Explain Heterogeneity in State Dependence using "Fundamental" Switches

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Abstract

This paper investigates state dependence effects in frequently purchased product markets. I use consumers' switching behavior in different product categories to provide necessary variation and test whether the variation may explain differences in consumers' responses to previous purchases and other relevant marketing variables. I find that part of the variation in switching behavior is stable: they explain a significant portion of consumers' state dependence in different categories and different years consistently. The finding provides a different way to look at household switches, and contributes to the literature of estimating state dependence in the consumer goods market.

Keywords: Switching Behavior, State Dependence, Variety Seeking

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1. Introduction

Both marketing and economics literature in brand/ product choices have documented consumer inertia and (inter-temporal) variety seeking behavior. Consumer inertia usually describes the phenomenon that an individual is more likely to stay in her previous choice, while (inter-temporal) variety seeking implies the tendency to switch away. It is well accepted that those phenomena are not only caused by variation in product characteristics and market environments, but it may be also related to changes of consumers' intrinsic preference. Unlike external factors, those changes are usually difficult to identify and may vary over time. Naturally, identifying those "fundamental" preferences are important for both researchers and business practitioners.

However, market specific transaction data usually cannot provide sufficient exogenous variation that may drive those phenomena independently. For example, the presence of search cost or product learning can both lead to consumer inertia, and both effects can be captured by past choices. (Part of) the variation in past choices may reflect "spurious state dependence" (Heckman 1981) and thus (upward) bias effect of state dependence. The typical modeling framework for those studies involve individual's discrete choices in a market where cross-sectional heterogeneity is flexibly controlled and where search cost and learning can be modeled or are minimized (Keane 1997, Seetharaman 2004, and Dubé, Hitsch and Rossi 2010). The state dependence is then captured by serially correlated errors, lagged choices, or other lagged preference parameters (Chandukala et al. 2008). A robust

result of those models is a dominating inertial effect in the field, which is interpreted as the "structural" state dependence.

This general result creates challenges for those who want to study switching behavior using transaction data and for those who hopes to identify variety seeking in the field. In earlier effort, Givon 1980 and Bawa 1990 model variety seeking behavior using transaction based data and find limited improvements in the model fitting. More studies on product switch and variety seeking utilize experimental and survey methods (McAlister and Pessemier, 1982). The experimental studies help identify important antecedents of product switches, including lack of stimulation (Menon and Kahn 1995, Van Trijp, Hoyer, and Inman 1996), lack of personal control (Su et al 2016, Yoon and Kim 2017), increased attention (Morewedge, Huh and Vosgerau 2010) and satiation (McAlister 1982, Lattin and McAlister 1985). The experiments provide us some guidance on how to treat heterogeneous variety seeking tendencies in the field. However, in most time, empirical researchers and practitioners do not have access to information of the above factors. Is it still possible to capture some of the fundamental preference in the state dependence preference using only transaction based data?

In this paper, my primary goal is *not* to distinguish variety seeking from inertia, instead, I am interested in how to make use of product switches earlier recorded to better learn and predict fundamental preference including state dependence and variety seeking. I focus on households' product switches directly, and test if variations in product switches may carry over and explain household choices in a completely different period and in a loosely related product category. If households' switching tendencies are truly fundamental, such behavior in the market may carry over and help explain state dependence effects in other markets.

More specifically, I investigate the product switches using IRI's scanner datasets (Bronnenberg, Kruger and Mela 2008). I first show households' switching behavior may not be only driven by variations in product characteristics and there are a significant portion of switches that are unexplained. Then, I introduce a simple statistic, "switch-per-choice" (SPC), to describe households' switch tendency. The switching information is used in the models of households' vendor choices in the carbonated beverage category four or five years later. The variation in SPC happens in a less related category and at a much earlier period, and thus should not affect the current choice, unless the SPC captures fundamental switch tendencies independent of the shopping occasions.

Interestingly, in 12 different combinations of specifications, samples and products, the estimation results all document significantly negative interactive effects of SPC on state dependence. Frequent switchers may also be more price sensitive for certain brands. Under the investigated markets, I conclude that part of the switch behavior reflects a stable preference that cannot be completely explained by variations of product characteristics, market environments, and household level characteristics.

