

KOÇ UNIVERSITY

THE “HANDS” OF PAST IN CONSUMER BRAND-CHOICE

Choice- versus Quantity-State Dependence

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THE “HANDS” OF PAST IN CONSUMER BRAND-CHOICE: CHOICE- VERSUS QUANTITY-STATE DEPENDENCE

Abstract

State dependence refers to the fact that consumers' prior experiences and decisions affect their subsequent purchase decisions, while it may take both positive (i.e., variety-avoiding) and negative (i.e., variety-seeking) forms. The author suggests that positive state dependence may have two possible drivers: decision making process for a brand at the time of its purchase and consumption or extent of experience with a brand after its purchase. The former type of dependence is defined as *choice-state dependence*, while the latter one is as *quantity-state dependence*.

The author hypothesizes that choice-state dependence has a stronger effect than quantity-state dependence in affecting current decisions for the majority of product categories. Furthermore, the author argues that category type (i.e., hedonic vs. utilitarian products) moderates this relationship and specifies that choice-state dependence of hedonic goods will be significantly stronger than that of utilitarian goods. Effect of past quantity decisions (i.e., quantity-state dependence), however, is expected to be similar for these two category types. The author presents a multinomial choice model to explore the hypotheses and accounts for consumer heterogeneity by latent class modeling. Several implications for marketing strategy are discussed.

Keywords: Brand-choice decisions; Latent class modeling; Multinomial choice models; Household panel data; Quantity decisions; State dependence

THE “HANDS” OF PAST IN CONSUMER BRAND-CHOICE: CHOICE- VERSUS QUANTITY-STATE DEPENDENCE

Determining the influence of consumers' past purchase decisions on their current decisions, namely state dependence or “the hand of past” (Heckman 1981), has been of interest to both marketing researchers as well as practitioners. Hence, a considerable amount of research has been published on state dependence in both marketing and economics literature. It has conclusively been shown that there exists a form of dependence in household choice data whereby consumers have a higher probability of choosing brands that they have purchased previously (Ailawadi et al 2007; Gupta 1988; Erdem 1996; Keane 1997; Seetharaman, Ainslie, and Chintagunta 1999; Tellis 1988). This dependence is mentioned with different names (e.g., purchase carryover effect, purchase-event feedback effect, first-order effect, habit persistence or state dependence) and can be defined as the situation in which purchasing of a brand at purchase occasion (t-1) makes the consumer more likely to repurchase that particular brand at occasion (t). I propose two conceptually distinct explanations for this dependence: *choice-state dependence* and *quantity-state dependence*.

--- Insert Figure 1 about here ---

It is noteworthy to clarify this distinction for both marketers and researchers. I believe that this study helps managers answer the questions, such as “does using my product for a longer time make my brand more preferable for the next time of purchase” or “how may the effect of prior choices differ across product categories”. From a researcher point of view, this study proposes two distinct concepts as the types of state dependence. Moreover, it provides behavioral reasons driving the link between past and current choices.

Ailawadi et al. (2007), find a positive effect of stockpiling on repeat purchases. Note that, stockpiling arises from purchasing more of the regular quantity and means the consumer uses the brand for a longer period (on the assumption that consumption does not increase due to the stockpiling). Consistent with their results, I expect to find a positive sign for *quantity-state dependence*. I assume that quantity decisions are the drivers of stockpiling and any consumer who purchases more than the normal quantity stockpiles. I further suggest that stockpiling causes a longer consumption period. Thus, effect of past quantity decisions (i.e., quantity-state dependence) occurs through consumption.

Moreover, consistent with state dependence literature (e.g., Dubé, Hitsch, and Rossi 2010; Roy, Chintagunta and Haldar 1996) I predict that consumers have a higher probability of choosing brands that they have previously purchased, independent of its consumption. Thus, a positive sign is expected to reveal also for *choice-state dependence*. As the main contribution of the current research, I posit that consumers' past brand-choice decisions (i.e., choice-state dependence) are significantly more influential on their subsequent choices than their past quantity decisions (i.e., quantity-state dependence). I further argue that this relative strength of choice-state dependence is more prominent for hedonic products than for utilitarian products.

There are several theories supporting this dependence, such as consumer learning (e.g., Ailawadi et al. 2007, Moshkin and Shachar 2002), memory activation (e.g., Bettman and Park 1986), habit development (Wood and Neal 2009). I develop my hypotheses on the basis of cognitive dissonance theory and consumer learning behavior. As noted earlier, choice-state dependence is expected to be stronger for hedonic (vs. utilitarian) products. The supporting rationale for this claim, derived from cognitive dissonance theory, is the necessity of a stronger justification of the brand purchase for hedonics (e.g., Kivetz and Simonson 2002; Kivetz and Zheng 2006). However, given that the difficulty of measuring behavioral drivers

with econometric analyses (due to the lack of control on consumer choice data); the current study can provide an indirect observation of different behavioral motivations.

Therefore, I summarize and build up my hypotheses:

[H.1a]: Choosing a particular brand in the previous occasion increases the likelihood of purchasing that brand in the next occasion (i.e., *positive* choice-state dependence).

[H.1b]: Purchasing more than normal quantity of a particular brand increases the likelihood of purchasing that brand in the next occasion (i.e., *positive* quantity-state dependence).

[H.1c]: The effect of choosing a particular brand in the previous occasion (i.e., choice-state dependence) will be stronger than the effect of purchasing more than the normal quantity of that brand (i.e., quantity-state dependence).

[H.2a]: Choosing a particular brand in the previous occasion (i.e., choice-state dependence) will have a stronger effect on the repurchase probabilities of hedonic products than those of utilitarian products.

