A Socioeconomic Approach to Assessing Price Competition between Private Labels and National Brands: The Case of Shredded Cheese

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Abstract

An LA/AIDS model is developed to estimate demand elasticities for packages of 8-oz shredded cheese for higher- and lower-income consumers. Data used in this study are scanner data for six supermarket stores in two distinct socioeconomic areas. Results show that: (1) lower-income shoppers are more price-sensitive than higher-income shoppers for both private labels and national brands; (2) compared with private labels, consumers are very sensitive to national brands price changes even in higher-income areas; (3) cross-price elasticities between private labels and national brands are all positive, i.e., private labels and national brands are substitutes in both lower- and higher-income stores; and (4) the number of promoted items does not have a statistically significant impact on sales; instead, the percentage of price discount affects sales for both private labels and national brands.

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1. Introduction

Competition between "national brands" and "private labels" has taken on greater importance in the retail food industry. Private labels or store brands are created and controlled by retailers. According to Information Resources Incorporated (IRI), market share of store brand grocery products has increased from 15% in 1988 to 21% in 1999. Sales of store brands have increased from $150 million in 1988 to over $43.3 billion in 1999. In 1999, Kroger's private label realized two cents for every food dollar spent in America (Thompson 1999). Thus, identifying and understanding the factors, such as pricing and quality that influence the competitive interaction between private labels and national brands has been a primary concern of retailers and manufacturers.

During the past decade, studies on marketing strategy with emphasis on competition issues between private labels and national brands have been addressed. For example, a number of studies analyzed the price setting behavior and market share for private labels and national brands (e.g., Cotterill and Putsis 2000; Putsis 1997; Raju, Sethuraman, and Dhar 1995a). Sethuraman (1995) used meta-analysis to investigate the cross-promotional effect between private labels and national brands. Some researchers (e.g., Cotterill and Putsis 2001; Cotterill, Putsis and Dhar 2000; Hoch 1996) focused on the strategic and competitive interaction between private labels and national brands. Moreover, several studies focused on the performance and success strategy of private

labels (e.g., Dick, Jain, and Richardson 1997; Hoch and Banerji 1993; Hoch, Montgomery, and Park 2001; Raju, Sethuraman, and Dhar 1995b; Sayman, Hoch, and Raju 2001). However, little research has addressed the competition issues between different consumer demographic characteristics.

Consumer demographic characteristics within retail trading areas have been shown to impact store-level price sensitivities. Hoch, Kim, Montgomery, and Rossi (1995) showed that the consumer demographic variables are much more influential than competitive variables. Jones (Jones and Mustiful 1996; Jones 1997) found that major differences exist in the consumer food purchasing behavior of higher- and lower-income shoppers. These results suggest that it is important to take into account the socioeconomic characteristics of consumers within store areas when examining competition between private labels and national brands.

The sales of cheese have matured in supermarkets. "In 1999, the $7.2 billion retail cheese category, which is an increase of 9% dollar share compared to 1998, showed volume gains of 3.7%. This is the highest increase the category has seen in the past four years, despite the fact that the average price per lb was up 5.1% from 1998" (Berry 2000). According to Dairy Management Inc. (DMI), per capita consumption of cheese has increased from 17.5 lbs in 1980 to 30.5 lbs in 2000 and is expected to reach 35 lbs by 2005, a two-fold increase.

A key objective of this paper is to investigate differences in price sensitivity and promotion effects for higher- and lower-income shoppers in the purchase of private labels and national brands of shredded cheese products. This paper is organized as follows.

The literature review is provided in section 2; the research method is described in section 3; empirical results are presented in section 4; managerial implications and future research directions are discussed in section 5; and the conclusions are presented in Section 6.

2. Literature Review

2.1 Own-Price Effect

Economic theory stipulates a negative own-price elasticity, i.e., the law of demand. In empirical studies, the negative own price elasticity of cheese products has been confirmed. For example, Maynard and Liu (1999) used A. C. Nielson weekly scanner data to estimate price elasticities for four different styles of cheese by various demand models. The own price elasticity of shredded cheese ranged from –1.70 to –2.66. Cotterill and Samson (2002) estimated a brand-level demand system for five brands of American cheese products to evaluate unilateral and coordinated market power strategies. The data provided by Information Resource Inc. (IRI) are market level for 33 U.S. cities, quarterly from 1988 to 1992. They found negative own price elasticities for five brands of American cheese; furthermore, the price elasticity for private label is more elastic than for Kraft but less elastic than for Borden.