2. Data and Hypothesis Development

The analysis is based on two market categories from IRI data sets during 2001 and 2007. The primary category is the carbonated beverage category; the data sets consist of households' purchasing records of carbonated beverage products in two mid-sized cities (Eau Claire, Wisconsin and Pittsfield, Massachusetts) of the United States. I select households who have more than 5 shopping trips within each year of 2007: 4189

households in 2007 meet this criterion. In addition to the primary data set, I calculate households' tendency to switch using the IRI yogurt category from 2001 and 2002[1].

The IRI carbonated beverage market records more than 43 companies, providing 146 different brands. I consider the choice decisions of the two main vendors: Coca Cola INC and PepsiCo, as well as the Private Label option. Those three choices take approximately 80% of the total market share during year 2007. The IRI yogurt market contains about 23 vendors and 89 different brands. For calculating the proxy for the potential variety seeking (or the lack of state dependence) behavior, consumer choices are defined similarly at the vendor level in the yogurt category: 10 major vendors[2] and private brands take 96.5% of the total yogurt market share, where private brands include all store owned brands.

Households in the sample are assumed to make vendor choices at each shopping trip. In the yogurt market and the carbonated beverage market, 84% and 73% of shopping trips involve single vendor brand purchases respectively; for both markets, most of the shopping trips (>95%) involve no more than two different vendors for both markets. For multiple vendors in a shopping trip, I use the most heavily chosen vendor. Both markets witness frequent vendor level switches. For an average household in the yogurt market or in the carbonated beverage market, about 50% of the shopping trips involve a vendor brand switch. In addition, the households also show substantial heterogeneity in total choices and switches. If part of those switches are "fundamental"--not driven by product characteristics, market characteristics or other external factors, then the switch information from yogurt

[1] I also provide the summary statistics on the year 2001-2002 data in the yogurt category in the Appendix (Table 5).
[2] They are COLOMBO, BREYERS, DANNON, KEMPS, OLD HOME, STONYFIELD FARM, WELLS DAIRY, YOFARM and YOPLAIT.

markets may help explain state dependence/ variety seeking in the beverage market for the same households[3].

Table *1*[4] illustrates the existence of potentially "fundamental" switches, which cannot be explained by changes of product characteristics including prices, relative prices, advertisement and display. I define the unexplained switches as a switch from choice i to choice j that is not triggered by 1) increase of price of i; 2) decrease of price j; 3) decrease of the relative price j compared with other alternatives; 4) product display or advertisement for j; 5) removal of product display or advertisement for i. For the significant number of switches each listed vendor brand shows, more than 10% of the switches on average cannot be easily explained. This calculation excludes unexplained switches due to new product/ brand trials, since those switches depend more on consumers' experience rather than fundamental preference. In the yogurt markets, even the major brands are subjected to unexplained switches.

<Table 1 about Here>

Therefore, the unexplained variation in switches may contain information which is unrelated to the observed characteristics in the choice context. For example, if households are more likely to be satiated after reaching a satiation threshold, the ones with shorter thresholds will be more likely to switch in all decision scenarios. Based on the above

[3] There are significant overlaps of household purchase records in the two categories. For example, 2065 and 1796 households from yogurt data in the Year 2001 and 2002 can be matched with the carbonated beverage data.

[4] The similar table for year 2002 can be found in the Appendix (Table 6).

observations, I use the number of switch-per-choice (SPC) as a measure of consumers' switching behavior.

The SPC is widely spread between 0 and 1, indicating great heterogeneity among households[5]: a unit value of SPC suggests the household switch choices after every single visit, while the most persistent households have SPC equal to 0. Given a certain level of total visits in a year, a higher SPC indicates more frequent switches. In order to better controlling for the unobserved factors related to the total shopping trips, in the later estimation models, I also consider the effect of the total (weekly) visits for each household.

With such constructed measures, I conjecture that the sufficient switches in the yogurt choice data explain differences in variety seeking preference in the carbonated beverage markets. In order to test this hypothesis, I model consumers' choices on major brands in a carbonated beverage markets, where household experience is less likely to drive choice behavior.

