

Consumer Choice and Multi-Store Shopping: An Empirical Investigation

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Abstract

We investigate the role of frequently purchased categories in multi store shopping and consumer store choice. Consumers' store choice is examined using panel data of household trips to two competing stores located in the same geographical area. A random effects bivariate probit specification incorporates own store and cross store category price and feature advertising of frequently purchased items. Stores of similar format differ in categories with significant own and cross price effects thus influencing multi-store shopping. The results indicate that for pure stockpiling categories, feature activity positively influences store choice whereas cross store category price negatively influences store choice. In categories which exhibit both stockpiling and consumption effect, we find that own store price and feature activity influence choice whereas competitor pricing does not have a significant effect.

Keywords: Store Choice; Price Competition; Random Effects Bivariate Probit

1. Introduction

The goal of a retailer through its choice of category assortment, prices and feature advertising is to influence store choice. A recent 2009 consumer research report² finds that 67% of respondents go to two or more stores to do their main grocery shopping. There is substantial competition among retailers of the similar format (Kopalle et al. 2009, González-Benito et al. 2005) and hence the benefit of attracting such shoppers is substantial. To influence store choice retailers often use loss leader promotions (Walters and Rinne 1986, Walters and Mackenzie 1988), feature advertising (Bodapati and Srinivasan 2006) or even engage in price wars. Store choice is so important that price wars between stores lead consumers to redistribute their purchases across stores and make them more sensitive to weekly prices (Van Heerde et al. 2008).

The effectiveness of retailers' marketing actions is attributed to the importance of categories in shoppers store choice decisions (Blattberg et al. 1995, Dhar et al. 2001). Briesch et al. (2010) find that "destination-ness" of categories drive consumers to visit stores of different formats. Some categories increase the shoppers' probability of choosing a particular store. Thus the consumers' behavior can vary depending on the role a category plays in his/her everyday life (Dhar et al. 2001). However, there is scant research to understand how consumers' response to marketing actions for various categories influence visit³ to more than one store of the similar format? Two stores of similar format offer similar breadth of product categories, marketing actions such as pricing, feature activity etc. We contribute to understanding of consumer store choice and retail strategy by analyzing the following research questions:

1. In a competitive setting, how do marketing actions in frequently purchased categories drive consumers to visit more than one store of the similar format in the same week?
2. Do competing stores differ in specific categories that attract consumers to the stores?
3. Which segments of consumers, based on observed or unobserved heterogeneity are most sensitive to store switching based on prices?

We employ a household level model to analyze consumer response to marketing actions in two competing grocery stores. Consumer store choice is modeled as a function of price and feature advertising in two stores located in the same geographical area. The main findings are as follows:

We find that retailer pricing in frequently purchased categories has the potential to draw consumers from the rival stores. This study finds that for pure stockpiling categories such as toilet tissue and paper towels, own store feature activity positively influences store choice whereas competing store price negatively influences store choice. In categories such as yogurt and salty snacks which exhibit both stockpiling and consumption effect, we find that own store price and feature activity influence choice whereas competitor pricing does not have a significant effect. Further, there exists some unobserved heterogeneity in consumers' response to category prices not only within a store but also across the stores. Across the stores, consumers' response to price is positively correlated for milk and soup categories.

² http://plma.com/PLMA_Store_Brands_and_the_Recession.pdf

³ In this study store choice and store visit are used interchangeably.

The broader implication of this research for retail managers is that retailers should analyze consumers' shopping basket in conjunction with monitoring the competitors' category prices for intelligent pricing of items in consumers' basket (Kumar and Rao 2006). It would benefit retailers to identify categories which can draw consumers to a store and reduce the consumers' probability of choosing the rival store. Competing retailers of similar format should offer different categories on promotions if consumers are interested in different mixes of items in these stores.

The rest of this paper is organized as follows. A review of the literature in section 2 is followed by modeling approach in section 3. Section 4 describes the data and variable constructs. Section 5 explains the results and section 6 concludes with the summary and a prospective view of the future work.