[H.2b]: Purchasing more than normal quantity of a particular brand (i.e., quantity-state dependence) will not be significantly different for hedonic and utilitarian products.

--- Insert Figure 2 about here ---

I document the persistence in brand choices and stockpiling effects using consumer panel data on purchases of frequently purchased consumer goods. I distinguish and measure the types of the state dependence using a multinomial logit model that incorporates previous marketing actions as a covariate. I examine different product categories, so that any differences in

interaction effects of product category characteristics and types of state dependence can be attributed to the different behavioral mechanisms.

The remainder of this paper is organized as follows. First, I address to the motivation for investigating two different state dependence effects for hedonic and utilitarian goods and discuss the research background. Next, I examine whether it is a generalizable fact that one of these dependences is significantly stronger or weaker than the other and propose two behavioral processes driving different types of state dependence. Then, I present the model and describe data. Expected results are discussed in detail. Finally, I summarize the contributions of the paper and address future research issues in the conclusion section.

RESEARCH FRAMEWORK

The main focus of this study is to disentangle the choice- and quantity-state dependence and emphasize the importance of this distinction. Results of Ailawadi et al. (2007) suggest that the influence of last brand-choice decisions is stronger than that of the quantity decisions for two product categories (yogurt and ketchup). Another research by Chandon and Wansink (2002) shows that yogurt and ketchup are perceived as having the same hedonic values (4.8 versus 4.8) on Dhar and Wertenbroch's (2000) hedonic scale. The relative strength of past brand-choice decisions, with respect to past quantity decisions, could be different for utilitarian products. I claim that increasing the number of product categories may add substantially to the understanding of the differential effects of different types of state dependence, as well as the underlying behavioral mechanisms. I examine and hypothesize that the choice-state dependence (vs. quantity-state dependence) becomes much stronger for hedonic (vs. utilitarian) products.

Research Background

The mere fact that consumers' prior experiences and decisions affect their subsequent purchase decisions (i.e., state dependence) is not new. One stream of research in this literature focuses on investigating the types of this dependence (e.g., habit persistence, carryover effect), while another one aims to explore the behavioral reasons driving it (e.g., switching cost, brand loyalty). However, as a combination of these two domains, any distinction regarding the behavioral mechanisms behind the different types of state dependence has not previously been examined.

Apart from past brand-choices, past quantity decisions have also been shown to be influential on the current choices. However, contrary to plenty of study focusing on the order of the consumer brand-choice process (Erdem 1996; Keane 1997; Seetharaman, Ainslie, and Chintagunta 1999; Tellis 1988), there is a limited number of research investigating the persistence of quantity purchased (e.g., Ailawadi et al. 2007; Erdem, Imai, and Keane 2003; Hendel and Nevo 2005; Gupta 1988; Tellis 1988). In this study, I aim to distinguish and compare the past brand-choice (i.e., choice-state dependence) and past quantity decision (i.e., quantity-state dependence) effects for different category types.

--- Insert Table 1 about here ---

I, therefore, have two main hypotheses that need to be supported by the consumer behavior point of view. First, I should discuss why being exposed to a brand for a longer time induces a higher repurchase probability (i.e., stockpiling effect on repeat purchases). Second, I need to address to the question that why previously purchasing a brand makes that brand more likely to be purchased in the next occasion (i.e., effects of past brand-choice decisions on repeat purchases). Next subsection aims to explore these questions from the consumer behavior standpoint.

Behavioral Motivation

In previous scanner panel data research, there exist several researches investigating the effect of past purchases explicitly modeling the structure underlying consumer behavior patterns exist. For instance, research by Dubé, Hitsch and Rossi (2010) suggests *loyalty* due to switching costs to be the behavioral explanation for the habit persistence. According to this explanation, consumers experiencing a form of psychological switching cost due to changing brands (Farrell and Klemperer 2006; Osborne 2007) build a pseudo loyalty that a past brand-choice or consumption instance alters the current utility derived from the consumption of the product. Another explanation is based on *consumer learning behavior* (Moshkin and Shachar 2002). This rationalization claims that as consumers obtain more experience with a brand, they learn more about its attributes, but the amount of learning declines over time.

Throughout the literature, researches exploring the sources of state dependence (e.g., Erdem and Sun 2001; Roy, Chintagunta and Haldar 1996; Seetharaman 2004) do not provide explicit examination of the behavioral structure underlying consumer choice processes. Likewise, research investigating the behavioral motivations that derive state dependence (e.g., Dubé, Hitsch and Rossi 2010; Osborne 2007) is lacking in the distinction of sources of state dependence. I position this study in the intersection of these two research areas. I build the hypotheses on two different behavioral explanations for the components of state dependence (i.e., brand-choice and quantity decisions): *cognitive dissonance theory* and *consumer learning behavior*.

Cognitive Dissonance Theory: Engine of Self-Justification

Aesop tells a story about a fox that tried in vain to reach a cluster of grapes that dangled from a vine above his head. The fox leapt high to grasp the grapes, but the delicious-looking fruit

remained just out of reach of his snapping jaws. After a few attempts, the fox gave up and said to himself, “these grapes are sour, and if I had some I would not eat them anyway”.

