 (Column 4) one at a time. We performed the equilibrium analysis the same way as in Steps 1-4 of §4.2. We computed incremental retailer profits from close store brand positioning (Figure 7A-B). We observed whether close store brand positioning is less profitable or unprofitable when the cost of category expansion $C(\mu_r)$ is lower (as in qualitative insight 1) and when the proportion of market unserved by national brand that is served by the store brand (v) is higher (as in qualitative insight 2). In general, the above basic results were unchanged. We also investigated whether such incremental profits from close positioning increased or decreased with change in parameter values. Detailed results are available from the authors. Below, we present the qualitative insights we obtained and their intuition.

Qualitative Insight 3 (cost of store brand, c_s)

> *Other things equal, positioning a store brand close to the national brand is likely to be less profitable (or unprofitable) when the cost of store brand is higher.*

This finding is expected. When the cost of store brand c_S is higher, for any given store brand price, the retailer gets lower margins $p_S - c_S$ from store brand sales. So, s/he has less incentive to promote store brand sales by positioning the store brand close to the national brand.

Qualitative Insight 4 (initial mean reservation price, μ_r)

Given the same cost of store brand, positioning a store brand close to the national brand is likely to be more profitable when the initial mean reservation price is higher.

High reservation price implies that consumers are willing to pay a higher price for national and store brands in the category. Hence, equilibrium national brand price and store brand price, and thus category average price increase. Given the same costs, national brand margin, store brand margin, and category margin also increase. In this high-price, high-margin scenario, retailer tends to get greater absolute margin and profit increase due to close store brand positioning. As a simple illustration, when $\mu_r = 3$, close store brand positioning ($\mu_d : 1 \rightarrow 0.6$) results in an increase in store brand margin from 1.8 to 1.84 and retailer profits from 83.27 to 84.83 (a percentage increase of 1.87% but an absolute increase of 1.56 units). However, when $\mu_r = 10$, close store brand positioning results in an increase in store brand margin from 6.76 to 6.88 and retailer profits from 583.9 to 595 (nearly same percentage increase of 1.9% but an absolute increase of 11.1 units). In some sense, the effect of an increase in mean reservation price can be deemed simply as a scaling effect.

High μ_r => High category price => High category margin => Higher absolute incremental profits from close positioning

This line of reasoning leads to two inferred qualitative insights:

Qualitative Insight 4A (category price)

Other things equal, positioning a store brand close to the national brand is likely to be more profitable in higher-priced categories.

Qualitative Insight 4B (category margin)

Other things equal, positioning a store brand close to the national brand is likely to be more profitable in categories with higher gross retail margin.

Qualitative Insight 5 (heterogeneity in reservation price differential, σ_d)

Positioning a store brand close to the national brand is less profitable when consumers are more heterogeneous in their reservation price differential.

One possible intuition is as follows. When a store brand is positioned closer to the national brand, retailer appropriately sets a smaller price differential, yet gains a higher sales of the higher-margin store brand and can increase its total profits. When σ_d is large, consumers are widely dispersed in their reservation price differential and the smaller price differential does not yield a sufficiently large volume of store brand consumers. However, when σ_d is small, consumers are more concentrated in their RPD. Retailers can set a small price differential in the concentrated region and capture a significant number of store brand consumers and increase its profits. (Note: Heterogeneity in reservation price, σ_r did not yield any qualitative insight and hence not reported here.)

Qualitative Insight 6 (Market size, K)

When close store brand positioning increases retailer profits, the incremental profits increase in proportion to the number of consumers in the market – the larger the market size, the greater is the incremental profits.

Market size or total number of consumers in the market enters the demand function in a multiplicative manner. Therefore, equilibrium prices are not affected and the equilibrium quantities sold and profits increase in direct proportion to the market size. As a result, incremental profits from store brand positioning change in direct proportion to the market size. For example, if market size increases 10 times from 100 to 1000 consumers, incremental profits

from store brand positioning are 10 times higher. So, when conditions are conducive for close store brand positioning, larger the market size, the greater is the incentive to position the store brand closer to the national brand.

Qualitative Insight 7 (National brand market share)

> *Positioning a store brand close to the national brand would be more profitable in markets where the national brand market share is higher.*

While national brand market share is not a parameter in the model, previous researchers have considered this variable. We compared the national brand market share when close store brand positioning is profitable to corresponding situations where close positioning is not profitable. In general, the average national brand market share is higher when conditions are conducive for store brand positioning than when it is not. For example, in Figure 4, when $v = 1$, close store brand positioning is not profitable for the retailer. The average national brand share in this case was 20.1%. When $v = 0.6$, close store brand positioning is profitable for the retailer and the average national brand share in this case was 32.4%.