2. Literature and Contribution

This study is related to literature on store choice. A summary of the literature review is presented in Table 1 below.

<Insert Table 1>

The literature on store choice finds that price, advertising and location influences choice. Prior studies look at the consumers' frequency of store visit and average size of the shopping basket as determinants of the store choice. These studies assume that consumers form an expectation of prices in all categories in a store. In the real environment, however, consumers are informed about prices in different stores especially for categories which are important constituents of their shopping basket. This information is readily available in newspaper advertisements, retailers' weekly fliers or easily obtained by talking to friends and relatives (Urbany et al. 1996). Further these studies do not model cross store effects as well as the cross category marketing actions for stores of similar format.

3. Modeling Specification

We analyze consumers' store choice decision for two competing grocery stores of similar format. These stores are located in the same geographical area. In general, consumers undertake weekly shopping trips and purchase some categories such as milk, snacks, tissues, cereals etc. more frequently than other categories. Consumers are routinely targeted by competing stores with price information of frequently purchased categories using fliers and advertisements. Simester (1997) finds that in a competitive setting, price advertising of frequently purchased categories serves as a commitment device for multiproduct retailers to influence consumers to purchase all items in one store.

However, it may not necessarily be the case that consumers buy all items in one store. Consumer motivations to make purchases in categories differ depending on the type of category i.e. staple (high frequency-high penetration) or non-staple category. The retailers' success in generating demand would depend on the role that a category plays in a consumer's portfolio (Dhar et al. 2001). The competing stores may develop expertise in particular categories (Dhar et al. 2001) and pricing of these categories would influence consumers' choice of rival store. Therefore, we expect that consumers who shop at competing stores of the similar format would be attracted to the stores for specific categories. Therefore,

H1: Stores of similar format differ in categories where price impacts the choice of competing store.

Prior findings suggest that feature activity in frequently purchased categories that can be stockpiled may influence store choice. The promotional elasticities are higher for categories such as bathroom tissue, paper towels, and yogurt (Narasimhan et al. 1996; Bell et al. 2002). These categories exhibit higher consumer propensity to stockpile. Hence the categories that can be stockpiled readily should react strongly to promotion. Therefore we expect that:

H2: Feature activity in categories that can be stockpiled negatively influences competitor store choice.

The model specification is explained next. We follow the prior literature for model specification (Van Heerde et al. 2008, Chib et al 2002, Manchanda, Ansari and Gupta 1999) and incorporate the cross-store effects, store co-incidence and unobserved heterogeneity allowing for the possibility of a household to visit both the stores in a given week. Since the focus of this study is to understand the role of categories on store choice in a competitive setting; we do not model consumers' purchase incidence.

Let the households' decision to shop in store s , week t be represented by y_{ht} . y_{ht} is a vector of binary dependent variables as shown:

$$y_{ht} = (y_{htA}, y_{htB})' \in \{(0,0), (0,1), (1,0), (1,1)\} \quad (1)$$

$h=1, \dots, H$; $t=1, \dots, T$; $s \in \{A, B\}$ where subscripts h, t, s refer to household, week and store respectively. The household's underlying latent utility for each of the two stores can be expressed as:

$$z_{hAt} = \beta'_A X_{hAt} + \varepsilon_{hAt} \quad (2)$$

$$z_{hBt} = \beta'_B X_{hBt} + \varepsilon_{hBt} \quad (3)$$

X_{hAt} is k_1 dimensional vector of variables that comprise of own store and cross store effects for store A. This includes the price, feature and display information of 10 categories under consideration in store A and B respectively. Similarly, X_{hBt} is k_2 dimensional vector of marketing activities in store B as well as competing store A. β'_A and β'_B represent the change in choice utility of store A and B due to own store marketing actions as well marketing actions of the competing store. The observed trip to a store $s \in \{A, B\}$ and the latent utility of the household are linked as follows:

$$y_{hst} = \begin{cases} 1, & \text{if } z_{hst} > 0 \\ 0, & \text{if } z_{hst} \leq 0 \end{cases}$$

