The Determinants of Coupon Discounts for Breakfast Cereals

by

Gregory K. Price and John M. Connor*

To be published in *Agribusiness*

Presented at the 2002 American Agricultural Economics Association Meeting
Long Beach, CA
July 30, 2002

* Gregory K. Price is an agricultural economist with the Economic Research Service, U.S. Department of Agriculture. John M. Connor is a professor in the Department of Agricultural Economics, Purdue University.

The authors would like thank Steven Vickner, Janet Netz, Jay Akridge, and two anonymous reviewers for their insightful and helpful comments. The opinions and conclusions expressed herein are those of the authors and do not necessarily reflect the views of the Economic Research Service or the U.S. Department of Agriculture.

Purdue Journal Paper No. 16464.

1. INTRODUCTION

Researchers in the field of marketing consider coupons to be promotional devices that aim to increase brand market share, strengthen brand loyalty, and expand a product's market by attracting consumers with low reservation prices. Economists provide a complementary perspective by modeling coupons as tools to exploit unilateral market power through price discrimination. While both research traditions demonstrate interest in the functions of coupons and their performance implications, the determinants of coupon values have been largely unexplored. Reasons for this deficiency in the literature include a lack of sufficiently detailed transaction data and the proprietary nature of coupon information.

The objective of this study is to develop and test a model that identifies the factors that influence coupon values at the brand level. The theoretical framework is derived from price discrimination theory and the principles of demand. Couponing is considered within the context of a complex marketing program in which it is coordinated with other non-price promotions such as advertising, store flyers, and in-store displays. In order to test the hypotheses of the model, the framework is operationalized with a simultaneous, two-equation, fixed-effects, panel-data model and fitted with data on household purchases of ready-to-eat (RTE) breakfast cereals. The RTE cereal industry has been chosen because of its intense use of couponing.

There are several reasons why it is important to know the determinants of coupon values. First, published theoretical and empirical research is not rigorous in identifying the factors that influence discount levels. While a handful of studies explicitly analyze subsets of the explanatory variables (Gerstner, Hess, & Holthausen, 1994; Shaffer & Zhang, 1995; Nevo & Wolfram, 1999), most works only hint at what the determinants may be. As a result, previous research does not provide insights for brand managers who are interested in understanding the factors that influence the face values of coupons.[1] Second, there is concern that the discounts in some industries are at non-optimal levels (i.e., values that do not maximize firm profitability or diminish welfare). Knowledge about the significant determinants of

coupon values can assist in the evaluation of financial or market performance. Third, product prices and coupon values are determined simultaneously. If the face values of coupons are to be set correctly, then the factors that affect both brand prices and discount levels must be identified and quantified with the appropriate data. Fourth, firms can increase sales with non-price strategies other than couponing. Brand managers need to understand how these other promotional activities affect discount levels (in terms of direction and magnitude) so that they may adequately set the face values of coupons.

2. FUNCTIONS OF COUPONS

Manufacturers offer coupons to achieve a number of goals, including attracting price-sensitive consumers (Ward & Davis, 1978; Schindler, 1984), price discrimination (Narasimhan, 1984; Houston & Howe, 1985), advertising products (Leone & Srinivasan, 1996; Capps, Seo, & Nichols, 1997), and increasing or protecting brand market share (Neslin, 1990; Raju, Dahr, & Morrison, 1994; Shaffer & Zhang, 1995). Since companies cannot prevent individuals with high reservation prices from using coupons, brand prices and discount levels should be set such that the leakage maximizes revenue (Larson, 1997).[2] Manufacturers also use coupons to obtain market research data from the clearinghouses that process the discounts.[3] Moreover, coupons serve as a strategic tool within the distribution channel (Gerstner & Hess, 1991). Because distributors may not pass manufacturers' price breaks downstream, couponing circumvents compliance problems by placing the savings directly in the hands of consumers.[4]

3. BACKGROUND ON THE RTE CEREAL INDUSTRY

In the early 1990s, RTE breakfast cereals were among the five most concentrated classes of food products, and there has been recent consolidation in the RTE cereal market (Wall Street Journal, 1995; Gibson, 1996; Miller, 1996b; Connor, 1999). Today, four firms dominate the industry: Kellogg, General Mills, Post, and Quaker.

The RTE cereal industry may be characterized as a tight structural oligopoly. It is generally believed that the leading cereal makers avoid competing on the basis of price in order to prevent destructive discounting practices that would erode firm profitability (Scherer, 1982). However, that long-standing practice was broken in April 1996. Per capita consumption of branded cereals stagnated in the early 1990s because of the rising differential between branded and private-label cereal prices (Price, 2000; Price & Connor, 2001). Consumers were also switching to more portable foods such as bagels and breakfast bars (Canedy & Abelson, 1999). Post announced that it would slash its cereals' prices by 20 percent so that it could reduce the company's dependence on inefficient promotional activities, namely couponing (Gibson & Ono, 1996). Two months later, the other major producers, including Kellogg and General Mills, stated that they would follow suit by cutting a portion of their brands' prices (Miller, 1996a; Balu, 1998a). A simultaneous reduction in the number and face values of coupons lowered the benefits of the price cuts for those consumers who redeemed the discounts.[5]

Although RTE cereal manufacturers rarely compete on the basis of price, rivalry does arise through a variety of non-price strategies. In the early 1990s, couponing was the predominant vehicle for product promotion. More than 44 billion coupons were issued for breakfast cereals in 1993, which cost manufacturers approximately 17 to 20 percent of industry sales revenue.[6] Furthermore, the major cereal makers spend 10 to 15 percent of the value of their sales on mass-media advertising to differentiate brands, reduce product substitutability, and create demand segments in the market (Connor, 1999). This strategy limits the market penetration of potential entrants and private-label cereal manufacturers. Intense advertising also raises the minimum level of promotional activity that is required for new entrants to have successful product introductions.

Because of high market concentration, barriers to entry, and non-price rivalry, the RTE cereal industry enjoyed extraordinarily high profitability up until the mid-1990s.[7] Moreover, the margin between cereal prices and manufacturing costs increased dramatically in the 1970s, 1980s, and the first

half of the 1990s. The difference, known as the price-cost margin (PCM), is approximated with data from the cereal breakfast foods industry, which includes RTE cereal manufacturers as well as the makers of infant and hot cereals (e.g., oatmeal). In 1995, the RTE cereal industry's PCM was 0.75, up from 0.46 in 1973 (Price, 2000).[8] Recently, high prices for branded cereals and consumers' increasing preference for portable breakfast foods have made it difficult for RTE cereal companies to maintain their previous success. While the dominant cereal makers announced price and discount cuts in 1996 to stimulate waning consumer demand and increase firm profitability, the results were disappointing (Balu, 1998b).