This result is consistent with the findings of Sayman, Hoch and Raju (2002) and is intuitive. When the national brand has a high market share, there is a greater market for the store brand to attract when it positions its brand close to the national brand (also see Sethuraman and Srinivasan 2002 for a similar argument with respect to price discounts). Therefore, other things equal, retailer should find it more profitable to adopt close store brand positioning.

5.2. Relaxing Certain Assumptions in the Basic Model

Incorporating Correlation between r_i and d_i

In our model, we have assumed independence between r_i and d_i. That is, consumers reservation price differential (premium they will pay for the national brand over a store brand) is independent of the reservation price (maximum price willing to pay) for the national brand.

However, there is a general belief that those with high reservation price may have high reservation price differential – i.e., a positive correlation between r_i and d_i. We incorporate this correlation in the following stylized manner. Using a median (= mean) split, we define high reservation price (HR) consumers as those with $r_i > \mu_r$; low reservation price (LR) consumers were defined as those whose $r_i < \mu_r$. The reservation price differential for the two consumer groups is assumed as follows:

LR Consumers: $d_i \sim N(\mu_{dl}, \sigma_d)$ and

HR Consumers: $d_i \sim N(\mu_{dh}, \sigma_d)$,

where $\mu_{dh} > \mu_{dl}$ indicating positive correlation. The demand functions can be rewritten as

$$(10) \quad q_n = K\left[1-\Phi\left(\frac{p_n-\mu_r}{\sigma_r}\right)\right]\left[1-\Phi\left(\frac{p_n-p_s-\mu_{dh}}{\sigma_d}\right)\right] \text{ if } p_n > \mu_r$$

$$(11) \quad q_n = K\left\{0.5\left[1-\Phi\left(\frac{p_n-p_s-\mu_{dh}}{\sigma_d}\right)\right]\right.$$

$$\left.+\left[0.5-\Phi\left(\frac{p_n-\mu_r}{\sigma_r}\right)\right]\left[1-\Phi\left(\frac{p_n-p_s-\mu_{dl}}{\sigma_d}\right)\right]\right. \text{ if } p_n \le \mu_r$$

$$(12) \quad q_s = K\left[1-\Phi\left(\frac{p_n-\mu_r}{\sigma_r}\right)\right]\left[\Phi\left(\frac{p_n-p_s-\mu_{dh}}{\sigma_d}\right)+q_{s2}\right] \text{ if } p_n > \mu_r$$

$$(13) \quad q_s = K*0.5\Phi\left(\frac{p_n-p_s-\mu_{dh}}{\sigma_d}\right)+K\left[0.5-\Phi\left(\frac{p_n-\mu_r}{\sigma_r}\right)\right]\Phi\left(\frac{p_n-p_s-\mu_{dl}}{\sigma_d}\right)+q_{s2} \text{ if } p_n \le \mu_r$$

$$\text{where } q_{s2} = vk\left[\Phi\left(\frac{p_n-\mu_r}{\sigma_r}\right)-\Phi\left(\frac{p_s-\mu_r}{\sigma_r}\right)\right]$$

We assumed μ_{dl} = 0.5 and μ_{dh} = 1.5 (positive correlation). We computed retailer profits (Π_{r3}) with all parameters at the initial values in Table 1. Then, we decreased both μ_{dl} and μ_{dh}

by δ (say $\delta = .1$) and computed retailer profits again. The difference yields the incremental profits under correlated condition.

We assumed $\mu_{dl} = 1$ and $\mu_{dh} = 1$ (no correlation). We computed retailer profits with all parameters at the initial values in Table 1. Then, we decreased both μ_{dl} and μ_{dh} by the same δ (.1) and computed retailer profits again. The difference yields the incremental profits under uncorrelated condition.

We compared the incremental profits from correlated condition with the profits from the uncorrelated condition and repeated the same for different values of μ_{dl}, μ_{dh}, δ. Our analysis yields the following qualitative insight.

Qualitative Insight 8 (correlation between reservation price and RPD)

Positioning a store brand close to the national brand is less profitable when consumers' reservation prices and reservation price differential are positively correlated than when they are not.