The utility equations for household h in week t for the two stores can be compactly written as:

$$z_{ht} = \beta' X_{ht} + \varepsilon_{ht} \quad (4)$$

where z_{ht} is s dimensional vector. X_{ht} is a matrix of variables influencing the utility of trip to store A and B. $\beta = \{\beta_A, \beta_B\}'$ is a vector of coefficients of the causal variables. $\varepsilon_{ht} = (\varepsilon_{htA}, \varepsilon_{htB})'$ represents the unobserved random factors that may impact store choice. Since there may be common unobserved factors across the two stores, therefore, ε_{ht} is assumed to have bivariate normal structure i.e. $\varepsilon_{ht} \sim \text{MVN}(0, \Sigma)$. Σ is a 2×2 variance-covariance matrix. We expect the households to differ in their preference for the two stores as well as response to prices in the two

stores. Therefore, we allow the coefficients of intercept terms and prices in six frequently purchased categories to vary across individuals.

The above specification results in a bivariate probit model (Chib and Greenberg 1998). Given the two stores and T=52 weeks of observations for each household h, the households' likelihood function of store choice is given by:

$$\Pr(Y_h = y_h | \beta, \delta_h, \rho) \equiv pr(y_h | \beta, \delta_h, \rho) \quad (8)$$

$$\propto \int \left[\prod_{t=1}^T \int_{B_{hts}} [\phi_s(Z_{ht} | W_h \delta_h + X_{ht} \beta, \Sigma)] dZ_{ht} \right] \phi(\delta_h | 0, D) dZ_h$$

where B_{hts} is the interval $(0, \infty)$ if $y_{hts}=1$ and interval $(-\infty, 0)$ if $y_{hts}=0$. δ'_h represents the vector of household specific random effects and ρ captures the store co-occurrence. We use data augmentation framework (Albert and Chib 1993, Chib and Greenberg 1995, 1998) to estimate the model parameters. Data augmentation is based on sampling by Markov Chain Monte Carlo technique (Gelfand and Smith 1990) using conditional distributions.

4. Data Description

The model is estimated using IRI scanner panel data from Massachusetts area. Data consists of households tracked over a period of 52 weeks from December 2004 to December, 2005. There are 14 stores of various formats in this area. Of these, 7 are grocery stores. Two grocery stores of competing chains, henceforth referred to as store A and store B are selected for the analysis. These stores account for more than fifty percent sales in that area. The data has household level information on price, feature and display for 30 categories sold in each of the two stores. Of all the categories, 10 top selling categories are selected for analysis at the individual household level. These are frequently purchased categories that can be stockpiled (toilet tissues, paper towels, salted snacks, soft drinks, and yogurt) as well as those that cannot be stockpiled (frozen dinner entrée, cold cereal, soup, milk and spaghetti). This classification of categories is based on prior studies (Bell et al. 2002, Narasimhan et al. 1996).

The data consists of households that have purchased across seven grocery stores in the area. Of these households, 100 households made 60% or more of total trips to the two selected stores. Out of these households, 74 households were randomly selected for the purpose of analysis. The data set for empirical analysis consists of information about consumers' store choice (dummy variable) which is the dependent variable in this analysis.

The independent variables are price, display, feature and inventory level of the household. Category price is household specific and calculated as the weighted average of the price of all the SKU's purchased by the consumer in week t in store $s=\{A,B\}$ (Bucklin and Lattin 1992). The weekly category feature and display variables are also calculated for every individual household in a similar manner as the household specific price. Therefore these variables take a value between 0 and 1. Besides the marketing activity we also control for consumer demographics such as age, income, marital status, education, holiday and household inventory. Table 2 gives the descriptive statistics of the marketing variables for each of the 10 categories.

<Insert Table 2>

Table 2 shows that category prices in the two stores are similar for most categories. The number of visits to store A is 972 and 1047 in store B. There are 713 trips where consumers have visited both the store and 1116 trips where none of the stores have been visited. The results of model estimation are explained in the next section.