The fox changed his attitude to fit his behavior. People do not like to have attitudes or behaviors in conflict and this causes dissonance (Festinger 1957). Dissonance theory suggests that need to justify the actions and decisions, especially the ones inconsistent with the beliefs, comes from this unpleasant feeling (Festinger 1957). Reducing cognitive dissonance is provided by either changing the behavior to bring it in line with the dissonant attitude or changing the attitude to bring it in line with the dissonant behavior. In their recent book, Tavris and Aronson (2007) conduct several experiments to explore how people attempt to reduce cognitive dissonance and they show that reduction of this unpleasant feeling is mostly obtained by self-justifying. Holland, Meertens and Van-Vugt (2002) further suggest that there are two self-justification strategies: internal and external self-justification. External justification denotes the use of external reasons to justify one's actions (e.g., lack of personal control, social pressures). Internal justification refers to the change of perceived actions. It may be a change in attitude or rejection of a negative consequence. The less external justification for the behavior, the more the attitude shifts to correspond to the behavior (Festinger and Carlsmith 1959).

As an implication of internal justification, Aronson and Mills (1959) define *justification of effort* as the tendency for individuals to increase their liking for something they have put a lot of effort into to attain it. Adapting this claim to marketing domain, I predict similar reasoning would apply also to the past brand-choices. Hence, I identify *justification of past brand-choices* as the tendency for individuals to increase their liking for, and thus likelihood of, choosing a brand that they have chosen previously among a set of alternatives.

Therefore, I predict that effects of prior decision making process at the time of the purchase (i.e., choice-state dependence) are based on consumers' tendency to justify their prior decisions. I aim to examine this claim using household panel data containing brand choice and quantity decisions over an observation period, thus no information regarding the consumer behavior exists in this data set. I argue that any variable that alters the degree of need for justification would let us observe whether there exists a relation between consumers' current brand-choices and needs for justification of their prior choices. Consumer traits (e.g., price sensitivity, loyalty, wealth), external factors (e.g., price reduction, sales force, deal feature) or product category characteristics (e.g., durability, storability) may act as the possible moderators.

I particularly choose hedonic and utilitarian distinction in the product category type. Following Strahilevitz and Myers (1998), I describe a utilitarian or a necessary item as one that is mainly desired to fulfill a basic need or to accomplish a functional or practical task, and I define a hedonic or a luxury item as one primarily desired for pleasure, fantasy and fun.

Prior research in social sciences (e.g., Kivetz and Simonson 2002; Kivetz and Zheng 2006; Prelec and Loewenstein 1998) suggests that justifying the purchases of a hedonic good is more difficult than of a utilitarian good because hedonic luxuries have inherent disadvantages compared with utilitarian necessities. Several recent researches (Okada 2005; Zheng and Kivetz 2009) suggest that consumers face a stronger need for justification and are inclined to rely on external justifications, such as promotions, to offer them an excuse for making the purchase decision when buying hedonic products than buying utilitarian ones. If not so, consumers experience cognitive dissonance.

I build up on this reasoning and predict for hedonic products that consumers will also need for a stronger internal justification, which will have them judge their prior purchase decisions in

favor of the purchased brand. Consequently, this subjective judgment will bring on the difference between the impacts of past brand-choices across hedonic and utilitarian product categories. Specifically, I argue that there will be a strong effect of past brand-choice decisions on current choices for hedonic goods due to the need for justification. For utilitarian products, however, consumers do not need such a strong need to justify their previous choices; they rather make an objective evaluation based on the product usage.

Although it is not a key aspect of the current study, I also examine the past and current promotion effects on the repurchase probabilities. Relying on the external justification argument, I hope to find a stronger promotion effect for hedonic products than for utilitarian ones, as a replication of prior findings (Okada 2005; Zheng and Kivetz 2009).

Consumer Learning Behavior

I posit that learning produces state dependence through the effect of experience with a brand after the purchase (i.e., quantity-state dependence effect). Consumers tend to develop beliefs about their tastes for currently available products as they consume them (Osborne 2007). A consumer who purchases a brand more than its regular quantity (i.e., who stockpiles) uses more of the brand or consumes it for a longer time. Hence, stockpiling provides a longer postpurchase evaluation period, which is defined as the examination of the purchased product to determine whether it meets, exceeds or fails to meet prepurchase expectations. From a cognitive learning standpoint, deeper evaluations of the product could yield either more repeat purchases caused by higher brand knowledge, or fewer repeat purchases due to boredom (Engel, Blacwell and Miniard 1995). Since the analyses capture brand-choice decisions only with the presence of purchase incidence, I observe only the positive state dependence situations, which result in more repeat purchases. Following the reasoning of Ailawadi et al.

(2007), behavioral learning theory also suggests that stockpiling forms persistence due to more reinforcement before the next purchase (see Rothschild and Gaidis 1981).

One can argue that product category may moderate the relation between learning and state dependence. For the particular distinction of hedonic versus utilitarian product categories, I do not expect such a significant change between learning processes. There may well be other factors moderating this link, yet this consideration would be beyond of the scope of the current research.

MODEL

I use a multinomial logit choice model that decomposes usual state dependence effect into the effects of (1) brand-choice and (2) quantity decisions of a brand. Following Ailawaldi et al. (2007), I add a term to the standard utility equation that allows us for this decomposition. Specifically, I formulate a multinomial logit model in a way that it captures previous brand-choice and quantity effects separately. The basic utility specification of brand j at purchase occasion t for household h therefore becomes:

$$\begin{aligned} V_{hjt} = & \beta_{0h} + \beta_{1h} PRICE_{hjt} + \beta_{2h} DISCOUNT_{hjt} \\ & + \beta_{3h} CHOICE_{hj(t-1)} + \beta_{4h} QUANT_{hj(t-1)} + \beta_{5h} DISCOUNT_{hj(t-1)} \end{aligned} \quad (1)$$

where,

- | | |
|------------------|---|
| $PRICE_{hjt}$ | = the regular price of brand j available to household h on purchase occasion t ; |
| $DISCOUNT_{hjt}$ | = the discount indicator, which is equal to 1 if brand j available to household h on shopping trip t is with a discount and 0 if otherwise; |