4. THEORETICAL MODEL

Assume that there is a market for a particular type of good with two sellers and two distinct submarkets. Figure 1 provides a graphical depiction of the brands that are produced by the firms. The manufacturers compete directly and indirectly with each other through product formulation and demand positioning. As a result, all of the brands are substitutes to some degree. Brands in a given submarket are either strong or moderate substitutes because of product similarity. For example, brands A-II-A and A-II-B are similar to each other and to the brands produced by Firm B in Segment II. The most intense rivalry arises when firms imitate product formulations and create similar images for a pair of brands. In figure 1, Firm A competes directly with Firm B by making brand A-I-A with attributes that are nearly identical to those of brand B-I-A and advertising it to the same set of consumers. Direct competition is denoted by bold arrows in figure 1. Product design differences within a particular segment ensure less intense rivalry between brands (for example, brand A-II-B with brands A-II-A and B-II-A). The thin lines between products indicate moderate substitutability. Brands in different submarkets are competitively the most insulated from one another (i.e., weak substitutes).

It is assumed that consumers repeatedly purchase their favorite brands. Product differentiation creates varying degrees of brand loyalty in consumers. Depending on an individual's preferences, a

person either greatly or weakly prefers one brand over the others in his/her favorite category. Those individuals who greatly prefer their products are assumed to be brand loyal and have a high reservation price for their goods. Loyal consumers are expected to be relatively price insensitive. That is, they require more compensation to switch brands than nonloyal consumers. Nonloyal consumers display the opposite characteristics.

All brands are assumed to be purchased by loyal and nonloyal consumers. The market may be thought of as monopolistically competitive where each brand is horizontally differentiated. Therefore, the consumers' demand curves for their favorite brands are downward-sloping and fairly elastic. The demand curve of a single loyal consumer for brand i is denoted as D^L_i in figure 2. A representative nonloyal consumer's demand curve is labeled as D^N_i in the same figure. The retail price of brand i is P^R_i, and the vertical intercepts indicate the two consumers' reservation prices. The loyal consumer has a reservation price of P^L_i for good i, but the nonloyal individual is not willing to pay more than P^N_i for that brand. Each person's demand function for his/her preferred brand is assumed to be specified by either

$$Q_i^L = \begin{cases} f(P_i^R,\ BL_i^L,\ P_{-i}^R,\ C_{-i}) \text{ if } 0 \le P_i^R \le P_i^L \text{ or} \\ 0 \text{ if } P_i^R > P_i^L \end{cases} \tag{1}$$

or

$$Q_i^N = \begin{cases} g(P_i^R,\ BL_i^N,\ P_{-i}^R,\ C_{-i}) \text{ if } 0 \le P_i^R \le P_i^N \text{ or} \\ 0 \text{ if } P_i^R > P_i^N, \end{cases} \tag{2}$$

depending on the degree of the individual's loyalty. In (1) and (2), Q^L_i and Q^N_i indicate the quantities demanded of brand i by a single loyal consumer and nonloyal consumer, respectively. The term BL_i denotes the level of loyalty to brand i. The prices of rival brands are represented by P^R_{-i}, and C_{-i} signifies the size of discounts for competing brands.

The firms are assumed to price discriminate against their own loyal and nonloyal consumers in each submarket. The manufacturer of brand i maximizes the profit from the loyal purchasers of that item by charging them the product's full retail price, P^R_i. (For simplicity, it is assumed that no retailers or

wholesalers are involved in the distribution and marketing chain.) The firm also offers coupons for brand i with a value of C_i. The coupons lower the item's effective price for those who redeem the discounts, and the reduced price ($P^R_i - C_i$) maximizes the profit from the nonloyal demand segment. Both P^R_i and C_i are set so as to allow for leakage. While P^R_i may be such that $P^R_i > P^N_i$ (so long as $P^R_i \leq P^L_i$) or $0 \leq P^R_i \leq P^N_i$, it is assumed in this scenario that $P^N_i < P^R_i < P^L_i$ and the coupons make brand i affordable for at least some of the nonloyal consumers who prefer that product.

There are costs associated with using coupons. Consumers must find, clip, sort, save, and redeem the discounts in order to accrue the savings denoted by the face values. The consumers are assumed to have transaction costs that are randomly distributed among both types of individuals.[9] That is, some consumers have transaction costs equal to t_j while others have either higher or lower transaction costs. Whether or not a person redeems the discount for his/her favorite brand depends critically on the level of his/her transaction costs. While loyal consumers always purchase their favorite brands (due to the assumption that $P^R_i < P^L_i$), the manufacturers cannot prevent them from utilizing the discounts. Loyal consumers use their preferred brands' discounts if their transaction costs are less than or equal to the products' coupon values. That is, loyal consumers with transaction costs t_j redeem brand i's coupons when $t_j \leq C_i$. Nonloyal individuals with the same transaction costs purchase the product if

$$P^R_i - C_i + t_j \leq P^N_i. \tag{3}$$

In other words, the face value must be large enough to offset the nonloyal consumers' transaction costs and still have enough left over to reduce the price paid to or below their reservation price. Some nonloyal consumers remain out of the market when (3) does not hold.

It is important to discuss one limitation of the model. Some retailers double or triple the face values of manufacturer-issued coupons (usually discounts of 50 cents or less) in order to encourage consumers to shop at their stores. While brand managers set the face values of coupons, the true savings

realized by consumers may be much greater if retailer doubling or tripling occurs. With additional discounts from retailers, more nonloyal individuals find that their preferred brands are affordable and greater leakage occurs in the loyal consumer segment. Because retailers are not considered in the theoretical framework, the effect of coupon doubling or tripling on the net prices paid is not captured in this study.

The first step in understanding the factors that influence the face values of coupons is to analyze the relationship between P^R_i and C_i using (3). Rearranging to obtain C_i by itself, the inequality becomes $C_i \geq P^R_i - P^N_i + t_j$. It is argued that to just induce the nonloyal consumers with transaction costs t_j to purchase brand i, the previous expression holds with equality. That is,

$$C_i = P_i^R - P_i^N + t_j . \tag{4}$$

The partial derivative $\partial C_i / \partial P^R_i$ reveals that there is a direct relationship between P^R_i and C_i. Considering the inequality, a change in the discount level must be greater than or equal to any price increase if the nonloyal consumers are to continue purchasing brand i.

Brand loyalty, the prices of competing brands, and rival couponing also affect the size of the discount for brand i. Changes in these variables shift the nonloyal consumers' demand curves and alter their reservation price.[10] Therefore,

$$P_i^N = z(BL_i^N , P_{-i}^R , C_{-i}) . \tag{5}$$

Using (4) and (5), the effect of a change in the nonloyal consumers' loyalty on brand i's discount, $\partial C_i / \partial BL^N_i$, is equal to $(\partial C_i / \partial P^N_i)(\partial P^N_i / \partial BL^N_i)$. The expression in the second set of parentheses is positive since an increase in brand loyalty causes the nonloyal consumers' demand curves to shift to the right as shown in figure 3 for a representative individual. The sign of the first expression is negative assuming that the nonloyal consumers' new reservation price, $P^N_i{}'$, is such that $P^N_i{}' < P^R_i$. The inverse relationship between P^N_i and C_i exists because a smaller discount is needed (after the shift in demand) to

induce the nonloyal consumers to purchase brand i. The net effect of an increase in the nonloyal consumers' loyalty on brand i's coupon value is negative.