5. Results

Results from Table 3 indicate that own store category price as well as competitor category price impact store choice. The results for own store category price effects indicate that price increase in cereals ($\beta = -0.82$), frozen dinner entree ($\beta = -0.77$) and yogurt ($\beta = -1.17$) category negatively impact choice of store A. For store B, price increase of milk ($\beta = -0.71$) and salty snacks ($\beta = -0.66$) negatively influences store choice.

The cross store category effects indicate that visit to store A is sensitive to price increase in store B for frozen dinner entrée ($\beta = 0.62$), spaghetti ($\beta = 0.56$), paper towels ($\beta = 1.09$) and toilet tissues ($\beta = 0.51$) categories. On the other hand visit to store B is sensitive to price increase in store A for soup ($\beta = 0.41$), milk ($\beta = 0.81$) and toilet tissues ($\beta = 0.81$) categories. A price increase in toilet tissue category in either of the stores results in consumers choosing the competing store. These results support hypothesis H1 suggesting that category pricing has the power to draw consumers from the competing store.

Feature activity also influences store choice. For store A, all categories except salty snacks, when featured influence store choice. Similarly for store B, all categories except milk, when featured influence store choice.

The cross store feature activity indicates that salty snacks and yogurt categories when featured by store B negatively impact consumers' choice of store A ($\beta = -0.35$, -0.36 for salty snacks and yogurt respectively). Milk and spaghetti categories featured by store A, have a negative influence choice of store B ($\beta = -0.41$, -0.53 for milk and spaghetti respectively). Salty snacks category is significant but with a wrong sign of the coefficient. Though cross store feature activity is significant, there is weak support for the hypothesis H2 that competitors' feature activity in stockpiling categories influences store choice.

An interesting observation is that for pure stockpiling categories such as toilet tissue and paper towels, own store feature activity and cross store category price influence consumer choice. For instance, in store A, paper towels and toilet tissue categories when featured positively influence store choice. However, competitor store price in these categories negatively influences store choice. A similar effect is observed for toilet tissues category in store B. For categories which exhibit both stockpiling and consumption effect (such as Yogurt in store A, salty snacks in store B) we find that own store price and feature activity influence choice. These findings suggest that identifying categories where choice is sensitive to own store price and feature activity has implications on retailers' marketing actions. The results from Table 4 indicate that consumers differ in their sensitivity to prices within and across the two stores for some categories. Across the stores there is positive correlation between price of carbonated beverage in store A and soup in store B. Price of frozen dinner entrée in store A is positively related to price of soup and milk in store B. These findings indicate that there exists some unobserved heterogeneity in consumers' response to category prices not only within a store but also across the stores. These results suggest the existence of latent segments among consumers who shop in more than one store for different categories.

Besides the above results, inventory level of the household also influences store choice. A reduction in the inventory for cereals, and paper towel categories positively influences consumers to choose store A. Low levels of household inventory in salty snacks and yogurt category positively influence visit to store B. However, we obtain wrong sign for impact of inventory of soup category in store A and spaghetti and toilet tissues for store B. A possible explanation is as follows. These are frequently consumed categories with a fairly constant rate of consumption as compared to other categories. Empirical evidence in prior literature indicates that consumers tend to stockpile in categories such as toilet tissues (Bell et al. 2002, Hong et al. 2002). Therefore, it is possible that whenever these categories are featured or on promotion, consumers visit the stores intending to stockpile these categories.

6. Conclusion

The objective of this study is to understand consumers' response to shopping at more than one store of similar format in a given week. To summarize; the results indicate that two stores of similar format differ in categories with significant own and cross price effects. The findings of this analysis suggest that consumers may be interested in different mixes of items in competing stores (Kopalle et al. 2009) and therefore visit both the stores. Multi store shoppers use pricing information of competing stores before visiting stores. They may access this information through feature advertising (Urbany et al. 2000, Bodapati and Srinivasan 2006), consulting friends (Urbany et al. 1996), searching online for price information (Degeratu and Rangaswamy 2000) or through their own experience of visiting the competing and buying in these categories. The findings of this study imply that analyzing consumers' shopping basket in conjunction with monitoring the competitors' category prices would lead to intelligent category pricing (Kumar and Rao 2006).