Sethuraman (1995) used Information Resource Inc. (IRI) store-level scanner data to estimate 261 cross-price elasticities for six product categories: bathroom tissue, fabric softener, flour, margarine, orange juice, and tuna. He concluded that average own-price

elasticity is -3.23 across all brands, -3.17 for national brands, and -3.43 for private labels. Cotterill and Putsis (2000) used 143 food product categories and 59 geographic markets to develop a model that captures variation in private label-national brand share and pricing across categories and markets. They found negative own-price elasticities; however, the own-price elasticity of private labels (-0.98) was found to be less elastic than for national brands (-1.07).

Hoch, Kim, Montgomery, and Rossi (1995) used weekly scanner data to estimate 18 product categories, including store-specific price elasticities for a chain of 83 supermarkets. They found that the price sensitivities were related to a comprehensive set of demographic and competitor variables that described the trading areas of each of the stores. Particularly noteworthy is that, for the product category of dairy cheese, income has a negative relationship to store-level price elasticity. That is, the higher-income store showed lower price elasticities.

2.2 Cross-Price Effect and Price Promotion Effect

According to economic theory, cross-price elasticities are expected to be positive for substitute goods. In this paper, positive cross-price elasticities should be interpreted to represent brand substitution in the product category of shredded cheese. Price promotion effects on brand substitution at the retail level have been revealed in marketing literature by using store-level scanner data. For example, Kumar and Leone (1988) used Information Resources Inc. (IRI) store level scanner data and hierarchical, cross-sectional, and time-series models to examine the effect of retail store price promotion, featuring,

and displays on sales of brands of disposable diapers within a city. Within a store, price promotion produced the largest amount of brand substitution, followed by featuring and displays.

Walters (1991) investigated the impact of retail price promotions on consumer purchasing patterns and the performance of competing retailers. He developed a conceptual framework for retail promotional effects that includes brand substitution effects, interstore sales displacements, and the effects of promotions on complementary goods. Results are generally supportive of the framework and show that retail price promotions created significant complementary and substitution effects within the store. Mulhern and Leone (1991) reviewed multiple-product pricing and developed a theoretical framework for retail pricing and promotion policies based on the implicit price bundling of related products. They empirically calibrated how the regular and deal prices of individual brands influence the sales of substitute and complementary items. Furthermore, Mulhern and Leone (1991) pointed out that strong cross-relationships, indicating substitution behavior, are present among the brands in the cake mix category.

Relative to price competition between private labels and national brands, Sethuraman (1995) investigated whether price discounts by national brands influence private labels sales and vice versa, through meta-analysis of 261 cross-price elasticity estimates from six product categories in three supermarket-chains. He concluded that, on average, price reductions by national brands and private labels have more or less equal influence on each others' sales. However, there is greater variation in the effect of private-label price cuts across national brands. He further indicated that national brands with large market shares decrease private-label sales through price cuts but are seldom

affected by private-label discounts. National brands with lower relative prices have greater influence on private-label sales and are also affected more by private-label price cuts.

Putsis (1997) used Information Resources Inc. (IRI) market level scanner data from 1991 to 1992 for 135 food product categories and 59 geographic markets to investigate price, promotion and competitive effects between private labels and national brands. The empirical results showed that price followship, although weak in general, is stronger for private labels than for national brands products: a 1% decrease in national brands price produced a 0.12 percent private labels price decrease; by contrast, a 1% decrease in private labels price produced only a 0.07 percent national brands price response. Furthermore, the market share of private labels has anticipated price effect, i.e., a higher market share of private labels lowers national brands prices and raises private labels prices.