Lower prices and larger discounts for rival brands increase the attractiveness of those items and shift a nonloyal consumer's demand curve to the left (figure 4). Using (4) and (5) again, $\partial C_i / \partial P^R_{-i} = (\partial C_i / \partial P^N_i)(\partial P^N_i / \partial P^R_{-i})$ and $\partial C_i / \partial C_{-i} = (\partial C_i / \partial P^N_i)(\partial P^N_i / \partial C_{-i})$. The expressions $\partial C_i / \partial P^N_i$ and $\partial P^N_i / \partial C_{-i}$ are negative while $\partial P^N_i / \partial P^R_{-i}$ is positive. Therefore, $\partial C_i / \partial P^R_{-i}$ is negative, indicating that targeted firms increase the discounts on their own goods as rival products become cheaper. The expression $\partial C_i / \partial C_{-i}$ is positive, showing that firms raise the price concessions on their own brands when rival manufacturers try to lure their customers away with competing discounts (as proposed by Shaffer & Zhang, 1995). Both reactions are intended to protect the targeted firms' sales.

Brand market share (MS_i) is also thought to influence discount levels. Manufacturers are assumed to use coupons as share-maintenance tools (Price, 1999). Therefore, a positive relationship between brand market share and discount levels is expected. Hedonic pricing studies (e.g., Stanley & Tschirhart, 1991) have shown that brand-specific characteristics (BSC_i) influence product prices. Since discount levels and brand prices are intimately related, product attributes are expected to affect discount levels (either positively or negatively) as well.

Most companies do not strictly rely on one non-price promotion to bolster sales and compete with rivals. In fact, many manufacturers have complex marketing programs in which non-price promotions are substituted for each other or combined in various proportions. Because there are tradeoffs and synergies between non-price promotions, adjustments in the mix of these marketing strategies can influence coupon values. Thus, it is important to consider the effects of other non-price promotions on discount levels.

Firms may choose to employ intense advertising campaigns (AD_i) to market a given brand rather than offer large coupon discounts to induce purchases. Thus, an inverse relationship between those two promotional activities is expected. Brand managers may also coordinate coupon drops with retail-level

campaigns. In-store displays ($DISPLAY_i$) catch consumers' attention and pique their interest in the promoted product, potentially leading to impulse purchases without coupon redemptions. As a result, in-store displays may reduce the need for large discounts. The issuance of coupons may also be synchronized with store flyers ($PRINT_i$) that feature products on a rotating basis. Many times, these flyers are included in Sunday newspapers, which also contain manufacturer-issued coupons. Due to the physical proximity of the promotions to each other, store flyers may prompt some consumers to clip the coupons in the free-standing inserts, thus raising redemption rates. Moreover, manufacturers may attempt to increase the probability of usage by offering coupons with relatively large face values. Therefore, a positive relationship may arise between the use of store ads and the size of the discount for a particular good. To summarize, the following expression depicts the determinants of brand coupon values:

$$C_i = v(P_i^R, BL_i^N, P_{-i}^R, C_{-i}, MS_i, BSC_i, AD_i, DISPLAY_i, PRINT_i). \quad (6)$$

Economic theory indicates that brand prices and discount levels influence each other. In order to account for the bi-directional causality between C_i and P^R_i, the determinants of P^R_i need to be identified. While brand managers probably set prices first before calculating the associated discounts, coupon values that are deemed to be too large or too small may be altered to achieve a particular effect on sales. Changes in discount levels may force managers, in turn, to adjust brand prices in order to maintain a certain relationship between the two variables.

Larger discounts, when redeemed, result in increased costs for firms, which must be accounted for in higher brand prices. Besides C_i, P^R_i is influenced by the prices of competing brands, costs of production, advertising expenditures, inventory levels, and brand-specific effects. That is,

$$P_i^R = w(C_i, P_{-i}^R, MAT_i, LAB_i, E_i, AD_i, INV_i, BSC_i). \quad (7)$$

The variables MAT_i , LAB_i , and E_i are the material, labor, and energy costs associated with producing brand i, respectively, and INV_i is the quantity of brand i held in inventory. Increasing costs of production and advertising expenditures are expected have a positive influence on P^R_i because a higher brand price is needed to cover rising costs (Wills & Mueller, 1989). Higher inventory levels, on the other hand, are thought to negatively affect P^R_i because the manufacturer must lower brand i's price to reduce unexpected build-up of stocks. Together, (6) and (7) comprise the behavioral model in this study.

5. APPLICATION TO THE RTE CEREAL INDUSTRY

The theoretical model is employed to identify the determinants of coupon discounts for RTE breakfast cereals. The RTE cereal industry has been chosen because of its intense use of couponing. RTE cereal makers have traditionally employed several non-price promotions to market their brands to consumers. Therefore, the behavioral model represented by (6) and (7) most accurately depicts the industry's pricing and marketing behavior.

The prepared cereal market is assumed to comprise four submarkets: regular or adult cereals, presweetened brands, cereals containing fruit and/or nuts, and granolas (these segments are similar to those chosen by Nevo & Wolfram, 1999).[11] Researchers and industry analysts generally agree that RTE cereals may be divided into regular and presweetened brands. Granolas may be considered a separate submarket since they have a natural, healthy image. Furthermore, their heft and firm texture distinguish them from other cereals. Brands that contain fruit and/or nuts may constitute an independent group because the other cereal types do not offer these ingredients, which may provide a more nutritious and complete meal.

RTE cereals have brand-specific characteristics that influence their prices and coupon values. Evidence suggests that presweetened brands as a group are discounted less than other kinds of cereal. With most presweetened cereals being consumed by children, parents are likely to indulge their children

and be relatively unconcerned about whether presweetened brands are discounted with coupons (Connor, 1997). When adults purchase regular cereals for their own consumption, they may be more price and coupon sensitive. It is believed that the average brand loyalty to fruit/nut and granola cereals is high. Thus, the coupon values for these brands may be larger than the discounts for regular and presweetened cereals in order to encourage switching among brands. Product prices and coupon values are also assumed to be influenced by other brand-specific characteristics. These attributes include cereal texture (e.g., flaked, puffed, or shredded), grain type, nutritional content, and the length of availability on store shelves (i.e., whether a particular brand is established or relatively new).