Future research could address some of the limitations of this study. We assume that items in the consumers' shopping basket do not vary over time which may not necessarily be the case. Future work can analyze multiple stores and explore how store trips and category purchases vary for competing stores of the similar and different formats. This may provide additional insights about consumer motivation to shop multiple stores of similar and dissimilar formats.

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Table 1: Literature Review

Literature	Marketing Mix Variable of Interest	Dependent Variable	Main Findings
Kumar & Leone (1988)	Brand Promotions	Store sales	Price promotion, feature and display produce store substitution.
Walters 1991	Retail price promotion	Store sales of competing retailers	Promotions of products in one store significantly decreased sales of substitutes and complements in a competing store.
Bodapati & Srinivasan (2006)	Feature advertising	Store choice	Feature advertising impacts price expectations for advertised and unadvertised items, impacting store choice and traffic.
Bell & Lattin (1998)	Expected basket attractiveness	Store choice	Consumers whose trips tend to be infrequent and large see higher expected basket attractiveness in EDLP stores than in HILO stores.

Table 1 contd: Literature Review

Literature	Marketing Mix Variable of Interest	Dependent Variable	Main Findings
Van Heerde et al. (2008)	Price wars	Store Choice	Price wars lead to more shopping around and increased spending. However spending per visit ultimately dropped because consumers redistributed their purchases across stores.
Briesch et al. (2010)	Category destination-ness	Store Choice	Destination categories are most influential in store choice decisions (i.e. high leverage). The high leverage categories tend to be purchased frequently, consume a high share of household spending and be fresh/refrigerated or frozen categories.
Present Research	Own and Cross store price and feature advertising of frequently purchased categories	Store choice	Identify power categories whose prices significantly affect the choice of the competing stores. Competing stores have different power categories.

Table 2: Data Description

Number of households=74

Number of weeks=52

Store Trips

Number of Observed Store Trips						
Store A	Store B	Both the stores	None of the stores	Total		
972	1047	713	1116	Observations 74x52=3848		
			STORE A		STORE B	
When store trips occur	Price (\$/unit)	Feature	Display	Price (\$/unit)	Feature	Display
Carbonated Beverage	0.024951	0.093253	0.048203	0.027928	0.049937	0.0624
Cold cereal	3.741628	0.030309	0.020878	3.686399	0.031559	0.024686
Soup	2.016194	0.023433	0.013998	1.590983	0.017722	0.01446
Milk	0.615469	0.016685	0.00026	0.586468	0.031279	0.003217
Frozen Dinner Entrée	4.079818	0.010942	0.001741	4.512423	0.013179	0.005237
Paper Towel	1.881339	0.007119	0.007926	1.956175	0.012487	0.010796
Spaghetti	1.567648	0.015173	0.007617	1.341972	0.02079	0.014557
Salty Snacks	4.140392	0.002631	0.03696	3.861494	0.056665	0.058003
Toilet Tissue	0.654706	0.014308	0.012383	0.632485	0.016545	0.011446
Yogurt	1.981436	0.021142	0	1.988248	0.031992	0.00705
When store trips do not take place	Price (\$/unit)	Feature	Display	Price (\$/unit)	Feature	Display
Carbonated Beverage	0.025474	0.040845	0.03159	0.027928	0.04995	0.062416
Cold cereal	3.741629	0.030317	0.020884	3.686517	0.031534	0.024666
Soup	2.016355	0.023439	0.014001	1.591089	0.017727	0.014464
Milk	0.615832	0.016672	0.00026	0.586847	0.031255	0.003214
Frozen Dinner Entrée	4.080616	0.010934	0.001739	4.512776	0.013168	0.005233
Paper Towel	1.881252	0.007113	0.00792	1.956395	0.012477	0.010528
Spaghetti	1.56697	0.015161	0.007611	1.341687	0.020774	0.014546
Salty Snacks	4.144944	0.002629	0.036931	3.861341	0.05662	0.057958
Toilet Tissue	0.654484	0.014297	0.012373	0.632604	0.016532	0.011437
Yogurt	1.981551	0.021126	0	1.988147	0.031967	0.007044