- $CHOICE_{hj(t-1)}$ = the previous brand-choice indicator for state dependence, which is equal to 1 if household h bought brand j on the previous purchase occasion before shopping trip t and 0 if otherwise;
- $DISCOUNT_{hj(t-1)}$ = the discount indicator of previous purchase, which is equal to 1 if household h bought brand j on promotion on the previous purchase occasion before shopping trip t and 0 if otherwise;
- $QUANT_{hj(t-1)}$ = the quantity indicator normalized due to the average quantity of the category purchased by household h ; defined as

$$QUANT_{hj(t-1)} = \frac{Q_{hj(t-1)}}{\bar{Q}_h}$$

where;

- $Q_{hj(t-1)}$ = the quantity (ounces) of brand j bought by household h on the previous purchase occasion before purchase occasion t ; and
- \bar{Q}_h = the average quantity (ounces) of the category purchased per purchase occasion by household h during an initialization period.

Chintagunta (1993) explores the effects of marketing actions on purchase behavior and argues that conditional-on-purchase analysis (i.e., ignoring the store visits in which households are exposed to the marketing activities of brands, but failed to make a category purchase) will overstate the effect of marketing action. However, he follows that an unconditional-on-purchase analysis may not be necessary, if the objective is merely to determine the impact of marketing variables on the current brand choice decisions (i.e., which of the two brands, A or B, the consumer purchases on the two purchase occasions that a purchase is made). Given that the aim of the current study is to investigate “which brands” and “in what quantity” the consumer purchases on two subsequent purchase occasions; I conclude that the estimation would not be biased due to conditional-on-purchase analysis.

$$\text{Prob}_{ht}(j|inc) = \frac{e^{V_{hjt}}}{\sum_k e^{V_{hkt}}} \quad (2)$$

Heterogeneity in consumer preferences remains unobserved in the real world choice data and influences the consumer brand choice. Thus, unobserved heterogeneity has an impact on present purchase behavior independent of past purchase behavior. To capture the correct estimate of state dependence, consumer heterogeneity has to be accounted for (Erdem 1996). Consumers may be heterogeneous in their preferences for exogenous reasons that are unrelated to consumers' past purchase histories (Keane 1997). As Heckman and Singer (1984) show that the degree of state dependence will be overestimated, if the heterogeneity in consumer preferences is ignored, in case of its existence in the true model. Thus, I include consumer heterogeneity into the using a latent class model (Kamakura and Russell 1989).

I capture consumer heterogeneity assuming that there are s latent segments in the markets (Gupta and Chintagunta, 1994). All members of a segment display the same intrinsic preference for making a purchase in a given category. Thus, each segment s would have its own $PRICE_{jt}^s$, $DISCOUNT_{jt}^s$, $CHOICE_{j(t-1)}^s$, $QUANT_{j(t-1)}^s$ and $DISCOUNT_{j(t-1)}^s$ values. I do not know, a priori, to which segment a particular consumer belongs. Let the probability of a given consumer, belonging to segment s , be given by π_s . Then the unconditional probability of household h making a purchase in category j will be given by:

$$\pi_s = \frac{e^{\beta_s}}{1 + \sum_{s=1}^{s-1} e^{\beta_s}}$$

where, β_s is the intrinsic preference of consumers belong to segment s .

The likelihood function therefore becomes:

$$L = \prod_h \prod_t \prod_j \sum_s \left[\left(\frac{e^{V_{hjt}}}{\sum_k e^{V_{hkt}}} \right) \left(\frac{e^{\beta_s}}{1 + \sum_{s=1}^{s-1} e^{\beta_s}} \right) \right] \quad (3)$$

Estimation will be at the brand level and results of the dominant segment for the brands will be aggregated to get the relevant measure of the overall product category. After investigating whether the brand-choice effect is significantly greater than quantity effect for each product category, the estimations of hedonic products will be aggregated and compared to the utilitarian products.

DATA

The data used in this study are the IRI store sales and consumer panel data for 30 product categories. The store sales data contain 5 years of product sales, pricing, and promotion data for all items sold in 47 U.S. markets. I first eliminate those with low ability to get stockpiled (see Table 2). The next task is to facilitate the selection and accurate labeling of product categories according to their hedonic and utilitarian values. Relevant literature suggests two of the categories are hedonic, yogurt and ketchup (Chandon and Wansink 2002), and two of them are utilitarian, laundry detergent and toothpaste (Strahilevitz and Myers 1998). To identify the rest of the categories, an experimental study, adapted from Dhar and Wertenbroch (2002), is conducted using Turkish undergraduate students. Subjects receive the list of 30 categories and asked to classify them as primarily utilitarian (defined as useful, practical, functional, something that helps achieve a goal) or hedonic (defined as pleasant and fun, something that is enjoyable and appeals to the senses) goods. For a ranking among the product categories in one category type, I also ask them to rate the perceived hedonic and utilitarian values (ratings are anchored at 1=utilitarian and 9=hedonic). One can argue that the data containing U.S. consumer information may contradict to Turkish consumer characteristics on several aspects and vice versa. I overcome this possible issue by showing the consistency between student classifications and previously determined category types

through the literature. Specifically, I hope to find that Turkish students will rate yogurt and ketchup as hedonic, and laundry detergent and toothpaste as utilitarian products to rely on their remaining category classifications.