6. EMPIRICAL MODEL AND DATA

Expressions (6) and (7) were operationalized with the following simultaneous, two-equation, fixed-effects, panel-data model:

$$\begin{aligned} C_i = {} & \alpha_i + \beta_1 P_i^R + \beta_2 BL_i + \beta_3 C_{-i} + \beta_4 MS_i + \beta_5 AD_i + \beta_6 DISPLAY_i + \\ & \beta_7 PRINT_i + \beta_8 POST96 + \beta_9 GM96 + \beta_{10} KEL96 + \beta_{11} NEWEXP96 + \varepsilon_1 \end{aligned} \tag{8a}$$

and

$$\begin{aligned} P_i^R = {} & \delta_i + \omega_1 C_i + \omega_2 P_{-i}^R + \omega_3 MAT_i + \omega_4 LAB + \omega_5 AD_i + \omega_6 INV + \\ & \omega_7 POST96 + \omega_8 GM96 + \omega_9 KEL96 + \omega_{10} NEWEXP96 + \varepsilon_2 \ , \end{aligned} \tag{8b}$$

where P^R_i and C_i are the retail price of and average redeemed discount for cereal i in dollars per pound, respectively.[12] Redeemed, manufacturer-issued coupons (excluding additional discounts from retailer doubling or tripling) were preferred to those that are simply offered because they must be used in order for the firms to realize their price discriminatory and competitive goals. Discounts that are issued but never redeemed by nonloyal individuals are, for the most part, wasteful from the firms' perspective.[13]

The variable BL_i is a measure of consumer loyalty to cereal i and is defined as the share of sales

volume that a particular brand represents among the buyers of RTE cereal. Although the theoretical model specifies the inclusion of the nonloyal consumers' brand loyalty, such data were unavailable. Therefore, the loyalty of all consumers who purchase brand i was used as a proxy.[14] The term C_{-i} is the weighted average discount that is redeemed for cereals that compete with brand i (i.e., those cereals that are in the same submarket as brand i) in dollars per pound. The weight used to calculate C_{-i} is brand market share relative to the appropriate submarket. Similar to C_{-i} , P^R_{-i} in 8b is the weighed average price (dollars per pound) of rival cereals in the same submarket as brand i.[15] Brand market share, MS_i , is the percentage market share held by brand i in the entire RTE cereal market.

The intensity of mass-media advertising for a given brand (AD_i) is measured in millions of dollars per pound of cereal purchased in a sample of 1,000 households. The percentage of brand sales that is accompanied with in-store displays is denoted by $DISPLAY_i$. The term $PRINT_i$ is the percentage of brand i's sales that occurs when the product is featured in newspaper advertisements or store flyers (either mailed to customers' homes or distributed at stores).

The firm-year dummy variables POST96, GM96, and KEL96 indicate the brands that were produced by Post, General Mills, and Kellogg in 1996, respectively. These variables were included in the model to capture the firms' slashing of cereal prices and coupon values that year. The term NEWEXP96 denotes the brands that were available for purchase in 1996 but were either introduced or discontinued during the study period (1992 to 1997). It is expected that new and expiring cereals do not compete intensively with established brands. Recent introductions, regardless of the prices and discounts for older brands, are highly couponed in order to generate trials with first-time purchasers. Unpopular cereals, on the other hand, are not heavily discounted because companies tend to concentrate on promoting more profitable brands. Given the competitive insulation of new and expiring brands, the RTE cereal industry's price and discount cuts are expected to have only applied to established cereals. In other words, the prices of and discounts for new and expiring cereals are not expected to have been

significantly lower in 1996.

The data used to quantify the variables in (8a) [except for AD_i] as well as P^R_{-i} in (8b) were obtained from the *Marketing Fact Book* (IRI, 1997 and previous years). The report provides annual, aggregate information on household purchases of 82 RTE cereals between 1992 to 1997.[16] Purchase data from more than 180 grocery stores (including major retail chains and small, independent establishments) were recorded in 27 markets across the United States using identification cards that were issued to consumers and scanned at the time of checkout. Computers kept track of purchased volumes and the prices paid by consumers, with IRI staff verifying all coupon redemptions. Only the brands that attained a market share of at least 0.5 percent in the entire RTE cereal market are reported by IRI. Brand totals include all package sizes, although different flavors are listed separately. The RTE cereal makers included in this study are Kellogg, General Mills, Post, Quaker, Nabisco, Malt-O-Meal, Ralston, Health Valley, Kashi, and private-label manufacturers. The data source does have some limitations in that it does not include sales at non-grocery outlets (e.g., convenience stores and gas stations), products without bar codes, and non-scannable items. However, these limitations are unlikely to significantly affect the data on RTE cereal purchases. Advertising expenditures, which cover expenses in 10 major media outlets, including magazines, newspapers, radio, and television, were taken from *Ad $ Summary* (Leading National Advertisers, 1997 and previous years) and divided by sales volume (obtained from IRI, 1997 and previous years).

The cost of food ingredients and packaging materials associated with the production of brand i (MAT_i) is represented by an index.[17] Inputs were separated into grains (wheat, rice, corn, oats, and barley), sugar, oil, nuts, dried fruit, paperboard boxes, and plastic bags, according to a list of primary inputs in the *Census of Manufactures* (U.S. Census Bureau, 1992). The amounts of the various food ingredients (in percentage terms) were chosen based on cereal type (Price, 1999). Annual producer price indexes for the commodities and packaging materials were gathered from the U.S. Bureau of Labor

Statistics (1999). The material cost index for a given brand was computed by adding together the food-ingredient cost index (obtained by multiplying the food ingredients' percentages by the respective producer price indexes and summing up all of the values) and the price indexes for boxes and bags. Some brands (Malt-O-Meal's entire product line and a few of Quaker's cereals) were bagged only. For those cereals, the price index for folding paperboard boxes was excluded from the material cost index.

The term LAB is payroll in thousands of dollars per employee and INV is the total value of inventories (including materials, work in progress, and finished goods) in millions of dollars in the cereal breakfast foods industry, respectively. Industry-level data on labor costs and inventory levels was obtained from the *Annual Survey of Manufactures* (U.S. Census Bureau, 1998 and previous years) and the *Census of Manufactures* (U.S. Census Bureau, 1992).[18]

7. RESULTS

Equations (8a) and (8b), which depict the RTE cereal makers' complex pricing and marketing strategies, were estimated with two-stage least squares in order to account for the endogeneity of brand prices, discount levels, and brand market share.[19] Autocorrelation was not detected in either (8a) or (8b), but heteroskedasticity was corrected in both equations. The coefficients and t-statistics associated with the time-variant regressors are presented in tables 1 and 2.