Table 3: Results of Bivariate Probit estimation

		STORE A				STORE B			
		est.	std	95% HDPI		est.	std	95% HDPI	
Own store price	Intercept	0.70	1.36	-1.99	3.37	0.34	1.42	-2.36	3.14
	Carbonated Beverage	0.08	0.15	-0.22	0.37	-0.11	0.22	-0.53	0.32
	Cold cereal	-0.82	0.27	-1.36	-0.29	-0.17	0.33	-0.83	0.49
	Soup	0.27	0.11	0.04	0.49	-0.22	0.23	-0.68	0.25
	Milk	-0.33	0.34	-1.00	0.32	-0.71*	0.41	-1.40	-0.19
	Frozen Dinner Entrée	-0.77	0.19	-1.14	-0.38	0.88	0.28	0.31	1.42
	Paper Towel	0.36	0.22	-0.07	0.80	-0.09	0.33	-0.75	0.55
	Spaghetti	-0.13	0.15	-0.44	0.15	0.15	0.19	-0.23	0.53
	Salty Snacks	-0.06	0.15	-0.36	0.24	-0.66	0.20	-1.08	-0.29
	Toilet Tissue	0.32	0.27	-0.22	0.85	0.23	0.28	-0.32	0.80
	Yogurt	-1.17	0.38	-1.97	-0.47	0.39	0.34	-0.31	1.05
Competitor store price									
	Carbonated Beverage	0.18	0.15	-0.11	0.47	-0.04	0.13	-0.29	0.21
	Cold cereal	0.26	0.27	-0.27	0.78	-0.19	0.23	-0.62	0.27
	Soup	0.06	0.20	-0.33	0.46	0.41	0.11	0.20	0.63
	Milk	0.45	0.29	-0.11	1.01	0.81	0.28	0.27	1.34
	Frozen Dinner Entrée	0.62	0.26	0.15	1.15	0.19	0.21	-0.22	0.61
	Paper Towel	1.09	0.29	0.52	1.66	-0.11	0.21	-0.52	0.30
	Spaghetti	0.56	0.19	0.20	0.93	-0.09	0.15	-0.38	0.20
	Salty Snacks	-0.67	0.13	-0.93	-0.41	-0.26	0.13	-0.52	-0.01
	Toilet Tissue	0.51	0.26	0.01	1.04	0.81	0.27	0.28	1.34
	Yogurt	-0.13	0.26	-0.66	0.38	0.02	0.27	-0.51	0.56