The targeted markets, the carbonated beverage markets, contain relatively less vendors: Coca Cola CO and PepsiCo INC take about 74% of the total market share (**Table *2***). With similar product categories and aggregate price distributions, it is quite likely that some switches between two vendors are caused by variety seeking preferences. I hope to utilize extra variation of SPC from the less related product category in a remote year to explain households' state dependence.

Moreover, **Table *2*** also shows that, at the product level (144oz coke product for example), the data still reports significant price variation over the year: such variation allow us to test the effect of SPC on price sensitivities. Because households with higher switching

[5] Figure 1 and Figure 2 in the Appendix show the histogram for the SPC variable in the year 2001 and 2002.

frequency can also be due to more cautious and active evaluation of the products, SPC may have interactive effects with price variables. Therefore, my second conjecture is that the interactive effect of SPC on marginal prices is negative so that higher SPC households tend to be more price sensitive.

<Table 2 about Here>

Besides the interactive effects of SPC, I am also interested in the main effect of SPC on product choices. It is unclear how switching tendencies may be correlated with any specific vendor or brand. However, if there is any significant link, the insights on such link, as well as the vendor itself can be further discussed.

3. Model and Estimation Results

Based on the previous descriptive evidence, I construct unbalanced panel data sets of binary vendor choices for each major vendor in IRI carbonated beverage market in 2007, and match the households with switching information using the IRI yogurt data sets (2001, 2002). Because consumption is not observed, I directly model households' product choices at each shopping trip in the carbonated beverage market. Denote $Y_{it} = 1$ if household i chooses the targeted vendor in shopping trip t, and the model can be written as

$$Y_{it} = 1 \text{ if } \alpha + \beta_0 Price_0 + [Price_1, I(Y_{it-1} = 1)]\#\#[SPC_i, Total_i]\beta + \epsilon_{it} > 0,$$

where $I(Y_{it-1} = 1)$ represents the state dependence variable, SPC_i represents per-choice switches of each household/ consumer in the reference category (yogurt markets), and $Total_i$ is the total number of visits in the reference category. $Price_1$ is the normalized

transaction price (Dollars per 144 oz of the relevant products) of the targeted vendor brand and $Price_0$ indicates the price index for the rest of the products.

I allow SPC and Total, calculated from a less related market, to interact with current price and state variables at each shopping trip t. If SPC does capture (fundamental) preferences in variety seeking or state dependence, I expect to see that it helps explain the state dependence effect for each individual household. If SPC carries information about the level of cautiousness or the tendency to evaluate alternatives, then its variation may shift consumers' price sensitivities.

<Table 3 about Here>

The estimation results show that the state dependence effects are significantly positive for 10 out of 12 cases, indicating a strong form of consumer inertia in the market[6]. By adding the SPC, the estimation results confirm significantly negative effects on the interaction term between SPC and state dependence (in all cases). A frequent switcher in yogurt market is likely to have much smaller—or even negative—state dependence effects.

In order to better understand the effect of SPC, in **Table *3***, I calculate the marginal effects of the key variables using the random effect logit models. In the upper panel of the table, it is confirmed that for the two largest vendors as well as for private label brands, the state dependence effects are reduced for households with higher switch frequencies long time ago in a yogurt market. Therefore, SPC does explains heterogeneity in the state dependence effect and demonstrates high persistency over periods. The marginal effects of

[6] Table 7 in the Appendix reports coefficients estimates on two major carbonated beverage vendors and the private label brands. The marginal effects of selected variables are reported in Table 3.

the state dependence are economically significant: for households with persistent purchase records in the yogurt market, previous choice of Coca Cola or Pepsi increases the repurchase probability by 6.6% and 5.3% percentage. For households who switch about half of the time in the yogurt market, the marginal effects of state dependence are reduced to 3.5% and 2%. These effects are completely removed for households who used to switch most frequently in a much earlier time. As expected, for private label brands, this marginal effect is much smaller. Meanwhile, even for the most frequent switchers in the yogurt market, I do not observe a significantly negative state dependence effect (on average). Therefore, verifying variety seeking preference at the aggregate level is still difficult with the help of SPC: even the switcher never chooses the same yogurt product in adjacent trips, such effect only reduces or removes positive state dependence effect in the carbonated beverage market.