Nevo and Wolfram (1999) also examined the relationship between cereal prices and coupon values, and their findings differ from those of this study. While a different time period (1989 to 1992), fewer brands (25), the use of face values rather than redeemed discounts, and more disaggregated data (quarterly information from 65 cities) contribute to the discrepancies, the differences between the studies are due primarily to Nevo and Wolfram's (1999) use of a large number of dummy variables. These variables, which capture changes in manufacturers' costs and consumer demand as well as differences in time and geographic location, explain virtually all of the variation in cereal prices. Therefore, the

reported relationship between coupon values and the residual variation in shelf prices only focuses on a small component of price variation. In contrast, this study's framework explicitly includes demand factors and manufacturers' costs in separate equations for coupon values and cereal prices.

The fit of this study's model is excellent with 83 and 96 percent of RTE cereal discounts and prices, respectively, being explained by the independent variables. Many of the variables in the brand-price and coupon-value equations are statistically significant, thus supporting a number of hypotheses proposed in this study. The significance of P^R_i and C_i at the 95 percent confidence level supports the contention that cereal prices and discount levels simultaneously influence each other. It is also evident that RTE cereal manufacturers price discriminate against consumers. Larger discounts are offered when brand prices rise in order to keep the nonloyal consumers in the market. Interestingly, according to the coefficient of P^R_i in table 1, redeemed discounts only rose 12.2¢ per pound for every $1-per-pound increase in cereal prices in the early and mid-1990s. This unequal change likely forced some nonloyal consumers to stop buying their favorite brands because they were no longer affordable. The exodus of nonloyal consumers from the breakfast cereal market may have been sufficiently large to cause the cereal industry's lackluster performance during that period. One potential strategy that may improve their financial condition is to equalize changes in prices and discount levels. In contrast, Nevo and Wolfram (1999) found that cereal prices are negatively correlated with discount size. The authors concluded that RTE cereal makers do not use coupons primarily as price-discriminatory tools. Instead, other factors, such as the strategic interaction between firms, influence the relationship between cereal prices and coupon values.

The findings support the hypothesis that RTE cereal manufacturers employ complex marketing campaigns when promoting their products to consumers. Couponing is synchronized with and substituted for other non-price promotions. Couponing and advertising are strong substitutes in the RTE cereal industry. More intense advertising campaigns make consumers aware of product attributes and encourage

trial or repeat purchases, reducing the need for issuing large discounts. When advertising expenditures increased by $1 million per pound of cereal purchased in the 1990s, redeemed discounts fell by 32.7¢ per pound. The non-price promotions $DISPLAY_i$ and $PRINT_i$ are statistically significant, suggesting that cereal makers coordinate couponing with these promotional vehicles.[20] The use of in-store displays lowers the average redeemed discount for a brand because they cause impulse purchases without coupon usage. Moreover, the average redeemed discount for a given brand is higher when more sales are made when the product is featured in store flyers. This finding implies that coupon drops are timed with retail promotions to encourage cereal purchases as well as the redemption of discounts.

Consistent with Shaffer and Zhang (1995), brand loyalty is a critical variable that cereal makers take into account when setting the face values of coupons. During the 6-year period, cereal makers reduced discounts an average of 5.3¢ per pound for every one-unit increase in the brand loyalty index. The outcome of MS_i supports the hypothesis that RTE cereal producers issue coupons to maintain brand market share. In the mid-1990s, a one-percentage-point difference in brand market share caused the average redeemed discount to vary by 27.4¢ per pound.

The variable C_{-i} is strongly significant and reinforces the contention that cereal manufacturers rely on couponing to compete with each other. When cereal makers offer large discounts to entice the purchasers of rival cereals to switch brands, the targeted firms retaliate with greater price concessions. This measure helps to prevent the erosion of the targeted firms' sales. According to table 1, companies raised the discounts for their own brands by 56.4¢ per pound when the weighted average discount redeemed for rival cereals increased by $1 per pound. The coefficient of C_{-i} provides empirical support for Shaffer and Zhang's (1995) hypothesis that companies use coupons to lure consumers away from their competitors. The importance of inter-firm rivalry with respect to couponing was also stressed by Nevo and Wolfram (1999); the authors found that coupons are more likely to accompany shelf price concessions when rivals coupon their own products.

In table 2, discount levels are an important factor that affect brand prices, thus agreeing with Narasimhan (1984) and Gerstner, Hess, and Holthausen (1994). Larger discounts represent increased costs for cereal makers, which must be accounted for in higher brand prices. However, changes in redeemed discount levels exceeded those of brand prices in the 1990s, indicating that this marketing strategy left price-sensitive consumers better off during that time. Relatively large discounts may cause the leakage segment to expand, and some loyal consumers may leave the market due to the higher brand prices (i.e., if P^R_i rises above P^L_i and they do not redeem the coupons). This strategy may not be optimal and may have contributed to the firms' financial decline. Cereal companies may be able to improve their performance by better equating the changes in prices and discount levels.

In table 2, P^R_{-i} is statistically significant at the 99 percent confidence level. The coefficient of this variable is interpreted as the average change in breakfast cereals' prices when the weighted average price of rival brands rises by $1 per pound. Between 1992 and 1997, cereal prices rose 70.3¢ per pound for every $1-per-pound increase in the prices of competing brands. Although near price equality may indicate either a competitive market environment or imperfect collusion, company executives' statements seem to support the latter scenario (Scherer, 1982).

Food-ingredient and packaging costs are important factors that influence RTE cereal prices. In the early and mid-1990s, brand prices increased an average of 1.6¢ per pound for every 10-unit increase in the material cost index. Given the importance of advertising in RTE cereal promotions, it is not surprising that mass-media advertising expenditures have a strong, positive influence on cereal prices. An additional $1 million in advertising expenditures per pound of cereal sold caused brand prices to rise by 80.0¢ per pound in the mid-1990s. In a previous study, Wills and Mueller (1989) found that advertising has a positive and significant positive impact on brand-level food prices in 133 product categories.

Cereal makers are concerned about inventory levels. Although breakfast cereals are not highly perishable like fresh meat or milk, they tend to become stale if not consumed within several months after

production. As anticipated, manufacturers lower brand prices to reduce the unexpected build-up of stocks. Employee wages (LAB) are not a significant determinant of cereal prices, but the aggregate data used to quantify the variable may have affected the magnitude of the coefficient. In addition, some of the top cereal makers, including Kellogg, attempted to reduce costs by laying off employees, closing plants, and forcing wage concessions during the study period (Gibson, 1995). Declines in wages may have offset any pay increases, leading to an insignificant relationship between the two variables.

Many of the brand-specific effects in the price and coupon-value equations are statistically significant. Therefore, cereal type (i.e., regular/adult, presweetened, fruit/nut, or granola) and other product attributes affect brand prices as well as discount levels. This finding reaffirms Stanley and Tschirhart's (1991) conclusion that brand-specific effects influence cereal prices.