Note: The numbers in bold are significant at 95% confidence level

Table 3 contd: Results of Bivariate Probit estimation

		STORE A				STORE B			
Own Store Feature		est.	std	95% HDPI		est.	std	95% HDPI	
	Carbonated Beverage	1.92	0.66	0.87	3.44	0.50	0.14	0.23	0.77
	Cold cereal	2.64	0.79	1.17	4.22	3.12	1.25	0.96	5.87
	Soup	3.09	1.44	0.64	5.62	4.05	2.17	0.86	7.57
	Milk	2.07	0.63	0.88	3.39	1.01	5.62	-9.90	12.07
	Frozen Dinner Entrée	2.97	1.06	1.07	5.35	5.49	2.40	1.07	8.49
	Paper Towel	3.55	2.22	0.50	9.03	2.26	1.45	0.09	4.86
	Spaghetti	2.12	1.06	0.58	4.35	1.51	0.78	0.47	3.26
	Salty Snacks	4.67	3.87	-0.81	13.26	1.96	1.14	0.56	4.45
	Toilet Tissue	2.47	1.65	0.42	5.71	2.37	1.72	0.08	5.59
	Yogurt	1.94	0.63	0.71	3.63	1.75	0.74	0.75	3.31
Competitor Store feature	Carbonated Beverage	0.03	0.18	-0.31	0.38	-0.11	0.17	-0.45	0.22
	Cold cereal	0.10	0.19	-0.29	0.47	0.00	0.19	-0.39	0.37
	Soup	-0.23	0.26	-0.75	0.26	-0.02	0.19	-0.40	0.36
	Milk	-0.08	22.58	-43.96	43.55	-0.41*	0.27	-0.86	-0.07
	Frozen Dinner Entrée	-0.31	0.31	-0.93	0.28	0.17	0.28	-0.38	0.72
	Paper Towel	0.13	0.29	-0.45	0.68	0.12	0.33	-0.52	0.77
	Spaghetti	0.15	0.22	-0.29	0.58	-0.53	0.27	-1.09	-0.01
	Salty Snacks	-0.35	0.14	-0.62	-0.08	17.50	8.70	3.50	34.20
	Toilet Tissue	0.40	0.23	-0.04	0.86	0.19	0.26	-0.33	0.69
	Yogurt	-0.36*	0.20	-0.70	-0.11	-0.20	0.22	-0.64	0.23
Own Store Display	Carbonated Beverage	2.61	0.70	1.28	3.95	2.06	0.71	0.90	3.42
	Cold cereal	1.58	0.69	0.56	3.00	2.38	0.98	1.01	4.92
	Soup	2.92	1.67	0.33	6.15	2.68	1.20	0.73	5.19
	Milk	5.14	4.46	-1.30	14.88	5.14	2.32	1.19	9.17
	Frozen Dinner Entrée	6.73	5.39	-2.66	15.47	2.30	1.23	0.38	4.89
	Paper Towel	3.50	2.49	0.48	9.69	3.42	1.63	0.34	6.78
	Spaghetti	1.39	0.88	0.12	3.42	1.61	1.02	0.27	3.92
	Salty Snacks	3.21	0.60	2.31	4.72	2.29	0.67	1.10	3.57
	Toilet Tissue	3.36	2.30	0.26	7.19	2.07	1.65	0.00	5.81
	Correlation coefficient	-0.03	0.04	-0.10	0.05				

Note: The numbers in bold are significant at 95% confidence level. * is significant at 90% confidence level.