Cotterill and colleagues (Cotterill and Putsis 2000; Cotterill, Putsis, and Dhar 2000; Cotterill and Putsis 2001) have investigated price setting behavior and strategic interaction between private labels and national brands. Their key findings include: (1) demand response to price and promotion is decidedly asymmetric; (2) consumer response to price and promotion decisions (demand) and firm pricing behavior (supply) jointly determine observed market prices and market shares; and (3) markets characterized by higher national brand market share and higher supermarket concentration tend to have higher prices for both national brands and private labels.

2.3 Consumers' Perception of Price and Quality for Private Labels versus National Brands

Consumers' perception of the relationship between price and quality appears to be a key factor when consumers make brand choice decision between private labels and national brands (Dunne and Narasimhan, 1999). Quality can be defined as "the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs" (Kotler, 2000). Quality also can be represented in two forms: objective and subjective quality. The former refers to actual quality, while the latter refers to what the consumer perceives as quality. Gabor and Granger (1966) found strong evidence that consumers use price as an indicator of quality at the individual level. McConnell (1968) further showed that most consumers do use price as a signal of brand quality.

Some research studies have shown that consumers use price to infer product quality (e.g., Huber and McCann, 1982; Nelson, 1970; Rao and Monroe, 1989). Shapiro (1968) concluded that some consumers choose high-priced brands in order to reduce the risk of choosing inferior products. Monroe (1973) showed that consumers believe price and quality are positively related and they often infer quality from price. The price-quality correlation may lead consumers to expect to pay a higher price for a higher-quality brand than for a lower-quality brand (Levin and Johnson, 1984). Winer (1986) indicated that, for frequently purchased products, consumers learn from experience that there is a positive correlation between a product's price and its quality. This expectation simplifies the choice decision by allowing consumers to infer product quality from price alone, without actual product trial (Pechmann and Ratneshwar, 1992). That is,

consumers perceive the higher priced brand as being a better quality brand than other brands.

In terms of consumer judgments of private label quality, research supports the view that private labels are perceived to have a lower quality than national brands (e.g., Bushman, 1993, Hite, et al., 1991, Rosen, 1984). Applebaum and Goldberg (1967) reported that consumers perceive differences between private labels and national brands. In particular, they noted that national brands are perceived to be higher in quality while private labels are perceived to be reasonably priced. Bellizzi et al. (1981) concluded that there is a statistically significant perceptual difference between national brands and private labels. National brands scored higher than private labels on quality, reliability, and prestige. Similar findings were also obtained by Cunningham et al. (1982).

Richardson, Dick, and Jain (1994) examined the relative importance of extrinsic cues versus intrinsic cues in determining perceptions of private labels quality in an experiment using a sample of 1564 shoppers for five products. One of the five products is cheese slices for private labels and national brands (Kraft brand). In their study, extrinsic cues are product attributes that are not part of the physical product, such as price and brand name; on the other hand, intrinsic cues cannot be changed without altering the physical nature of the product, such as product ingredient and taste. The important findings of their experimental study included: (1) regardless of ingredients, national brands are perceived to be of higher quality than private labels; (2) extrinsic cues (e.g., brand name) are more influential than intrinsic cues (e.g., ingredients); and (3) perceived quality has a greater influence on consumer decision making than value-for-money - - even for purchasers of private labels.

3. Research Method

3.1 Data

The data used in this study are store-level scanner data provided by a national supermarket chain in the Columbus, Ohio metropolitan area (CMA). The data represent weekly observations including UPC (Universal Product Code), prices, sales quantities, customer counts, and total store sales. The data period covers 69 weeks from December 2000 to April 2002. To avoid aggregation bias, this paper focuses on the shredded cheese category of 8oz package size and these packages include three brands: private label, Kraft (national brand), and all other brands. For estimation purposes, a third brand of shredded cheese, others, is utilized to determine the allocation of expenditure among the brands of a product category and make a complete demand system. In this study, other brands, such as Sargento and Borden have a small market share in the shredded cheese category. There are 22 UPCs in private label, 27 in national brand, and 25 in other brands.