Post's 1996 price cuts were statistically significant, thus supporting published news articles that the company dropped its cereals' prices to reduce the company's reliance on inefficient promotional activities, namely couponing (Gibson & Ono, 1996). The company's discounts were also found to be lower that year. The coefficients of POST96 in the two equations underestimate the actual price and discount reductions because the company's 1996 cereal prices and discount were compared with those in all other years in the study period, not just those in late 1995 and early 1996. Only General Mills' price cuts were significant that year. The coefficient of GM96 in table 2 may overestimate the actual price reduction because only a portion of its brands were discounted in 1996 and it incorporates the firm's price cuts from May 1994 (Holusha, 1994). The prices for Kellogg's cereals in 1996 were not different from those in other years even though the firm announced that it would slash half of its cereals' prices by 19 percent. Since the coefficient of KEL96 in table 1 suggests that the company's coupon values were, on average, 2.5¢ per pound higher than in other years, Kellogg may have altered its price-discounting strategy from one that was general (which could be taken advantage of by all consumers) to one that was targeted. By increasing discount levels, Kellogg would be able to offer price concessions to a specific

group of consumers, namely the price-sensitive individuals.

New and expiring brands' prices and discounts were significantly lower in 1996. This result was not expected since those kinds of cereal were thought to be somewhat insulated from competition. Discounts for new cereals were assumed to be high regardless of the coupon values for similar, establish brands because the makers of new cereals want to generate interest among potential first-time purchasers. Expiring brands, on the other hand, were thought to have waning demand because they have fallen out of favor with consumers. Companies were expected to concentrate on promoting more profitable brands and treat unpopular cereals as "cash cows."[21] Instead, it appears that the manufacturers of new and expiring brands dropped the prices of and discounts for those cereals in order to prevent a precipitous decline in sales that would have been caused by potentially large premiums above the net prices for established cereals.

8. CONCLUSIONS

While the companies blame coupons for their poor performance, it appears that the firms' predicament may be due to the incorrect mix of pricing and couponing activities. Either discounts are too large or price-sensitive consumers are priced out of the market when changes in brand prices exceed those of discount levels. Coordinating pricing and couponing strategies may improve the companies' situation.

Although there are many facets of couponing that can influence profitability, marketing directors may also be able to alleviate some of the pressures on firm performance by quantifying the significant variables highlighted in this study to calculate more appropriate coupon values. For example, brand loyalty was found to be an important determinant of discount levels. If consumers' loyalty to a certain cereal is determined to be higher than originally thought, then, all else being equal, marketing managers should lower that product's coupon discount because many consumers will continue to buy the cereal even with a smaller savings.

Managers in the RTE cereal industry should be aware that the presence of price discrimination and near symmetry of prices can be detected empirically. While these pricing tactics have undesirable welfare consequences, conscious parallelism in pricing is, by and large, legal so long as it is not the result of overt agreements. However, if such pricing practices are combined with evidence of intent to enhance market power, the conduct could be actionable under United States antitrust laws.

Before any action is taken against the RTE cereal industry, regulators should take into account one other finding of this study. Even if cereal manufacturers price discriminate and do not price independently, they are rivalrous with respect to couponing. Firms encourage brand switching and protect market shares with large discounts. Any proposed antitrust remedy to change pricing practices must consider these strategies of the leading RTE cereal companies. Furthermore, policy restraints that focus exclusively on the problems of noncompetitive pricing and price discrimination are likely to have unintended consequences for couponing behavior due to the intimate relationship between brand prices and discount levels.

FOOTNOTES

[1] Brand managers are also interested in other aspects of couponing including ad size, distribution method (e.g., free-standing inserts in newspapers, on-pack discounts, and shelf displays), the scope of circulation, the number of products required for discount eligibility, issue dates, and the validity period.

[2] According to Larson (1997), losses may result if leakage occurs after companies expect that demand segments are sealed (i.e., no leakage occurs) and the firms do not adjust brand prices and discount levels accordingly.

[3] Some large companies such as Proctor & Gamble and General Mills operate their own clearinghouses. Due to the large number of coupons that are issued and redeemed, it is more cost effective for those firms to process their own coupons than to pay a third party to perform the task.

[4] Other methods of addressing the principal-agent problem include the use of on-pack coupons and distributing discounts through on-shelf dispensers.

[5] Although reducing the number of coupons issued does not lower the face values, consumers may view such action as lowering the benefits of coupons. Discounts may be more difficult to locate, thus lowering the total price reduction that individuals may realize in a given time period.

[6] Couponing in the RTE cereal industry is expensive because the firms incur costs beyond the total dollar value of the redeemed discounts. While the total redemption value of breakfast cereal coupons was $915 million in 1993, manufacturers spent an additional $300 million to $400 million on the printing, distribution, and handling of the discounts that year.

[7] According to Cotterill (1999), industry profits averaged 17 percent of sales revenue in the 1980s and the first half of the 1990s. The RTE cereal industry's performance was so phenomenal that the Federal Trade Commission filed an antitrust lawsuit against several firms in 1972 (Scherer, 1982). General Mills, Kellogg, General Foods (later known as Post), and Quaker (eventually dropped from the suit in 1978) were charged with monopolizing the market through highly effective tacit collusion and not competing on the basis of price. After nearly 10 years of lobbying and litigation, the companies were exonerated by an administrative law judge.

[8] The dominant RTE cereal producers have relatively low food-ingredient costs (9 percent of sales revenue in 1992, down from 23 percent in 1954). Expenses for packaging (cardboard boxes and plastic or foil bags) exceed those for food ingredients (Connor, 1999). The cereal industry's PCM was significantly less in 1996. The sudden drop was primarily due to the industry-wide price cuts which occurred in April and June of that year.

[9] It is assumed that the degree of an individual's loyalty to his/her preferred brand does not influence the level of the person's transaction costs.

[10] Because loyal consumers have strong brand preferences, it is assumed that their loyalty is constant. Thus, changes in rival brands' prices and coupon discounts do not shift those individuals' demand curves.

[11] Cereals that were categorized as either regular or presweetened follow the segmentation in the *Marketing Fact Book* (Information Resources, Inc. [IRI], 1993). Granolas and brands that contain fruit and/or nuts are typically denoted by the products' names (such as Kellogg's Low Fat Granola, General Mills' Raisin Nut Bran, and Post's Fruit & Fibre). For those brands that do not have obvious titles (e.g., General Mills' Basic 4), the cereals were located on store shelves to verify their ingredients.

[12] All dollar variables are in nominal terms. Dollar values were not deflated due to low inflation during the study period.

[13] Coupons may have a positive benefit even when they are not redeemed. The advertising effect of discounts can make consumers aware of product availability and increase the potential of purchase without redemption.

[14] According to IRI, the developer of the indicator, the non-negative index is a good measure of brand loyalty because the number and volume of cereal purchases are large enough to allow a loyalty pattern to emerge.