In the mid panel, the table reports the marginal price at different value of SPC. Interestingly, for the three choice problems, I observe an increasing trend of the marginal price. The differences in price response for the major products are significant between extreme persistent households and those who switched most frequently (P-value < 0.05). For private label brands, the marginal prices have the same trend, and yet with more noise. This common trend in price sensitivities shows that high SPC households make more cautious decisions, holding all other variables constant. Therefore, SPC may provide additional source of variation in different types of fundamental preference.

In the bottom panel, I list the marginal effect of SPC at the different levels. It seems that Private label brands and major vendors illustrate distinctive patterns: while SPC does not contribute to purchase probability for the major vendors, it has increasing influence on

private label brands. Households who had high switches in the yogurt market prefer the private label more for the carbonated markets. It may be worth investigating who are the frequent switchers? In the discussion section I revisit this question with more data on households' demographics.

The variable "Total", which controls for the total number of visiting trips in the yogurt data set, reveals weaker and inconsistent effects on the state dependence or price. Other control variables, such as the price index for alternative choices ("price0"), the main effect of "Total", as well as the constant terms, tend to have expected signs.

In order to investigate the robustness of the results, I also test different measures of SPC based on 2002 in the yogurt data selected and report additional estimation tables in the Appendix (**Table *8***): the estimates from different years are relatively stable cross periods, indicating stable behavioral effects at the aggregate level.

4. Discussion and Conclusion

The fact that households maintain their tendencies to switch across a long period of time suggests that there can be fundamental preference associated with the switches. However, some household level characteristics needs to be controlled before reaching such conclusion. Particularly, households' location and households' size can be correlated with SPC, and because those characteristics are also relatively static over 5 years, they may affect choices in a way that is not consistent with my conjecture.

In the previous estimations, I deliberately controlled for total shopping visits over the target years in the yogurt markets. This variable can be viewed as a proxy variable for the distance between the household location and the potential shopping stores. For those who live in relatively inconvenient area, households may be more variety seeking (or less state

dependent) given the lower shopping frequency. Indeed, the model reports some evidence supporting the above explanation: the interaction term between the total shopping visits and the state dependence variables appear to be mostly positive, especially for the random effect logit estimations. Therefore, household location should not affect the main effect through visiting frequencies.

Household size can also be a crucial influencer: household with more members will switch more often and appreciate variety in different periods. The IRI data sets provide us household size information, allowing us to further investigate the effect of SPC in each household size group. Based on the results of three random effect logit models[7] conditional on levels of the household sizes, the reduced inertia is reported for 8 out of the 9 cases, yet the decreasing trends become weaker. With two-member households, I find the previous findings are the most robust, including the increasing trends for price sensitivity. Meanwhile, within households of three members or single members, marginal effects of price estimated do not increase with prices.

Linking demographic variables with SPC may improve the understanding of households switching behavior. In **Table *4***, I provide OLS regression results for possible correlations between SPC and other main demographic variables. Overall, demographic variables explain about 25% of the variation in SPC. As I have expected, total visits and household sizes are significantly correlated with SPC. In addition, household level income has a negative effect: households with lower combined pre-tax income tend to switch more frequently. The coefficients show that for an additional 10,000 US dollar increase of

[7] In the Appendix, I provide conditional estimations for three levels of household sizes in Table 9, Table 10, and Table 11.

annually income, households are associated with a reduction of SPC by 0.5 percentage point; all else being equal.

<Table 4 about Here>

Why higher income owners tend to switch less? Note that those choices made are actually more suboptimal. Just like using habit formation to explain consumer inertia (e.g. Dubé, Hitsch and Rossi 2010), maybe readers can also link the empirical finding with the behavioral literature. It is possible that for higher income owners, less attention is devoted to the market and some experimental studies do suggest attention leads to consumption satiation (Morewedge, Huh and Vosgerau 2010). A recent experimental study also indicates that consumers with lower social-economic status and thus with lack of personal control tend to be more variety seeking (Yoon and Kim 2017). Those facts are both likely to be captured by product switches and reflect the stableness in product switching behavior.