--- Insert Table 2 is about here ---

Among all categories, I choose only those that are rated as medium or high in stockpilability. In each category, I focus only on those households that purchase a brand at least twice during the sample period. I classify each product's weekly price as either "regular" or "discount," where the latter implies a temporary price decrease of at least 5%. The data set also provides the weekly prices and point-of-purchase marketing variables for each product category.

EMPIRICAL ANALYSIS

To assess the impact of consumption on subsequent choices, I first need to have a household purchasing a brand with both regular and more than regular (i.e., stockpiled) quantities. As noted earlier, I ignore the possibility of increasing consumption due to stockpiling and assume purchasing more than regular quantities provides household using that brand for a longer period. As a support of this assumption, I need to distinguish the heavy consumers (i.e., having an increase in their consumption quantity for any reason) from consumers who stockpiles. I propose to do so by focusing only on the consumers who purchase a more-than-regular quantity *on a discount*. In other words, I examine promotion-induced purchases for distinguishing the stockpiling behavior from increased consumption. One can argue that, focusing only on the promotion-induced purchases may bias the analyses in terms of price sensitivities. Hence, households' price sensitivities are also accounted for in the model. I

further decompose and quantify the effects of past decisions into brand- and quantity-state dependence effects.

The first step is to test the quantity-state dependence indicator, β_{4j} , that captures the consumption impact on repeat purchases. I estimate the mean and standard deviation of the coefficient, β_{4j} for each brand in a product category and hope to find no significant variation within a certain category. Next, quantity decision coefficient, β_{4j} , is estimated for all product categories. I expect β_{4h} to have a positive sign for all categories, in accordance with Ailawadi et al. (2007) arguing that stockpiling results in purchase reinforcement. This effect is translated as the consumption effect in the current study, since stockpiling allows for a longer period of consumption.

I next turn my attention to other two parameter estimates. I expect the choice-state dependence indicator, β_{3j} , to be positive, consistent with previous literature. It is shown that previous purchase of the brand reinforces preference, and the household is more likely to purchase the brand on the current purchase occasion (e.g., Ailawadi, Gedenk, and Neslin 1999; Seetharaman 2004; Seetharaman, Ainslie, and Chintagunta 1999).

I expect that the past discount term, β_{5j} , is negative consistent with previous research showing that promotion purchases are less reinforcing than nonpromotion purchases (Gedenk and Neslin 1999; Guadagni and Little 1983). Dodson, Tybout, and Sternthal (1978) argue that this lessening effect of promotion may be due to a diminishing of brand attitude because the consumer attributes his or her purchase to the promotion, not to the brand. This rationale is in line with the reasoning that promotions serve as an external justification of the purchase.

To capture the unobserved heterogeneity in the model, I use Latent Class Cluster model that identifies clusters which group together consumers who share similar interests, values,

characteristics or behavior. The model simultaneously estimates utilities for each segment and the probability that each respondent belongs to each segment. It is noteworthy to clarify two aspects of Latent Class: First, the model reports the utilities for each *segment*, but not for each consumer. The consumer characteristic and/or preferences within each segment are quite similar, however they are relatively different from segment to segment. Second, Latent Class analysis does not assume that each consumer is wholly *in* one segment or another (as in cluster analysis). Rather, each consumer is considered to have some non-zero probability of belonging to each segment. If the solution of the model fits the data extremely well, then those probabilities converge to zero or one. The overall probability of membership across households for each segment defines the size of that segment.

The main interest of this study is comparing the consumer segments across product categories. Each segment s has its own coefficient estimations. Optimal number of segments can be determined using Bayesian Information Criterion (BIC) (Bauer and Curran 2003).

Classifying consumers according to their past brand-choice decisions, I expect to find two main segments for each product category, one of which significantly dominates the other in the percentage of consumers contained. In contrast, I expect no such a segmentation within a category when I classify consumers on the basis of their past quantity decisions.

As noted earlier, I expect both β_3^s and β_4^s to be positive for all categories. Regarding the comparison of these two terms, I further expect β_4^s to be greater than β_3^s , meaning that choice-state dependence is more impactful than quantity-state dependence. Therefore, the mean of β_4^s of the dominant segment should be higher than the mean of β_3^s . Moreover, I expect the β_4^s coefficient to be much stronger for hedonic category type than utilitarian category type. Hence, I expect a deviation in β_4^s across the category types. A hypothetical illustration of the expected results for two brands is given in Table 3.

--- Insert Table 3 about here ---

Finally, I calculate the overall repeat purchase probability of each brand depending on consumers' quantity decisions and price discounts of the brand. Doing so, I aim to observe the reinforcement effect of stockpiling (i.e., positive quantity-state dependence) and the reducing role of promotion on repurchase probabilities. Expected results are illustrated at Table 4.

--- Insert Table 2 about here ---

CONCLUSION

This research investigates whether the state dependence effect is composed of two distinct constructs: decision making process for a brand at the time of its purchase (i.e., choice-state dependence) and extent of experience with a brand after its purchase (i.e., quantity-state dependence). Finding support for a distinct and significant effect of both constructs, I next examine their relative influences. I show that both of the effects are positive, whereas choice-state dependence has a stronger impact than quantity-state dependence for the majority of the product categories. I finally posit that product category will modify the relative influence of choice-state dependence to quantity-state dependence. In particular, the effect past brand-choice decisions (i.e., choice-state dependence) of hedonic goods is expected to be significantly stronger than that of utilitarian goods. Effect of past quantity decisions (i.e., quantity-state dependence), however, is expected to be comparable to each other for these two categories.