[15] The prices of rival brands were excluded as an explanatory variable in (8a) due to the near price equality among similar RTE cereals.

[16] Two of the cereals are in aggregate: all private-label brands and those cereals that were available for purchase in 1996 but were either introduced or discontinued during the six-year period.

[17] Energy costs were not included as an explanatory variable in (8b) because they are a negligible portion of total production costs in the cereal breakfast foods industry. For example, using data from the *Annual Survey of Manufactures* (U.S. Census Bureau, 1995), fuel and electricity costs were 3.4 percent of material costs and 0.7 percent of the total value of industry shipments in 1995.

[18] Use of information from the cereal breakfast foods industry is acceptable because its specialization and coverage ratios indicate that the industry is well-defined by the Standard Industry Classification system.

[19] Brand market share was considered to be endogenous because cereal makers can issue coupons to increase their brands' market shares in addition to using them as share-maintenance tools. The Spencer-Berk test was employed to verify the exogeneity of C_{-i} , AD_i , $DISPLAY_i$, $PRINT_i$, and P_{-i} (Kmenta, 1986).

[20] Although annual data were employed in the estimation of the empirical model, it is possible to make general conclusions about the coordination and substitution of non-price promotions. In store displays and store flyers feature products on a rotating basis. Several weeks may pass between when a given item is promoted. Similarly, coupons are not issued every week for the same product. Instead, firms offer coupons with a specific validity period and may wait several months before initiating subsequent campaigns. Thus, if a significant relationship appears between redeemed coupon values and other non-price promotions, it is probably because the activities overlap. If the promotions were not coordinated, then no correlation would exist. Advertising, on the other hand, is relatively constant when compared with the use of store flyers and in-store displays. In this case, the negative relationship between advertising and coupon discounts is indicative of substitution rather than synchronization.

[21] A cash cow is a declining brand that has reduced marketing support. Manufacturers sometimes choose this promotional strategy because the increase in short-run profits outweighs the cost of extending a product's life a few years through additional promotional expenditures.

REFERENCES

Balu, R. (1998a). Kellogg increases prices on majority of cereal brands. Wall Street Journal, December 15, B23.

Balu, R. (1998b). Quaker raises cereal prices and cites product improvements, ingredient costs. Wall Street Journal, May 26, B12.

Canedy, D. & Abelson, R. (1999). Under pressure, Kellogg speeds a shift at the top. New York Times, January 6, C1.

Capps, O., Jr., Seo, S. & Nichols, J. P. (1997). On the estimation of advertising effects for branded products: An application to spaghetti sauces. Journal of Agricultural and Applied Economics, 29, 291-302.

Connor, J. M. (1999). Breakfast cereals: The extreme food industry. Agribusiness, 15, 247-259.

Connor, J. M. (1997). Couponing as a horizontal and vertical strategy: Theory and effects. Retail Food Industry Center Working Paper No. 97-06, University of Minnesota, St. Paul, MN.

Cotterill, R. W. (1999). High cereal prices and the prospects for relief by expansion of private label and antitrust enforcement. Agribusiness, 15, 229-245.

Gerstner, E. & Hess, J. D. (1991). A theory of channel price promotions. American Economic Review, 81, 872-886.

Gerstner, E., Hess, J. D., & Holthausen, D. M. (1994). Price discrimination through a distribution channel: Theory and evidence. American Economic Review, 84, 1437-1445.

Gibson, R. (1995). Kellogg plans more cuts in work force. Wall Street Journal, August 23, A3.

Gibson, R. (1996). General Mills to buy Ralcorp's Chex, other branded cereals for $570 million. Wall Street Journal, August 15, B8.

Gibson, R. & Ono, Y. (1996). Cereal prices are cut by Philip Morris's Post. Wall Street Journal, April 16, A2.

Holusha, J. (1994). General Mills to cut prices on cereals. New York Times, April 5, D5.

Houston, D. A. & Howe, J. S. (1985). An economic rationale for couponing. Quarterly Journal of Business and Economics, 24, 37-50.

Information Resources, Inc. (1997 and previous years). Marketing fact book. Chicago, IL: Information Resources, Inc.

Kmenta, J. (1986). Elements of econometrics (2nd ed.). New York, NY: Macmillan Publishing Co.

Larson, R. B. (1997). Using price discrimination theory to plan promotions. Agribusiness, 13, 401-408.

Leading National Advertisers, Inc. (1997 and previous years). Ad $ summary. New York, NY: Competitive Media Reporting.

Leone, R. P. & Srinivasan, S. S. (1996). Coupon face value: Its impact on coupon redemptions, brand sales, and brand profitability. Journal of Retailing, 72, 273-289.

Miller, J. P. (1996a). Cereal makers fight bagels with price cuts. Wall Street Journal, June 20, B1.

Miller, J. P. (1996b). General Mills gets clearance to buy Chex. Wall Street Journal, December 27, A3.

Narasimhan, C. (1984). A price discrimination theory of coupons. Marketing Science, 3, 128-147.

Neslin, S. A. (1990). A market response model for coupon promotions. Marketing Science, 9, 125-145.

Nevo, A. & Wolfram, C. (1999). Prices and coupons for breakfast cereals. NBER Working Paper No. W6932, National Bureau of Economic Research, Cambridge, MA.

Price, G. K. (1999). Modeling coupon values for ready-to-eat breakfast cereals. Unpublished Ph.D. dissertation, Purdue University, West Lafayette, IN.

Price, G. K. (2000). Cereal sales soggy despite price cuts and reduced couponing. FoodReview, 23, 21-28.

Price, G. K. & Connor, J. M. (2001). Modeling coupon values for ready-to-eat breakfast cereals. Food Marketing Policy Center Research Report No. 54, University of Connecticut, Storrs, CT.

Raju, J. S., Dhar, S. K., &, Morrison, D. G. (1994). The effect of package coupons on brand choice. Marketing Science, 13, 145-164.

Scherer, F. M. (1982). The breakfast cereal industry. In W. Adams (Ed.), The Structure of American Industry (6th ed.), New York, NY: Macmillan Publishing Co., 191-217.

Schindler, R. (1984). How cents-off coupons motivate the consumer. In K. E. Jocz (Ed.), Research on sales promotion: Collected papers, Cambridge, MA: Marketing Science Institute, 47-62.

Shaffer, G. & Zhang, Z. J. (1995). Competitive coupon targeting. Marketing Science,14, 395-416.

Stanley, L. R. & Tschirhart, J. (1991). Hedonic prices for a nondurable good: The case of breakfast cereals. Review of Economics and Statistics, 73, 537-541.

U.S. Bureau of Labor Statistics (1999). Producer price index-commodities. http://www.bls.gov/ppihome.htm.

U.S. Census Bureau (1998 and previous years). Annual survey of manufactures. Washington, DC: U.S. Department of Commerce.
U.S. Census Bureau (1992). Census of manufactures: Industry series, grain mill products. Washington, DC: U.S. Department of Commerce.