To see the intuition for this, let us consider an extreme case with all high reservation price (HR) consumers having very high reservation price differential (can be deemed as being loyal to the national brand) and all low reservation price consumers having zero reservation price differential (the price sensitive segment). In this case, the optimal retailer action is to target the national brand to the HR market and target the store brand to the price sensitive LR market. Trying to position the store brand to target national brand consumers would not be profitable because not many consumers would switch to the store brand. This is the classic segmentation view of store branding -- the role of store brand is to attract the high price sensitive / low quality sensitive segment, not to take market share away from national brands. More generally, when high reservation price (HR) consumers also have high reservation price differential (HRPD), the

retailer may be better off targeting the national brand to the HR/HRPD consumers and the store brand for the LR/LRPD consumers, other things equal.

Relationship between μ_d and v

Parameter v is the proportion of consumers who can not afford the national brand that end up purchasing the store brand. "v" can be influenced by

(i) nature of category – if it is an essential good such as baby food or diapers, consumers may be more likely to purchase the store brand so long as $p_s < r_i$ (high v).
(ii) nature of consumers – if consumers with low reservation price are price sensitive such that they are willing to purchase the store brand so long as $p_s < r_i$
(iii) store brand perception – if consumers perceive store brand to be not as good as national brand, but of acceptable quality,
(iv) store image – if consumers perceive that any brands with the store name would be reasonable quality.

In the basic model, we assume v as an exogenous parameter so as to focus directly on store brand positioning through (μ_d). It is likely, however, that positioning store brand against national brand (decreasing μ_d) may indirectly increase v. To capture this possibility, we related v to μ_d with the following function, $v = v_o + b(1-\mu_d)$ -- v_o, $b > 0$. We varied v_o and b in a reasonable range such that $v \leq 1$ and conducted the equilibrium analysis as before. Coefficient b can be interpreted as the effect of close store brand positioning in persuading the unserved market segment to purchase the store brand. As would be expected, incremental profits from close store brand positioning $1-\mu_d$ increase with b because store brand sales is increased both in the competitive (NS) market and in the unserved ($\overline{NS}$) market. Qualitative insight 1 related to category expandability holds. Qualitative insight 2 is not relevant since v is now endogenous.

Manufacturer influencing positioning (μ_d).

So far, we have assumed that the national brand manufacturer engages in reservation price enhancing activities that expand category demand through μ_r but do not influence

positioning parameter (μ_d). In the real world, it may be possible for the manufacturer also to influence μ_d through its promotions. This ability would be deemed as the substitution role of manufacturer's promotions. For example, some national brands (e.g., Pine sol floor cleaner) use comparison advertising and claim that their product is superior to cheaper private labels. To capture this possibility, we consider the situation where the manufacturer can also influence (increase) μ_d and speculate what the retailer's optimal action would be with respect to store brand positioning. The following table reports our assessment of optimal retailer action:

	Mfr can $\uparrow \mu_d$ only (only substitution, no category expansion)	Mfr can $\uparrow \mu_d$ and μ_r (substitution and category expansion)
v high ($\approx$1)	Retailer should not oppose manufacturer's effort to differentiate the NB from SB.	Retailer should not oppose manufacturer's effort to differentiate the NB from SB.
v moderate ($\approx$.6)	Retailer should attempt to oppose manufacturer's differentiation by positioning SB close to NB.	Retailer's decision to oppose manufacturer's effort to differentiate would depend on the tradeoff between the incremental benefits from category expansion (higher μ_r) and decreased profits from substitution (higher μ_d).

Note from findings F14 and F17 that when v is high, an increase in μ_d actually favors the retailer. Suppose the manufacturer can differentiate its brand and increase μ_d from its present state of 1 to 1.2 (say). Then, equilibrium wholesale and retail price of national brand increase and store brand price decreases. These changes increase the unserved market ($\overline{NS}$) – see Figure 2. If the retailer is getting a significant portion of this unserved market then the retailer stands to benefit from the differentiation. However, if v is not very high, as explained in QI2, retailer may stand to lose from differentiation ($\uparrow \mu_d$) and must try to oppose the effort through close store brand positioning.

6. EMPIRICAL ANALYSIS

The analytical model enabled us to address the first two objectives of this manuscript as enumerated in the introduction section – (i) investigate if close store brand positioning is always profitable, and if not (ii) identify market conditions when close store brand positioning may be less profitable or unprofitable. The empirical analysis section addresses the next two objectives – (iii) prescribe type of categories in which retailers should (or should not) position the store brand close to the national brand, and (iv) investigate/explain retailers' actual store brand positioning behavior.