To investigate the price competition between private labels and national brands related to different socioeconomic conditions, two distinct store groups, higher and lower-income groups, are identified from socioeconomic information provided by the chain for all residents within a 3-mile radius of each store. As shown in Table 1, the lower-income group (stores 1, 2 and 3) is located in areas that have large proportions of lower-income shoppers, while the higher-income group (stores 4, 5 and 6) is located in areas that have a large proportion of higher-income shoppers. These two store groups reflect significantly different socioeconomic conditions not only in income, but also in race and education. As shown in Table 1, for example, only 10 percent of the prospective

shoppers are college graduates in lower-income stores (stores 1, 2 and 3), as compared to 38 percent in higher-income stores (stores 4, 5 and 6).

= = Table 1 = =

3.2 The Empirical Model and Estimation Procedure

To demonstrate how lower and higher-income consumers differ in price sensitivity for private levels and national brands, the brand-level demand systems are estimated for these two groups (stores 1, 2 and 3 in the lower-income group; stores 4, 5 and 6 in the higher-income group). Assuming weak separability of preferences, a brand demand system determines the allocation of expenditure among the brands of a product category using brand prices and category expenditure alone. In this paper, the demand system takes the form of the Almost Ideal Demand System (AIDS) introduced by Deaton and Muellbauer (1980).

The Almost Ideal Demand System (AIDS) has been widely used in recent years. Advantages of the AIDS model include the fact that it is derived from the underlying choice axioms and, consistent with neoclassical consumer theory, individual behavior can be aggregated to estimate demand parameters consistently from store-level data. The original form of the AIDS model as developed by Deaton and Muellbauer (1980), with market share demand function for these three brands, can be written as:

$$(1)\quad W_i = \alpha_i + \sum_j \gamma_{ij} \log(p_j) + \beta_i \log(x/P)$$

where w_i is market share of brand i; α_i, β_i, γ_i are parameters of the system; $x = \sum_{i=1}^{n} p_i q_i$ is total sale; p_j represent the price of the j^{th} brand; p_i and q_i represent the price and quantity respectively of the i^{th} brand; and P is a price index defined as

$$(2)\quad \log P = \alpha_0 + \sum_{k=1}^{n} \alpha_k \log p_i + \frac{1}{2} \sum_{k=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \log p_k \log p_j$$

The price index, P, is non-linear in its parameters and this creates difficulties for empirical estimation. Moschini (1995) has suggested a linear approximation of the AIDS model (LA/AIDS) to use alternative price indices as below:

$$(3)\quad \ln P^* = \sum_{i=1}^{n} w_i^0 \ln(p_{it})$$

where w_i^0 is the market share of brand *i* in the base period and p_{it} is the price of brand *i* in the period *t*.

In contrast with many attraction-type market share models, the LA/AIDS functional form is derived from the consumer's cost function, and w_i is expressed, consequently, as a share of expenditure (Cotterill, Putsis, and Dhar 2000). Some theoretical restrictions are derived from utility theory and directly imposed upon the parameters. These are known as the adding-up restriction: $\sum_i \alpha_i = 1$, $\sum_i \beta_i = 0$, and $\sum_i \gamma_{ij} = 0$; and the homogeneity condition: $\sum_j \gamma_{ij} = 0$.

Equation (1) does not include demographic or marketing variables. Pollak and Wales (1978; 1980) propose a translating method to include demographic and marketing variables. Within a store, price promotion, featuring and displays can be considered as the marketing variables that affect sales of brands. Particularly, price promotion has the most significant effect (Kumar and Leone 1988; Mulhern and Leone 1991). Since there is an average of 25 UPCs (items) in each brand, the dummy variables can not be used to represent the promoted items. Alternatively, the number of items in a given brand that is on promotional price during week t is used to examine the price promotion effect. Therefore, the LA/AIDS model can be written as:

$$(4)\quad W_{it} = \alpha_i^* + \delta_{ij} PROM_t + \sum_j \gamma_{ij} \log(p_{jt}) + \beta_i \log(x / P^*) + \varepsilon_{it}$$

i= 1(private label), 2(national brand), 3(other brands).

The variables and empirical model used in this paper can be represented as below:

Chart 1. Definition for variables used in this paper.