Moreover, I provide a plausible explanation for the underlying behavioral processes and propose a different behavioral explanation for each type of dependence. First, to explain the impact of past brand-choice decisions, I propose cognitive dissonance theory. Next, referring

to the related literature, I suggest consumer learning behavior to be the reason for past quantity decision effects. By reason of the limitations of household panel data, I limit my investigation with an implicit observation of the former claim. Specifically, I show that the effect of a past brand-choice (vs. quantity) decision is stronger for hedonic products than for utilitarian ones, due to the stronger need for justification of the past brand purchase decision.

Implications

I believe that the findings have a substantial implication of exploring the stockpiling effect on repurchase probabilities. I also hope that the current study adds considerably to the brand loyalty (switching behavior) and habitual consumption literatures. Moreover, for policy makers, current research is expected to provide more precise answers to these questions: “Should I offer deep and infrequent promotions and have my consumers delighted with the deal, thus stockpile my product or should I offer shallow and frequent promotions to attract them over and over again?”, “Does free sampling campaign work for my brand or should I increase the length of my product line?”, “Does using my product for a longer time make my brand more preferable for the next time of purchase?” or “How may the effect of prior choices differ across product categories?”.

As another implication of separately modeling the sources of state dependence, I aim to observe a differential impact of successive purchasing and stockpiling on repurchase probabilities. In particular, I consider different quantity decisions (i.e. to buy with regular quantities versus to stockpile) as one factor of consumer heterogeneity and posit that a consumer who has stockpiled (vs. has successively purchased) a hedonic product would be less likely to repurchase that particular brand on the next purchase occasion. However, this reducing effect of stockpiling on repurchase probabilities is expected to be lower, if does not vanish, for utilitarian products. Specifically, an implication of the current study suggests that

successive purchasing has a smaller strengthening effect on repurchase probabilities of a utilitarian product than a hedonic one. This argument is directly related to any marketing action induces stockpiling.

As to the other managerial implications, the consideration of unobserved heterogeneity allows the manager to be aware of consumers' differential sensitivities to marketing variables and their state dependence tendencies. This brings possible opportunities for the policy makers to develop differentiated marketing offerings to attract the attentions of different consumer segments.

Limitations and Further Research

A number of drawbacks need to be noted regarding the present study. As noted earlier, the examination is limited with secondary data, yet I aim to identify the behavioral drivers of consumer actions. Further experimental investigations are needed to explore the validity of the behavioral propositions. In addition, empirical extensions of the model to allow for higher order processes and determine the order of quantity decision could also be fruitful. Also, incorporating variety-seeking behavior in the model would further enrich the theoretical framework proposed in this paper.

There is some evidence to suggest that not all promotion related increases in primary demand are due to forward buying, yet in some cases promotions appear to increase consumption (Bell, Chiang and Padmanabhan 1999). However, I ignore increasing consumption possibility in this research and assume stockpiling will cause a longer consumption period. It would be appealing to assess the distinction between the product categories according to the tendency of increasing consumption incidence due to stockpiling is also in support of the hypotheses. Ailawadi and Neslin (1998) find a higher stockpiling-induced consumption incidence increase for yogurt than for ketchup. In addition, Ailawadi et al. (2007) finds that effect of the past

brand-choice decisions is stronger for yogurt (1.33) than for ketchup (.73); however both effects are greater than past quantity decision effects (.36 and .40, respectively). Considering the definition of utilitarian products (see Dhar and Wertenbroch 2002; Strahilevitz and Myers 1998), I expect no increase due to stockpiling for utilitarian products. Therefore, there can be a difference between the effect of past brand-choice and quantity decisions for the categories whose consumption incidence increases with stockpiling.

REFERENCES

- Ackerberg, Daniel A. (2003), "Advertising, Learning, and Consumer Choice in Experience Good Markets: An Empirical Examination," *International Economic Review*, 44(3), 1007–1040.
- Ailawadi,Kusum, L., Karen Gedenk, Christian Lutzky and Scott A. Neslin, (2007), "Decomposition of Sales Impact of Promotion Induced Stockpiling Effect," *Journal of Marketing Research*, Vol. XLIV, (August), 450-467.
- Allenby, Greg M. and Peter J. Lenk (1995), "Reassessing Brand Loyalty, Price Sensitivity, and Merchandising Effects on Consumer Brand Choice," *Journal of Business and Economic Statistics*, Vol. 13, No. 3 (July), 281-289.
- Andrews, Rick L., Andrew Ainslie and Imran S. Currim (2002), "An Empirical Comparison of Logit Choice Models with Discrete versus Continuous Representations of Heterogeneity," *Journal of Marketing Research*, Vol. 39, No. 4 (November), 479-487.
- Aronson, Elliot and Judson Mills (1956), "The effect of severity of initiation on liking for a group," *Journal of Abnormal and Social Psychology*, 59, 177–181.
- Bauer, Daniel, J. and Patrick J. Curran (2003), "Distributional assumptions of growth mixture models: Implications for over extraction of latent trajectory classes," *Psychological Methods*, 8, 338–363.
- Bell, David R., Jeongwen Chiang, and V. Padmanabhan (1999), "The Decomposition of Promotional Response: An Empirical Generalization," *Marketing Science*, 18 (4), 504-26.