Wall Street Journal (1995). Philip Morris's Kraft prevails in U.S. suit over antitrust issue. Wall Street Journal, February 23, A15.

Ward, R. W. & Davis, J. E. (1978). A pooled cross-section time series model of coupon promotions. American Journal of Agricultural Economics, 60, 393-401.

Wills, R. L. & Mueller, W. F. (1989). Brand pricing and advertising. Southern Economic Journal, 56, 383-395.

TABLE 1. Regression results explaining coupon discounts for RTE cereal from 1992 to1997

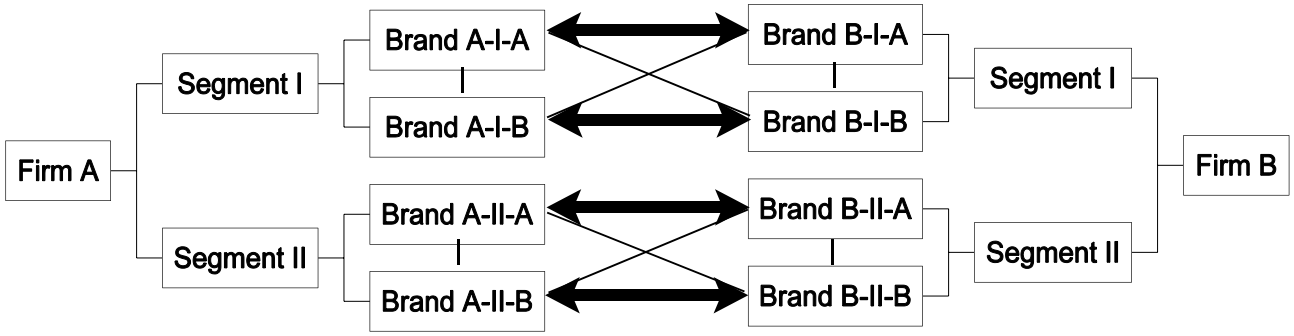
Variable	Coefficient	t-Statistic
P^R_i	0.1216[#]	2.1777
BL_i	-0.0529[*]	-2.9999
C_{-i}	0.5635[*]	3.5881
MS_i	0.2740[*]	2.8787
AD_i	-0.3265[†]	-1.5568
$DISPLAY_i$	-0.0020[#]	-1.7370
$PRINT_i$	0.0017[†]	1.5702
POST96	-0.0297[#]	-2.0512
GM96	-0.0030	-0.2493
KEL96	0.0246[#]	1.7402
NEWEXP96	-0.0297[#]	-2.0876
R^2 (full equation)		0.8273
R^2 (brand-specific effects only)		0.6496
R^2 (time-variant variables only)		0.5672

[*] Significant at the 99 percent confidence level (one-tailed test). Critical value is 2.326.
[#] Significant at the 95 percent confidence level (one-tailed test). Critical value is 1.645.
[†] Significant at the 90 percent confidence level (one-tailed test). Critical value is 1.282.

TABLE 2. Regression results explaining RTE cereal prices from 1992 to1997

Variable	Coefficient	t-Statistic
C_i	0.6932[#]	2.2151
P^R_{-i}	0.7032[*]	9.8300
MAT_i	0.0016[*]	2.8439
LAB	0.0069	1.0273
AD_i	0.8002[*]	2.3480
INV	-0.0003[#]	-2.0466
POST96	-0.2249[*]	-4.9936
GM96	-0.1985[*]	-3.6876
KEL96	-0.0071	-0.1718
NEWEXP96	-0.1646[*]	-4.4343
R^2		0.9593
R^2 (brand-specific effects only)		0.9179
R^2 (time-variant variables only)		0.3343

[*] Significant at the 99 percent confidence level (one-tailed test). Critical value is 2.326.
[#] Significant at the 95 percent confidence level (one-tailed test). Critical value is 1.645.



Note: Brands across different segments are assumed to be weak substitutes

Figure 1. Competing brands offered by two firms in different submarkets

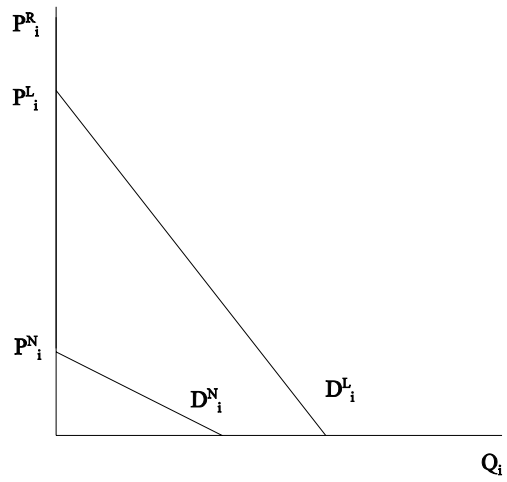


Figure 3. Demand curves of a single nonloyal consumer and nonloyal consumer for brand i

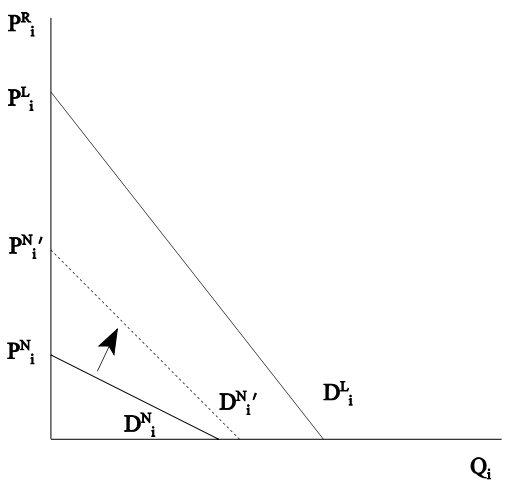


Figure 2. Demand curves of a single loyal consumer with different levels of loyalty to brand i

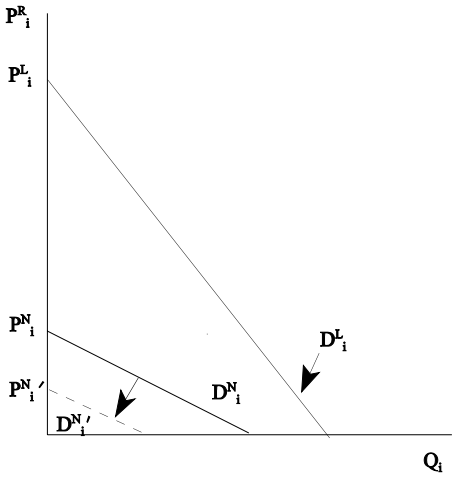


Figure 4. Effect of lowering competing products' prices or increasing rival brands' discounts on a nonloyal consumer's demand curve