Returning to my conjecture of the "fundamental" preference, I find both household level and individual consumer level explanations for the stableness of the state dependence over long period of time. Because conditional on the size of the household, as well as the visiting frequencies, the regression analysis still shows that the state dependence is reduced for households who have high product switch tendencies in different categories and much earlier years.

Admittedly, my analysis is based on only two markets and the household level data also limit my ability to further explore more detailed individual characteristics. Due to the current data limitation, I leave possible extensions to other markets, as well as additional

tests on individual consumers, for future research. However, by only focusing on the direct relation between switches and state dependence, it already shows promising effects. The fact that households with higher SPC shared common characteristics should be noticed by researchers and policy makers: first, households with higher SPC are less likely to be affected by inertia. For households with the highest SPC, such inertia can be completely removed in the investigated markets. Second, households with higher SPC are also associated with larger household sizes, lower shopping frequencies and more interestingly. Conditional on those household level characteristics, I still find SPC is negatively correlated with state dependence across markets and across time. Third, income level may play a role in product switches and variety seeking, and SPC can capture such variation.

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Table 1 Switches due to Fundamental Preferences: Year 2001

Brand	Choices	Switches	"Fundamental" Switches	
COLOMBO	4496	2329	237	10.18%
COOLBRANDS	1923	1170	156	13.33%
DANNON	10441	4505	545	12.10%
KEMPS	2953	1381	102	7.39%
OLD HOME	1961	882	95	10.77%
STONYFIELD	1840	800	120	15.00%
WELLS D	490	170	15	8.82%
YOFARM	879	453	102	22.52%
YOPLAIT	15207	4879	617	12.65%
PRIVATE	3596	1680	170	10.12%

"Fundamental" switches are switches that cannot be explained by variations of observed characteristics, including prices, relative prices, advertisement and display.

Table 2 Summary Statistics for Products in the IRI Carbonated Beverage Markets

	Share	Avg Price	Std. Dev.
Coca Cola	37.05%	5.03	2.66
-Coke	28.20%	5.08	2.77
--Coke 144oz	18.71%	4.29	1.02
Pepsi	36.51%	5.1	2.68
-Coke	21.80%	5.09	2.79
-Coke 1440z	12.73%	4.52	1.16
Private	6.11%	2.86	2.1

Table 3 Marginal Effects based on Random Effect Logit: using SPC from 2001 Yogurt data

	Coca Cola	Pepsi	Private
lagchoice			
SPC=0	0.0663***	0.0535**	0.0184***
	(0.0190)	(0.0187)	(0.00519)
SPC=0.5	0.0346***	0.0200*	0.0151***
	(0.00822)	(0.00804)	(0.00292)
SPC=1	0.00411	-0.012	0.00203
	(0.0160)	(0.0154)	(0.00651)
price1			
SPC=0	-0.200***	-0.148***	-0.00446
	(0.0271)	(0.0268)	(0.00398)
SPC=0.5	-0.238***	-0.215***	-0.00864*
	(0.0122)	(0.0123)	(0.00378)
SPC=1	-0.275***	-0.279***	-0.0166
	(0.0236)	(0.0244)	(0.0118)
SPC			
SPC=0	-0.0188	-0.0109	0.0183***
	(0.0388)	(0.0412)	(0.00218)
SPC=0.5	-0.0177	-0.0082	0.0348***
	(0.0378)	(0.0399)	(0.00756)
SPC=1	-0.0164	-0.00576	0.0649**
	(0.0365)	(0.0383)	(0.0211)
Clusters	1965	1734	1727
N	29963	27224	26564

Standard errors in parentheses

$^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table 4 The Effects of Demographic Variables on SPC

	Dependent Variable: SPC
total visits	-0.00542***
	(0.000554)
hh_income	-0.00483*
	(0.00230)
hh_workhour	-0.00926
	(0.00643)
familysize	0.0286***
	(0.00467)
hh_edu	-0.00287
hh_age	-0.00453
	(0.00571)
constant	0.649***
	(0.110)
Household Occupation	Yes
Marital Status	Yes
N	2846