PLSHARE	market share of private label
NBSHARE	market share of national brand
OBSHARE	market share of other brands
PLPROM	the number of items on discount for private label
NBPROM	the number of items on discount for national brand
OBPROM	the number of items on discount for other brands
PLPRICE	natural log of price of private label
NBPRICE	natural log of price of national brand
OBPRICE	natural log of price of other brands
TSALE	natural log of total sales

(5) $PLSHARE = \alpha_1+\delta_{11}PLPROM+\delta_{12}NBPROM+\delta_{13}OBPROM$
$+\gamma_{11}PLPRICE+\gamma_{12}NBPRICE+\gamma_{13}OBPRICE$
$+\beta_1 TSALE +\varepsilon_1$

(6) $NBSHARE = \alpha_2+\delta_{21}PLPROM+\delta_{22}NBPROM+\delta_{23}OBPROM$
$+\gamma_{21}PLPRICE+\gamma_{22}NBPRICE+\gamma_{23}OBPRICE$
$+\beta_2 TSALE +\varepsilon_2$

(7) $OBSHARE = \alpha_3+\delta_{31}PLPROM+\delta_{32}NBPROM+\delta_{33}OBPROM$
$+\gamma_{31}PLPRICE+\gamma_{32}NBPRICE+\gamma_{33}OBPRICE$
$+\beta_3 TSALE +\varepsilon_3$

The demand systems are estimated for higher-income stores and lower-income stores respectively. There are three stores in each group. Each store includes 69 weeks. Thus, the total observations in each demand system are 207. The iterative seemingly unrelated regression (ITSUR) procedure of the SAS program is used for estimating the models in this paper. There are three equations in each model; the last equation of each model is dropped to avoid the singularity problem.

Once the parameters have been estimated, the demand elsticities can be calculated by following Green and Alston (1990).

The own-price elasticity:

(8) $e_i = -1 + (\frac{\gamma_{ii}}{w_i}) - \beta_i$

The cross-price elasticity:

$$(9)\quad e_{ij} = (\frac{\gamma_{ij}}{w_i}) - (\frac{\beta_i}{w_i})w_j$$

4. Empirical Results

Table 2 shows the descriptive statistics of variables; Table 3 presents regression results using LA/AIDS model; and Table 4 presents estimated demand elasticities. As shown in Table 2, the average price of private labels is $1.80 per 8-oz of shredded cheese while national brands price is $2.60 per 8-oz of shredded cheese; i.e., private labels are 44 percent lower in retail price than national brands. In terms of market share, private labels control 58 percent of the market in higher-income stores and 62 percent of the market in lower-income stores. Meanwhile, national brands control 27 percent of the market in higher-income stores and 23 percent of the market in lower-income stores.

= = Table 2 = =

= = Table 3 = =

= = Table 4 = =

Table 3 indicates that the mathematical signs of the price variables are as expected and these variables are statistically significant for both higher- and lower-income stores. However, the signs of promotion variables are mixed and not statistically significant. Note that the promotion variables present the number of items on price discount in a week. In other words, the results of promotion variables indicate that the number of promoted items does not have a statistically significant impact on sales. In

terms of model performance, the goodness of fit measures show reasonably good performance (adjusted R-squares between 0.65 and 0.73).

The own-price and cross-price elasticities between private labels and national brands are reported in Table 4. As expected, the own-price elasticities are all negative. Lower-income shoppers have a more elastic own-price elasticity of –1.82 for private label shredded cheese, as compared to a value of –1.56 for higher-income shoppers. Likewise, lower-income shoppers are shown to be more price-sensitive toward the purchase of national brands of shredded cheese, having an own-price elasticity of –3.61 vs. –2.59 for higher income shoppers. Simply stated, lower-income shoppers are more price-sensitive than higher-income shoppers for both private labels and national brands. In addition, compared with private labels, consumers are very sensitive to national brands price changes even in higher-income areas.

Table 4 further shows that cross-price elasticities between private labels and national brands are all positive, i.e., private labels and national brands are substitutes in both lower- and higher-income stores. Moreover, the brand substitution effects are larger in lower-income stores than in higher-income stores. In higher income stores, private labels price increases of one percent causes national brands sale increases of 0.88 percent, while national brands price increases of one percent causes private labels sale increases of 0.49 percent. At the same time, in lower-income stores, private labels price increases of one percent causes national brands sale increases of 1.16 percent, while national brands price increases of one percent causes private labels sale increases of 0.93 percent.