6.1. Hypotheses

The qualitative insights from §4 and §5 identify eight market characteristics, which could influence incremental profits from close store brand positioning. These theoretical variables are listed in Table 3 (Column 2). The greater the incremental profits from close store brand positioning, the more likely that the retailer will position the store brand close to a national brand. We use this premise to test the implications of the analytical model and identify in what type of categories retailers actually position the store brand close to the national brand.

Table 3
Variables Used in Empirical Analysis

QI #	Theoretical variable (Notation)	Variable derived for empirical analysis (Acronym)	Hyp. relation from QI	Data source	Previous research where data source used
1	Cost of category expansion, $C(\mu_r)$	Category expandability (EXPAND)	-	Expert Opinion	--
1	Cost of category expansion, $C(\mu_r)$	Advertising expenditure (ADEXP)	-	BAR/LNA Report	Sethuraman and Tellis (2002)
2	Proportion of unserved market served by store brand (v)	No data available	-	N/A	N/A

3	Relative cost of store brand manufacture (c_s)	Ease of private label supply - # of vendors (PLSUPPLY)	-	Infoscan Supermarket Review	--
4A	Mean reservation price (μ_r) => category price	Category average price per purchase (PRICE)	+	Marketing Factbook	Narsimhan, Neslin and Sen (1996), Sethuraman and Tellis (2002), Ailawadi, Lehmann and Neslin (2003)
4B	Mean reservation price (μ_r) => category margin	Gross retail % margin (%MARGIN)	+	Supermarket News	Same as QI 4A
5	Variance in reservation price differential (σ_d)	Coefficient of variation in RPD (RPDVARIANCE)	-	Consumer survey	Sethuraman and Cole (1999)
6	Market size (K) - # of consumers	Household penetration % (PENETRATION)	+	Marketing Factbook	-- same as QI4A --
6	Market size (K)	Purchase Freq. (PURFREQ)	+	Marketing Factbook	-- same as QI4A --
7	National brand market share	National brand market share (NBSHARE)	+	Marketing Factbook	Sayman, Hoch and Raju (2002)
8	Correlation between reservation price and RPD	No data available	-	N/A	N/A

[a] + = high values on the variable favors close store brand positioning (increases retailer profits)
– = high values on the variable does not favor close store brand positioning (decreases retailer profits)
QI = Qualitative Insight (from §4.3 and §5.1).

Table 3 (Column 3) lists the category characteristics derived or inferred from the theoretical variables. Data are not available to test the implications for two variables – proportion of unserved market served by store brand (v) and correlation between reservation price and RPD. The transition from theoretical variables (qualitative insights) to category characteristics for empirical testing is fairly straight forward in most cases except for cost of category expansion and market size. As stated in qualitative insight 1, low cost of category

expansion implies that the category is expandable relative to a situation with high cost. An offshoot of the expandability result is the relationship between advertising and store brand positioning. In our case, when category is expandable through advertising, manufacturers would have high advertising budgets and retailer would be better off not positioning the store brand close to the national brand. In the analytical model, market size is the total number (K) of consumers in the market. In the real world, both number of households that purchase the product and the frequency of purchase (which is assumed to be constant at 1 in our analytical model) determine unit volume market size. Therefore, we consider both variables.

Based on the above discussion, we have the following expectations:

The likelihood of positioning a store brand close to the national brand is higher in

(i) *less expandable categories,*
(ii) *less advertised categories*
(iii) *categories where supply of private labels is easier to obtain (less costly),*
(iv) *high priced categories,*
(v) *high margin categories,*
(vi) *categories where consumers are heterogeneous in their reservation price differential,*
(vii) *categories with higher household penetration,*
(viii) *frequently purchased categories, and*
(ix) *categories with higher national brand market share.*

The operationalization of these category characteristics and their data sources are described next.

6.2. Operationalization of Variables and Data Source

Dependent Variable – Store Brand Positioning. Data on store brand positioning are based on observations in two stores located in the same neighborhood but belonging to two different supermarket chains. Following Sayman, Hoch, and Raju (2002), positioning a store brand close to a national brand is reflected in (i) placing the store brand next to the national brand on the shelf, (ii) using "compare and save" or similar slogans, and (iii) imitating national brand

packaging. We also employ these three criteria for assessing the positioning of store brand. The first two criteria can be objectively observed. The third criterion is more subjective and was determined based on the assessment and agreement by two trained observers.