Table 3 contd: Results of Bivariate Probit estimation

		STORE A				STORE B			
		est.	std	95% HDPI		est.	std	95% HDPI	
Price Index in the store									
	Laundry Detergent	-0.06	0.07	-0.19	0.07	-0.07	0.05	-0.17	0.03
	Peanut Butter	0.04	0.03	-0.02	0.10	0.00	0.00	-0.01	0.01
	Toothbrush	0.03	0.06	-0.09	0.14	-0.03	0.04	-0.12	0.05
	Facial Tissue	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
	Household Cleaner	0.01	0.02	-0.04	0.06	0.00	0.00	0.00	0.01
	Margarine	-0.86	0.46	-1.79	0.02	-0.97	0.43	-1.81	-0.11
	Mustard & Ketchup	0.02	0.02	-0.01	0.05	0.01	0.00	0.00	0.02
	Photography supplies	-0.01	0.04	-0.08	0.07	-0.01	0.01	-0.02	0.00
	Shampoo	0.01	0.03	-0.04	0.07	-0.03	0.05	-0.13	0.06
	Sugar Substitutes	0.04	0.02	0.01	0.08	0.00	0.00	0.00	0.00
	Toothpaste	0.00	0.01	-0.01	0.01	0.00	0.00	0.00	0.00
	Beer	-0.09	0.07	-0.23	0.04	0.00	0.00	0.00	0.00
	Blades	0.09	0.04	0.02	0.16	0.01	0.01	0.00	0.03
	Deodorant	0.10	0.03	0.04	0.16	0.00	0.01	-0.01	0.01
	Diapers	-0.01	0.02	-0.04	0.02	0.00	0.01	-0.01	0.01
	Frankfurters	0.03	0.02	-0.01	0.08	0.00	0.02	-0.04	0.03
	Mayonnaise	0.13	0.11	-0.08	0.35	0.00	0.00	-0.01	0.01
	Razors	0.00	0.02	-0.03	0.03	0.01	0.01	-0.02	0.04
	Coffee	0.08	0.05	-0.02	0.18	-0.03	0.06	-0.15	0.09
	Frozen Pizza	0.00	0.01	-0.02	0.02	0.01	0.01	-0.01	0.03
Inventory									
	Carbonated Beverage	-0.02	0.04	-0.11	0.06	0.01	0.04	-0.08	0.10
	Cold cereal	-0.15	0.05	-0.25	-0.06	0.02	0.05	-0.07	0.11
	Soup	0.09	0.04	0.02	0.16	-0.04	0.04	-0.12	0.03
	Milk	0.11	22.58	-43.51	43.90	4.12	22.52	-40.44	47.97
	Frozen Dinner Entrée	0.01	0.04	-0.08	0.10	-0.02	0.05	-0.11	0.07
	Paper Towel	-0.11	0.05	-0.20	-0.02	-0.05	0.05	-0.14	0.04
	Spaghetti	-0.02	0.04	-0.10	0.06	0.10	0.05	0.01	0.19
	Salty Snacks	-0.03	0.05	-0.12	0.06	-0.16	0.05	-0.25	-0.07
	Toilet Tissue	0.04	0.05	-0.05	0.13	0.16	0.05	0.07	0.25
	Yogurt	-0.05	0.04	-0.13	0.04	-0.09	0.04	-0.17	-0.01
Demographics									
	Income	0.01	0.02	-0.04	0.05	0.01	0.02	-0.03	0.06
	Household size	-0.03	0.03	-0.10	0.03	-0.05	0.03	-0.11	0.02
	Age	0.00	0.04	-0.07	0.07	-0.15	0.04	-0.23	-0.07
	Education	0.00	0.01	-0.03	0.02	-0.01	0.01	-0.04	0.02
	Married	-0.07	0.04	-0.14	0.00	-0.04	0.04	-0.11	0.04

Note: The numbers in bold are significant at 95% confidence level. * is significant at 90% confidence level.

Table 4: Unobserved Heterogeneity Matrix

	Intercept A	CB- A	CC-A	SOUP- A	MILK- A	FDE- A	PT-A	Intercept B	CB- B	CC- B	SOUP- B	MILK- B	FDE- B	PT- B
Intercept-A	0.24													
CB-A	0.09	0.09												
CC-A	0.05	0.05	0.13											
SOUP-A	0.00	-0.01	0.00	0.10										
MILK-A	-0.05	-0.01	-0.03	-0.01	0.10									
FDE-A	0.22	0.15	0.11	0.00	-0.08	0.52								
PT-A	-0.01	-0.01	-0.01	0.00	0.01	-0.04	0.12							
Intercept-B	-0.09	-0.05	-0.03	0.00	0.03	-0.14	0.01	0.17						
CB-B	-0.05	-0.03	-0.02	-0.01	0.02	-0.09	0.01	0.05	0.07					
CC-B	-0.07	-0.04	-0.04	-0.01	0.03	-0.15	0.02	0.04	0.05	0.15				
SOUP-B	0.23	0.13	0.11	0.02	-0.09	0.41	-0.03	-0.14	-0.10	-0.14	0.53			
MILK-B	0.14	0.08	0.07	0.01	-0.05	0.25	-0.02	-0.09	-0.04	-0.09	0.26	0.23		
FDE-B	-0.08	-0.05	-0.07	-0.01	0.05	-0.17	0.03	0.04	0.05	0.06	-0.17	-0.11	0.21	
PT-B	0.02	0.01	0.01	0.01	-0.02	0.04	0.00	-0.02	-0.01	-0.01	0.06	0.03	-0.03	0.11

Note: The numbers in bold are significant at 95% confidence level.

- A-store A
- B-Store B
- CB-Carbonated Beverage
- CC-Cold Cereals
- Soup
- Milk
- FDE-Frozen Dinner Entrée
- PT-Paper Towel

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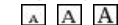
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