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix—not intended to publish

Table 5 Summary Statistics for Households

	Yogurt MKT				Coke MKT	
	Year 2001		Year 2002		Year 2007	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
No. of Household	3160	-	3783	-	4189	-
Avg Choice: Total	19.1	10	19.7	10.2	15.3	8.6
Avg Switch: Total	8.9	6.6	9.4	7	7.7	8.6

Table 6 Summary Statistics in the Yogurt Market: Year 2002

Brand	Choices	Switches	Fundamental Switches	
COLOMBO	5613	3088	346	11.20%
COOLBRANDS	1784	1053	150	14.25%
DANNON	13196	5820	648	11.13%
KEMPS	2788	1392	135	9.70%
OLD HOME	2677	1219	135	11.07%
STONYFIELD	2290	1097	128	11.67%
WELLS D	1536	592	96	16.22%
YOFARM	1715	964	165	17.12%
YOPLAIT	18097	5666	701	12.37%
PRIVATE	4453	2279	245	10.75%

Figure 1 Histogram–Number of Switches Per Choice (Year 2001)

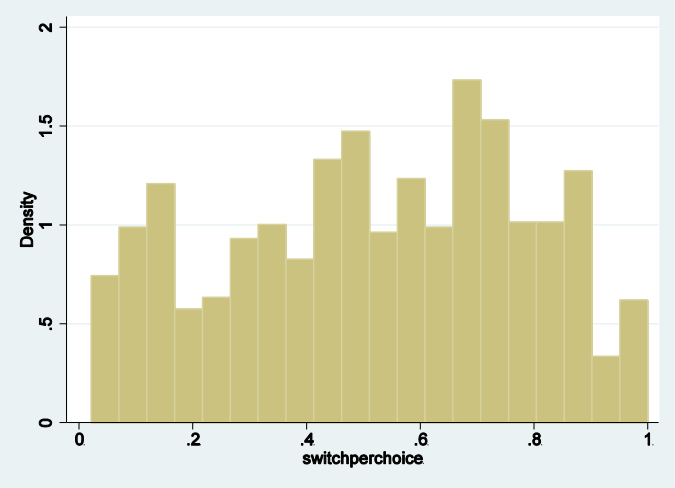

Figure 2 Histogram–Number of Switches Per Choice (Year 2002)

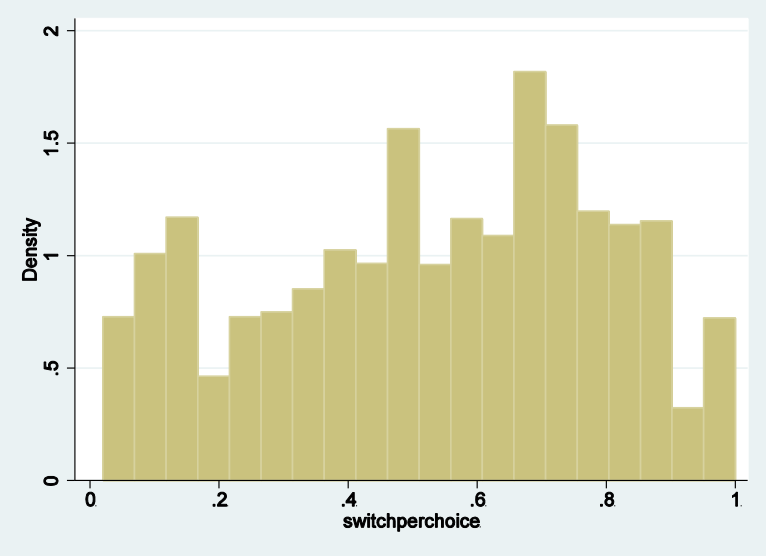

Table 7 Estimation Results: using SPC from 2001 Yogurt data (Coefficients Shown)