- Bronnenberg, Bart J., Michael W. Kruger and Carl F. Mela (2008), “Database Paper: The IRI Marketing Data Set,” *Marketing Science*, Vol. 27, No. 4 (July–August) 745–748.
- Chandon, Pierre and Brian Wansink (2002), “When Are Stockpiled Products Consumed Faster? A Convenience-Salience Framework of Postpurchase Consumption Incidence and Quantity,” *Journal of Marketing Research*, Vol. 39, No. 3 (August), 321-335.
- Dodson, Joe A., Alice M. Tybout and Brian Sternthal (1978), “Impact of Deals and Deal Retraction on Brand Switching,” *Journal of Marketing Research*, Vol. 15, No. 1 (February), 72-81.
- Dube, Jean-Pierre, Gunter J. Hitsch, and Peter E. Rossi (2010), “State Dependence and Alternative Explanations for Consumer Inertia,” *The RAND Journal of Economics*, Vol. 41, Issue 3, (Autumn), 417–445.
- Erdem, Tülin (1996), “A Dynamic Analysis of Market Structure Based on Panel Data A Dynamic Analysis of Market Structure Based on Panel Data,” *Marketing Science*, Vol. 15, No. 4 (1996), 359-378.
- Erdem, Tülin and Baohong Sun (2001), “Testing for Choice Dynamics in Panel Data,” *Journal of Business and Economic Statistics*, Vol. 19, No. 2 (April), 142-152.
- Erdem, Tülin and Michael P. Keane (1996), “Decision-Making Under Uncertainty: Capturing Dynamic Brand Choice Processes in Turbulent Consumer Goods Markets,” *Marketing Science*, 15(1), 1–20.
- Erdem, Tülin, Susumu Imai and Michael P. Keane (2003), “Brand and Quantity Choice Dynamics Under Price Uncertainty,” *Quantitative Marketing and Economics*, 1, 5–64.

- Farrell, Joseph and Paul Klempner (2006), "Co-ordination and Lock-in: Competition with Switching Costs and Network Effects," *Economics Papers 2006-W07, Economics Group*, Nuffield College, University of Oxford.
- Festinger, Leon (1957), "A theory of cognitive dissonance," *Stanford, CA: Stanford University Press*.
- Festinger, Leon and James M. Carlsmith (1959), "Cognitive consequences of forced compliance," *Journal of Abnormal and Social Psychology*, 58(2), 203–210.
- Guadagni, Peter M. and John D. C. Little (1983), "A Logit Model of Brand Choice Calibrated on Scanner Data," *Marketing Science*, Vol. 2, No. 3 (Summer), 203-238.
- Gedenk, Karen and Scott A. Neslin (1999), "The Role of Retail Promotion in Determining Future Brand Loyalty: Its Effect on Purchase Event Feedback," *Journal of Retailing*, 75 (Winter), 433–59.
- Gupta, Sachin and Chintagunta, Pradeep. K. (1994), "On using demographic variables to determine segment membership in Logit mixture models," *Journal of Marketing Research*, Vol. 31, No. 1 (February), 128– 136.
- Gupta, Sachin, Pradeep K. Chintagunta and Dick R. Wittink (1997), "Household heterogeneity and state dependence in a model of purchase strings: Empirical results and managerial implications," *International Journal Research in Marketing*, 14(4) 189–213.
- Gupta, Sunil (1988), "Impact of Sales Promotions on When, What, and How Much to Buy," *Journal of Marketing Research*, Vol. 25, No. 4 (November), 342-355.
- Heckman, James J. (1991), "Identifying the Hand of Past: Distinguishing State Dependence from Heterogeneity," *The American Economic Review*, Vol. 81, No. 2, Papers and Proceedings of the Hundred and Third Annual Meeting of the American Economic Association (May), 75-79.

- Heckman, James, J. and Burton Singer (1984), “A method of minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data,” *Econometrica*, 52 (2), 271-320.
- Hendel, Igal and Aviv Nevo (2006), “Measuring the Implications of Sales and Consumer Inventory Behavior,” *Econometrica*, Vol. 74, No. 6 (November), 1637-1673
- Holland, R., Meertens, R. M., and Van Vugt, M. (2002), “Dissonance on the road: Self-esteem as a moderator of internal and external oriented modes of self-justification,” *Personality and Social Psychology Bulletin*, 12, 1713-1724.
- Jones, J. Morgan and Jane T. Landwehr (1988), “Removing Heterogeneity Bias from Logit Model Estimation,” *Marketing Science*, Vol. 7, No. 1 (Winter), 41-59.
- Kamakura, Wagner A. and Gary J. Russell (1989), “A probabilistic choice model for market segmentation and elasticity structure,” *Journal of Marketing Research*, Vol. 26, No. 4 (November), 379–390.
- Keane, Michael P. (1997), “Modeling Heterogeneity and State Dependence in Consumer Choice Behavior,” *Journal of Business and Economic Statistics*, 15(3), 310–327.
- Kivetz, Ran and Itamar Simonson (2002), “Earning the Right to Indulge: Effort as a Determinant of Customer Preferences toward Frequency Program Rewards,” *Journal of Marketing Research*, Vol. 39, No. 2 (May), 155-170.
- Kivetz, Ran, and Yuhuang Zheng (2006), "Determinants of Justification and Self-Control," *Journal of Experimental Psychology: General* (November), 135 (4), 572-587.
- Moshkin, Nickolay V. and Ron Shachar (2002): “The Asymmetric Information Model of State Dependence,” *Marketing Science*, 21(4), 435–454.