5. Discussion

The empirical results of this paper show that the number of promoted items of shredded cheese does not have a statistically significant impact on sales; instead, the percentage of price discount affects sales for both private labels and national brands. Stated differently, the frequency of price promotions does not affect total sales; instead, the depth of price promotions does influence the total sales for both private labels and national brands in the shredded cheese product category. It is particularly important to note that, compared with private labels, consumers are very sensitive to national brands price changes even in higher-income areas. As reviewed from the literature in section 2.3, several citations support the premise that private labels are seen as inferior quality alternatives at value prices. On the other hand, consumers perceived national brands as superior quality at higher prices. Surprising, in higher-income stores, the own-price elasticities are very distinct between private labels and national brands (-1.56 vs. –2.59). That is, even among the higher-income shoppers, prices are more important than quality in the shredded cheese products. This finding supports the report that "Kraft has acknowledged that private-label pressure is weighing in the cheese division, but Kraft has dealt with such pressures before and working with retailers to narrow the price gaps even as it continues creating new products that private-label companies don't offer." (*The Wall Street Journal, April 16, 2003)*

This paper demonstrates the application of the LA/AIDS model in marketing strategy research. This study applied the LA/AIDS model to supermarket scanner data in estimating the brand-level demand for a specific product category (8 oz shredded cheese). Despite the large amount of literature in applied economics, demand analysis remains

confined to studies on expenditure levels of broad commodity groups. Broad commodity groups are less important for marketers, who mainly develop strategies at the brand or category level. From the marketers' perspective, the analyses of demand at the brand and product category levels are more critical than broadly defined commodities.

To reduce the difficulty of empirical estimation, this study uses a linear approximation of the AIDS model (LA/AIDS) to estimate the price elasticities for private labels and national brands. For future research, the original AIDS model can be used to analyze the competition behavior between private labels and national brands. Further, from the cheese industry perspective, the product categories need to be more widely represented to include other cheese categories, such as sliced cheese.

6. Conclusions

This paper investigates differences in price sensitivity and promotion effects for higher- and lower-income shoppers in the purchase of private labels and national brands of shredded cheese products. A Linear Approximation of the Almost Ideal Demand System (LA/AIDS) is used to estimate the brand-level demand system for higher and lower income supermarket shoppers. For managerial and/or decision-making purposes, this paper provides new insights into price competition between private labels and national brands. An important finding is that price discounts can be used as an effective strategy to increase sales of shredded cheese. Further, this study demonstrates the application of the LA/AIDS model to supermarket scanner data in estimating the brand-level demand for a specific product category (8 oz shredded cheese).

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Table 1. Household Demographic Data for Six Stores (By Percentage)

Demographic Information	Low-income Stores				High-income Stores			
	Store 1	**Store 2**	**Store 3**	**Average**	**Store 4**	**Store 5**	**Store 6**	**Average**
Household Income								
Under $10,000	13.8	12.9	9.3	**12.0**	3.8	5.0	3.8	**4.2**
$10,000-$49,999	57.6	58.3	54.1	**56.7**	32.8	41.8	37.7	**37.4**
$50,000-$74,999	18.5	18.2	22.4	**19.7**	27.4	20.9	24.6	**24.3**
$75,000-$99,999	6.5	6.3	8.4	**7.1**	17.5	12.1	15.3	**15.0**
$100,000 +	3.8	4.3	5.9	**4.7**	18.8	20.2	18.2	**19.1**
Race								
White	59.2	83.6	85.7	**76.2**	95.4	92.4	93.1	**93.6**
Black	38.6	14.4	12.1	**21.7**	2.3	3.2	5.0	**3.5**
Others	2.1	2.0	1.8	**2.0**	2.6	4.6	1.9	**3.0**
Education								
Grade School	7.3	10.0	11.1	**9.5**	4.1	2.0	2.5	**2.9**
Some high School	21.3	25.4	25.8	**24.2**	11.6	5.0	8.6	**8.4**
High School Gradate	33.5	36.7	37.6	**35.9**	28.2	16.2	27.0	**23.8**
Some College	24.3	19.2	17.8	**20.4**	26.2	26.6	28.2	**27.0**
College Graduate	13.8	8.8	7.5	**10.0**	29.9	50.6	33.5	**38.0**