	Linear Probability Model			Random Effect Logit		
	Coca Cola	Pepsi	Private	Coca Cola	Pepsi	Private
Price1	-0.170***	-0.139***	0.00228	-1.092***	-0.762***	0.0876
	(0.0271)	(0.0265)	(0.0110)	(0.169)	(0.175)	(0.310)
Price0	0.151***	0.200***	0.0898***	0.682***	1.233***	1.315***
	(0.0128)	(0.0141)	(0.00909)	(0.0780)	(0.0923)	(0.155)
Total	-0.00378	-0.00667**	0.00173**	-0.0297*	-0.0191	0.0460**
	(0.00207)	(0.00207)	(0.000594)	(0.0132)	(0.0144)	(0.0178)
SPC	0.285***	0.270***	0.0680***	0.738	1.405**	1.450**
	(0.0684)	(0.0672)	(0.0184)	(0.442)	(0.469)	(0.530)
lagchoice	0.417***	0.454***	0.440***	0.269*	0.0991	0.778***
	(0.0179)	(0.0175)	(0.0175)	(0.115)	(0.119)	(0.197)
price1#Total	0.00192	0.00228*	-0.000979*	0.0123*	0.00270	-0.0210
	(0.00100)	(0.00101)	(0.000493)	(0.00608)	(0.00665)	(0.0149)
lagchoice#Total	-0.000202	0.000894	0.00409***	0.00153	0.00984*	0.00660
	(0.000653)	(0.000649)	(0.000604)	(0.00402)	(0.00426)	(0.00684)
price1 # SPC	-0.108**	-0.114***	-0.0134	-0.358	-0.673**	-0.0168
	(0.0334)	(0.0328)	(0.0144)	(0.206)	(0.216)	(0.407)
lagchoice#SPC	-0.164***	-0.191***	-0.179***	-0.273*	-0.308*	-0.850***
	(0.0223)	(0.0220)	(0.0217)	(0.138)	(0.145)	(0.242)
constant	0.293***	0.228***	-0.142***	0.355	-1.131**	-7.387***
	(0.0631)	(0.0617)	(0.0253)	(0.400)	(0.420)	(0.543)
week dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	27232	27224	26564	27232	27224	26564

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8 Estimation Results: using SPC from 2002 Yogurt data (Coefficients Shown)

	Linear Probability Model			Random Effect Logit		
	Coca Cola	Pepsi	Private	Coca Cola	Pepsi	Private
Price1	-0.232***	-0.152***	0.00464	-1.514***	-0.963***	-0.176
	(0.0254)	(0.0245)	(0.00934)	(0.158)	(0.163)	(0.314)
Price0	0.157***	0.188***	0.0734***	0.744***	1.216***	1.126***
	(0.0119)	(0.0130)	(0.00816)	(0.0722)	(0.0852)	(0.149)
Total	-0.00504**	-0.00586***	0.00173***	-0.0414***	-0.0339**	0.0479**
	(0.00178)	(0.00176)	(0.000470)	(0.0114)	(0.0124)	(0.0163)
SPC	0.101	0.156*	0.0766***	-0.0150	0.433	1.214*
	(0.0641)	(0.0617)	(0.0159)	(0.414)	(0.435)	(0.496)
lagchoice	0.409***	0.438***	0.385***	0.349**	-0.0798	0.513*
	(0.0170)	(0.0165)	(0.0170)	(0.106)	(0.114)	(0.207)
price1 # Total	0.00219*	0.00162	-0.000987**	0.0179***	0.00586	-0.0219
	(0.000864)	(0.000855)	(0.000378)	(0.00529)	(0.00571)	(0.0137)
lagchoice#Total	-0.0000586	0.00164**	0.00533***	-0.000533	0.0105**	0.00842
	(0.000572)	(0.000570)	(0.000501)	(0.00349)	(0.00380)	(0.00616)
price1 # SPC	-0.0188	-0.0660*	-0.0172	0.0898	-0.360	0.288
	(0.0313)	(0.0300)	(0.0122)	(0.195)	(0.200)	(0.377)
lagchoice # SPC	-0.149***	-0.185***	-0.135***	-0.357**	-0.0244^{+}	-0.425^{+}
	(0.0212)	(0.0207)	(0.0203)	(0.130)	(0.139)	(0.243)
constant	0.440***	0.260***	-0.118***	1.092**	-0.479	-6.874***
	(0.0587)	(0.0567)	(0.0226)	(0.370)	(0.387)	(0.530)
week dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	30775	30768	29968	30775	30768	29968