In each product category, the store brand is observed in tandem with each of the national brand. For that store brand, with any national brand (say A), the following observations are made: (i) Is the store brand located next to national brand (A), (ii) Is there a shelf talker comparing the store brand with national brand (A), and (iii) does the store brand have similar packaging as national brand (A). The same three questions were answered for other national brands (B, C etc.). In each product category, the national brand that satisfied the maximum number among the three criteria was considered the focal national brand. In a given product category, we declared a store brand to be positioned close to a national brand if it satisfied at least two of the above three criteria. All three criteria were satisfied in less than 5% of the observed categories and therefore appeared to be too stringent a condition for determining store brand positioning. In particular, shelf talkers were used in very few categories even when there appeared to be an obvious attempt to imitate the national brand, based on other criteria.

Independent Variables – Category Characteristics. Table 3 lists the variables, their operationalization and data source. Category expandability was determined based on expert opinion. For each product category, we asked three grocery products experts their level of agreement to the following statement:

"Total category sales in this product category can be increased through non-price marketing investments such as advertising, product improvement, sampling, publicity, or other non-price promotions."

A 5-point Likert scale (1=strongly disagree, 5 = strongly agree) was used. The average correlation across the three experts was 0.62, indicating reasonable agreement. Their ratings

were added to get an expandability score for each category. The judgment based measure appeared to have face validity – categories that are in the relatively early stage of the product life cycle (e.g., bottled water) and more hedonic products such as soft drinks and cookies had the highest expandability scores (>13/15); whereas, mature categories and categories that are considered commodities (e.g., salt, sugar) scored the lowest on expandability (<6/15). The correlation between expandability and national brand advertising was positive and significant (0.36), as we predicted, providing some nomological validity.

Media advertising expenditures for the categories were obtained from Leading National Advertisers (LNA) class/brand summary (1999) following the procedure used in Hoch and Banerji (1993), Sethuraman and Tellis (2002) and Ailwadi, Lehmann and Neslin (2003).

We use number of supply vendors in the product category as a surrogate for ease of private label supply. First, a large number of suppliers in a category suggests less barriers to entry, thus ease of manufacturing. Second, a large number of vendors suggests that there are many fringe manufacturers with little market power. According to Stern (1966), a retailer may be able to persuade one or more of the fringe firms to supply private labels at low cost. Number of vendors was directly taken from Infoscan Supermarket Review (1994).

In a prelude to a detailed analysis of 20 product categories, Sethuraman and Cole (1999) collected reservation price differential data on 120 product categories from over 180 consumers (each reporting data for 40 categories) and computed their means and standard deviations. To account for differences in the means, we used the coefficient of variation (standard deviation / mean) as a measure of heterogeneity in reservation price differential.

Data on category level purchase price, household penetration and purchase frequency were obtained from the Marketing Factbook (1994), consistent with previous research

(Narasimhan, Neslin and Sen 1995, Sethuraman and Tellis 2002, Ailawadi, Lehmann, and Neslin 2003). Data on category margin was obtained from *Supermarket News*, as in Sethuraman and Tellis (2002). As in Sayman, Hoch and Raju (2002), market share for the focal national brand was obtained from the Marketing Factbook.

6.3. Preliminary Analysis

Data on all dependent and independent variables are available for 109 product categories. We use this data for our analysis. To gain a preliminary understanding, we addressed the question: Do stores in the same neighborhood belonging to two different chains exhibit similar store brand positioning behavior, that is, position the store brand close to the national brand in the same categories? If they do, it indicates that product/market characteristics potentially drive store brand positioning behavior. The following cross-tabulation indicates the extent of agreement.

		Positioned against a national brand? Chain A		Total (Chain B)
		Yes	No	
Positioned against a national brand? Chain B	Yes	26 (23.9%)	11 (10.1%)	37 (34.0%)
	No	7 (6.4%)	65 (59.6%)	72 (66.0%)
Total (Chain A)		33 (30.3%)	76 (69.7%)	109 (100%)

In Chain A, store brand was positioned against a national brand in 33 (30.3%) out of 109 categories; in Chain B, store brand was positioned against a national brand in 37 (34.0%) out of 109 categories. These percentages are similar to the numbers in Sayman, Hoch and Raju (2002) -- 32% and 39% in the two stores they observed. Interestingly, in 91 (83.5%) of the 109

categories, store brand positioning behavior was the same across stores, that is, both stores positioned against a national brand or both did not follow any targeted positioning strategy.