Source: Spectra, 2001

Table 2. Descriptive Statistics of Variables

	High Income Stores				*Low Income Stores*			
	Mean	Std Dev	Minimum	Maximum	Mean	Std Dev	Minimum	Maximum
Price($)								
Private Labels	1.84	0.36	1.01	2.71	1.81	0.37	1.01	2.69
National Brands	2.66	0.30	1.57	2.99	2.64	0.31	1.56	2.99
Others	2.33	0.24	1.80	2.72	2.27	0.25	1.79	2.76
Sales Value ($/week)								
Private Labels	1204.98	430.71	366.77	2455.97	1182.80	478.23	360.47	2660.27
National Brands	538.59	164.33	261.50	1416.13	427.42	208.20	118.79	1309.41
Others	309.96	160.95	69.74	1135.64	270.74	174.96	16.54	1113.30
Sales Quantity(items/week)								
Private Labels	707	345	205	1993	715	429	198	2622
National Brands	212	100	90	912	173	116	41	852
Others	138	78	26	450	124	83	6	444
Price promoted items(items/week)								
Private Labels	11	9	0	22	11	9	0	22
National Brands	3	7	0	25	3	7	0	25
Others	5	6	0	22	5	5	0	22
Market Share								
Private Labels	0.58	0.12	0.20	0.83	0.62	0.15	0.25	0.90
National Brands	0.27	0.08	0.12	0.69	0.23	0.10	0.07	0.63
Others	0.15	0.07	0.04	0.44	0.15	0.09	0.01	0.45

Table 3. Regression Result(LA/AIDS Model)

	High Income Stores				*Low Income Stores*			
Parameter	Estimate	Std Err	t Value	Pr > |t|	Estimate	Std Err	t Value	Pr > |t|
Dependent Variable: PLSHARE								
Constant	-0.6138	0.1264	-4.86	<.0001	0.2057	0.1490	1.38	0.1690
PLPROM	-0.0024	0.0009	-2.74	0.0067	-0.0049	0.0012	-4.10	<.0001
NBPROM	0.0032	0.0012	2.62	0.0096	0.0036	0.0016	2.24	0.0260
OBPROM	-0.0115	0.0011	-10.35	<.0001	-0.0105	0.0015	-7.24	<.0001
PLPRICE	-0.2268	0.0417	-5.44	<.0001	-0.4837	0.0573	-8.45	<.0001
NBPRICE	0.5526	0.0602	9.18	<.0001	0.7270	0.0767	9.48	<.0001
OBPRICE	-0.3259				-0.2434			
TSALE	0.1649	0.0192	8.57	<.0001	0.0412	0.0233	1.77	0.0779
Adj R-Square: 0.67					*Adj R-Square: 0.65*			
Dependent Variable: NBSHARE								
Constant	0.9159	0.0824	11.12	<.0001	0.2688	0.0925	2.91	0.0041
PLPROM	0.0004	0.0006	0.72	0.4754	0.0019	0.0007	2.50	0.0130
NBPROM	-0.0012	0.0008	-1.43	0.1538	0.0000	0.0010	0.00	0.9968
OBPROM	0.0057	0.0007	7.82	<.0001	0.0055	0.0009	6.09	<.0001
PLPRICE	0.0828	0.0271	3.05	0.0026	0.2214	0.0355	6.23	<.0001
NBPRICE	-0.4509	0.0392	-11.49	<.0001	-0.6026	0.0476	-12.66	<.0001
OBPRICE	0.3680				0.3812			
TSALE	-0.0866	0.0125	-6.91	<.0001	0.0088	0.0144	0.61	0.5426
Adj R-Square: 0.69					*Adj R-Square: 0.73*			

Table 4. The Estimated Own-price and Cross-price Elasticities

	High Income Stores		*Low Income Stores*	
	Private Label Price	National Brand Price	Private Label Price	National Brand Price
Private Label Sales	-1.56	0.49	-1.82	0.93
National Brand Sales	0.88	-2.59	1.16	-3.61