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9 Marginal Effects based on Random Effect Logit (Households with Single Member)

	Coca Cola	Pepsi	Private
lagchoice			
SPC=0	0.0729	0.0454	0.104^{+}
	(0.0604)	(0.0649)	(0.0570)
SPC=0.5	0.0447^{+}	0.00183	0.0467*
	(0.0258)	(0.0252)	(0.0186)
SPC=1	0.0204	-0.0317	-0.0252
	(0.0393)	(0.0402)	(0.0213)
price1			
SPC=0	-0.232**	-0.106	-0.000251
	(0.0814)	(0.0847)	(0.0155)
SPC=0.5	-0.188***	-0.164***	-0.0120
	(0.0361)	(0.0368)	(0.0180)
SPC=1	-0.144*	-0.206**	-0.0486
	(0.0564)	(0.0652)	(0.0547)
SPC			
SPC=0	-0.141	-0.0902	0.00959
	(0.117)	(0.122)	(0.0110)
SPC=0.5	-0.128	-0.0767	0.0439*
	(0.0981)	(0.101)	(0.0201)
SPC=1	-0.111	-0.0632	0.120^{+}
	(0.0713)	(0.0786)	(0.0722)
Clusters	219	219	217
N	2702	2697	2585

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10 Marginal Effects based on Random Effect Logit (Households with Two Members)

	Coca Cola	Pepsi	Private
lagchoice			
SPC=0	0.0678*	0.0529+	0.0129+
	(0.0304)	(0.0295)	(0.00665)
SPC=0.5	0.0242+	0.0224	0.00653*
	(0.0141)	(0.0139)	(0.00268)
SPC=1	-0.0174	-0.00938	-0.00328
	(0.0279)	(0.0287)	(0.00432)
price1			
SPC=0	-0.190***	-0.158***	-0.00903
	(0.0431)	(0.0414)	(0.00629)
SPC=0.5	-0.260***	-0.237***	-0.0102+
	(0.0210)	(0.0213)	(0.00531)
SPC=1	-0.327***	-0.317***	-0.0109
	(0.0428)	(0.0447)	(0.0120)
SPC			
SPC=0	-0.000747	0.0372	0.00557+
	(0.0633)	(0.0624)	(0.00314)
SPC=0.5	0.00183	0.0412	0.0104
	(0.0621)	(0.0669)	(0.00692)
SPC=1	0.00407	0.0439	0.0192
	(0.0600)	(0.0695)	(0.0165)
Clusters	619	619	616
N	8843	8842	8607

Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11 Marginal Effects based on Random Effect Logit (Households with Three Members)

	Coca Cola	Pepsi	Private
lagchoice			
SPC=0	0.000759	0.0807+	0.00739
	(0.0446)	(0.0431)	(0.00886)
SPC=0.5	-0.00583	0.0393*	0.00701
	(0.0200)	(0.0186)	(0.00642)
SPC=1	-0.0128	-0.00204	-0.00119
	(0.0432)	(0.0368)	(0.0208)
price1			
SPC=0	-0.346***	-0.182**	-0.00677
	(0.0631)	(0.0605)	(0.00679)
SPC=0.5	-0.213***	-0.189***	-0.00312
	(0.0298)	(0.0273)	(0.00465)
SPC=1	-0.0669	-0.195***	0.0177
	(0.0626)	(0.0562)	(0.0270)
SPC			
SPC=0	-0.000747	0.0372	0.00557+
	(0.0633)	(0.0624)	(0.00314)
SPC=0.5	0.00183	0.0412	0.0104
	(0.0621)	(0.0669)	(0.00692)
SPC=1	0.00407	0.0439	0.0192
	(0.0600)	(0.0695)	(0.0165)
Clusters	278	278	278
N	4690	4688	4566

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$