6.4. Analysis of Antecedent Factors

Our main interest is in identifying category characteristics that influence a retailer's decision to position its store brand close to the national brand. We estimate the following binary logit model to identify which of the nine variables significantly influence store brand targeting strategy:

$$(14) \quad P(\text{position} = 1) = \frac{e^{v}}{1+e^{v}}, \text{ where}$$

$$v = b_0 + b_1(\text{EXPAND}) + b_2(\text{ADVERTISING}) + b_3(\text{PLSUPPLY}) +$$

$$b_4(\text{PRICE}) + b_5(\%\text{MARGIN}) + b_6(\text{RPDVARIANCE}) +$$

$$b_7(\text{PENETRATION})\ b_8(\text{PURFREQ}) + b_9(\text{NBSHARE}).$$

P(position=1) implies the probability that the store brand in a category is positioned against a particular national brand. The empirical results are presented in Table 4.

Four of the nine variables in Chain A and four variables in Chain B were statistically significant and in the hypothesized direction. In particular, positioning a store brand close to the national brand is less likely in categories whose sales are expandable and in highly advertised categories, but more likely in high-margin categories and where the leading national brand has a large market share.

Multicollinearity does not appear to be a major problem in estimating Equation (14) – the magnitude of the highest correlation between any two independent variables is .44 (between purchase cycle and household penetration). One notable difference was that the coefficient of advertising increased and was significant at $p<.01$ when expandability was not in the model.

Table 4
Empirical Results

Description of Variables	Hypothesized Sign	Logit Estimates (Chain A) Estimate (Std. Error)	Logit Estimates (Chain B) Estimate (Std. Error)
Category expandability	-[b]	-.362 (.13)**	-.359 (.13)**
Advertising expenditure	-	-.011 (.0065)*	-.0125 (-.0074)*
Ease of private label supply	+	.019 (.029)	.013 (.029)
Variance in RPD across consumers	-	1.21 (1.98)	-2.13 (2.03)
Average price per purchase ($)	+	.018 (.305)	.269 (.306)
Category % margin	+	.156 (.078)*	.137 (.077)*
Household Penetration (%)	+	.025 (.018)	.008 (.017)
Frequency of purchase	+	-.015 (.156)	-.060 (.173)
National brand market share	+	.034 (.017)*	.041 (.017)**

[b]Negative sign implies that positioning a store brand close to the national brand is *less* likely in categories that are expandable than in categories that are not expandable.
** $p < .01$. *$p < .05$ – one-tailed test.

7. DISCUSSION AND CONCLUSION

This paper is motivated by the general belief, supported by theoretical and empirical literature, that retailers are better off positioning a store brand close to the national brands. In this research, we investigate the basic question – do retailers always benefit by positioning their store brand close to the national brand?

7.1. Discussion of Key Results and Contribution

Analysis of a game-theoretic model reveals some insights regarding the market conditions when it may not be profitable for the retailer to compete intensely with the focal national brand. The first insight relates to the product life cycle concept. Retailers may be better

off not positioning its store brand close to the national brand in categories where the manufacturer can expand category demand through non-price marketing investments such as product improvements and advertising. Such product categories would include products in the early stage of the life cycle, where marketing would promote purchase of the product by increasing awareness and educating consumers. Such categories may also include hedonistic products where advertising could increase consumption pleasure and induce consumers to purchase. The intuition for this result is that by positioning the store brand close to the national brand, the retailer would force the national brand manufacturer to focus on price reduction and discourage him/her from investing in category demand enhancing activities, an action that could be detrimental to both manufacturer and retailer.

The second key insight relates to the notion of segmentation. Positioning the store brand close to a national brand may not be profitable when there is a significant "unserved" market (demand that is not met at given national brand prices) that can be served by the store brand (qualitative insight -- QI2), when there is a significant variation in consumers' reservation prices differential (QI5) and when high reservation price consumers are more loyal to the national brand (high RPD) while low reservation price consumers are price sensitive (low RPD) – QI8. All these market conditions are conducive for the store brand to be used as a segmentation tool -- target store brand for the low reservation price consumers and the national brand for the high reservation price consumers. In addition, positioning a store brand close to the national brand may be less profitable when the cost of store brand is higher, category price and margins are lower, the market size is smaller, or when the competing national brand has a low market share.

A follow-up empirical test of the hypotheses derived from the analytical results provides additional insights about actual retailer behavior. Of particular interest is the empirical

relationship between advertising and store brand positioning. There are two conflicting theoretical viewpoints on this relationship. The piggybacking theory of store brand positioning, advanced in our analytical model, would state that store brands should not be positioned close to highly advertised national brands. This is because, in categories conducive for advertising, national brands can advertise heavily and increase its own sales and category sales. The retailer benefits from this increased demand both through higher prices and profits from the national brand. The increased price of the national brand offers greater pricing flexibility for the store brand. Rather than competing head-on with the national brand, the retailer may be better off availing of this conducive demand environment (piggybacking) and position a store brand to predominantly gain customers who are less willing to buy the national brand at the higher prices.

The countervailing power view of store brand positioning would suggest that store brands should be positioned close to the highly advertised brand. Through advertising, the national brand manufacturers are able to differentiate their brands and wield power over the retailers. By positioning a store brand close to the national brand, the retailer will be able to counter the advertising power and gain more profits (Morton and Zettelmeyer 2000). Our empirical finding appears to support the piggybacking theory of store brand positioning, though there may be alternate explanations for the observed positive relationship.

We also find that store brands tend to target leading national brands, especially brands with large market share, supporting our analytical results and the theoretical and empirical results of Sayman, Hoch and Raju (2002). Thus, this paper makes a theoretical contribution in identifying some conditions when close store brand positioning may not be profitable for the retailer and an empirical contribution in understanding retailers' actual positioning behavior.

7.2. Limitations and Future Research Directions

The inclusion of category expansion parameter, normally distributed consumer heterogeneity of reservation prices, and the notion of unserved market demand is both a strength of this manuscript and a potential limitation. On the one hand, the model allows us to investigate variables that have not been considered in previous marketing channels literature. For example, our quick review of all *Marketing Science* issues published since its inception (1983-2003) revealed 18 articles employing game-theoretic models in channels of distribution. A majority of these articles (12/18) used linear in price (aggregate) demand functions. Other studies used log-linear, quadratic, or more general aggregate, demand functions with price as the only variable. A few studies incorporated heterogeneity in consumer reservation price but assumed a uniform distribution leading to a linear in price demand structure. We did not find any research that incorporated the variables mentioned above, which we believe is a strength of this manuscript.

On the other hand, the demand functions in our model are non-linear and do not lend themselves to analysis using closed-form solutions and comparative statics. Therefore, we had to resort to numerical analysis procedure. However, we believe our results are credible for the following reasons:

(i) the demand functions and profit functions appear to be smooth and well behaved, leading to interpretable equilibrium solutions,
(ii) the choice of parameters was made easy since all of them (except v and K) could be expressed in monetary units and could be drawn from previous literature,
(iii) the results appear to be robust in the range of parameters investigated,
(iv) all the results are intuitive or can be explained, and
(v) many of the results are consistent with findings from previous literature.

Nevertheless, future researchers may attempt to validate or negate results from this study using a more direct calculus approach.

The analytical model also incorporated only one national brand in one retail outlet and considered only the demand-enhancing role of manufacturer's non-price marketing investments. This modeling approach appeared to be sufficient for our purpose. If there are two or more national brands, the category expandability result (QI1) would still hold. The unserved by national brand market may diminish because there are many national brands to serve the market. The question of how this situation would influence store brand positioning would depend on the nature of the competitive relationship among the national brands.

Incorporating store competition into the analytical model is relatively complex. We are unable to say whether the basic results would change in the presence of store competition. Future research can incorporate multiple brands, store competition, and different roles of advertising in the analytical models. Future research can also study the possibility of manufacturers offering more trade deals and inducing the retailer to offer temporary price discounts on the national brand to ward off, or in reaction to, close store brand positioning.

The empirical analysis is based on data from two stores in one geographic market. Future research can test the generalizability of the results obtained in this research by collecting data from different markets and by using more direct measures of the variables (e.g., private label cost) and incorporating additional variables such as reservation price. In particular, we have introduced the notion that the size of unserved market can play a significant role in a retailer's positioning decision, but we do not have any empirical measures. Getting an estimate of the size of available unserved market could be quite useful in store brand marketing decisions.

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