- Okada, Erica Mina (2005), "Justification Effects on Consumer Choice of Hedonic and Utilitarian Goods," *Journal of Marketing Research*, Vol. 42, No. 1 (February), 43-53.
- Osborne, Matthew (2007): "Consumer Learning, Switching Costs, and Heterogeneity: A Structural Examination," *Discussion paper, Economic Analysis Group*, Department of Justice.
- Prelec, Drazen and George Loewenstein (1998), "The Red and the Black: Mental Accounting of Savings and Debt," *Marketing Science*, Vol. 17, No. 1, 4-28.
- Roy, Rishin, Pradeep K. Chintagunta and Sudeep Haldar (1996), "A Framework for Investigating Habits, "The Hand of the Past," and Heterogeneity in Dynamic Brand Choice," *Marketing Science*, Vol. 15, No. 3, 280-299.
- Rothschild, Michael L. and William C. Gaidis (1981), "Behavioral Learning Theory: Its Relevance to Marketing and Promotions," *Journal of Marketing*, 45 (Spring), 70-8.
- Seetharaman, P. B. (2004), "Modeling Multiple Sources of State Dependence in Random Utility Models: A Distributed Lag Approach," *Marketing Science*, 23(2), 263–271.
- Strahilevitz, Michal and John G. Myers (1998), "Donations to Charity as Purchase Incentives: How Well They Work May Depend on What You Are Trying to Sell," *Journal of Consumer Research*, Vol. 24, No. 4 (March), 434-446.
- Tavris, Carol and Elliot Aronson (2007), "Mistakes were made (but not by Me): Why we justify foolish beliefs, bad decisions, and hurtful acts," *New York: Harcourt*
- Tellis, Gerard J. (1988), "Advertising Exposure, Loyalty, and Brand Purchase: A Two-Stage Model of Choice," *Journal of Marketing Research*, Vol. 25, No. 2 (May), 134-144.
- Wertenbroch, Klaus and Ravi Dhar (2000), "Consumer Choice between Hedonic and Utilitarian Goods," *Journal of Marketing Research*, Vol. 37, No. 1 (February), 60-71.

- Wood, Wendy and David T. Neal (2009), “The habitual consumer,” *Journal of Consumer Psychology*, Volume 19, Issue 4 (October), 579-592.
- Zheng, Yuhuang and Ran Kivetz (2009), “The differential Promotion Effectiveness on Hedonic Versus Utilitarian Products,” *Advances in Consumer Research*, 36, 565.

FIGURE 1:
CONCEPTUAL FRAMEWORK

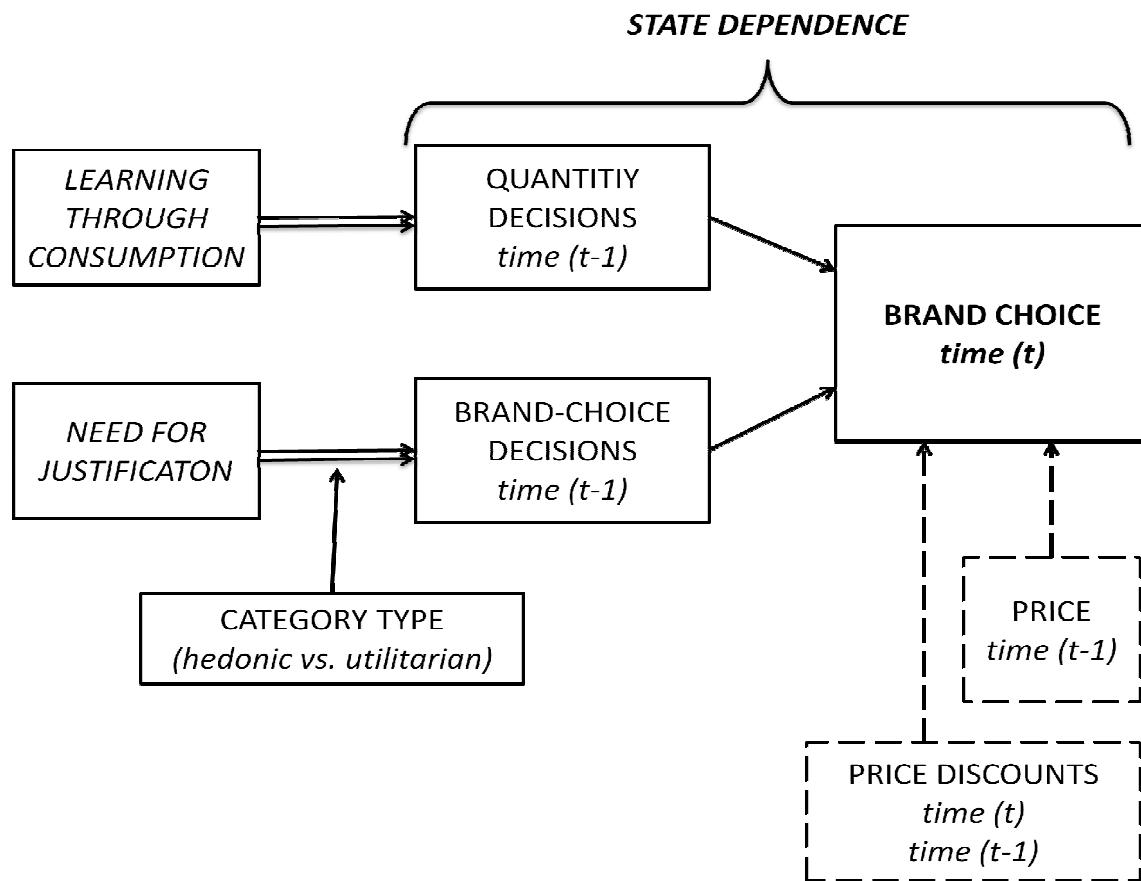


FIGURE 2:
SKETCH OF HYPOTHESIS DEVELOPMENT

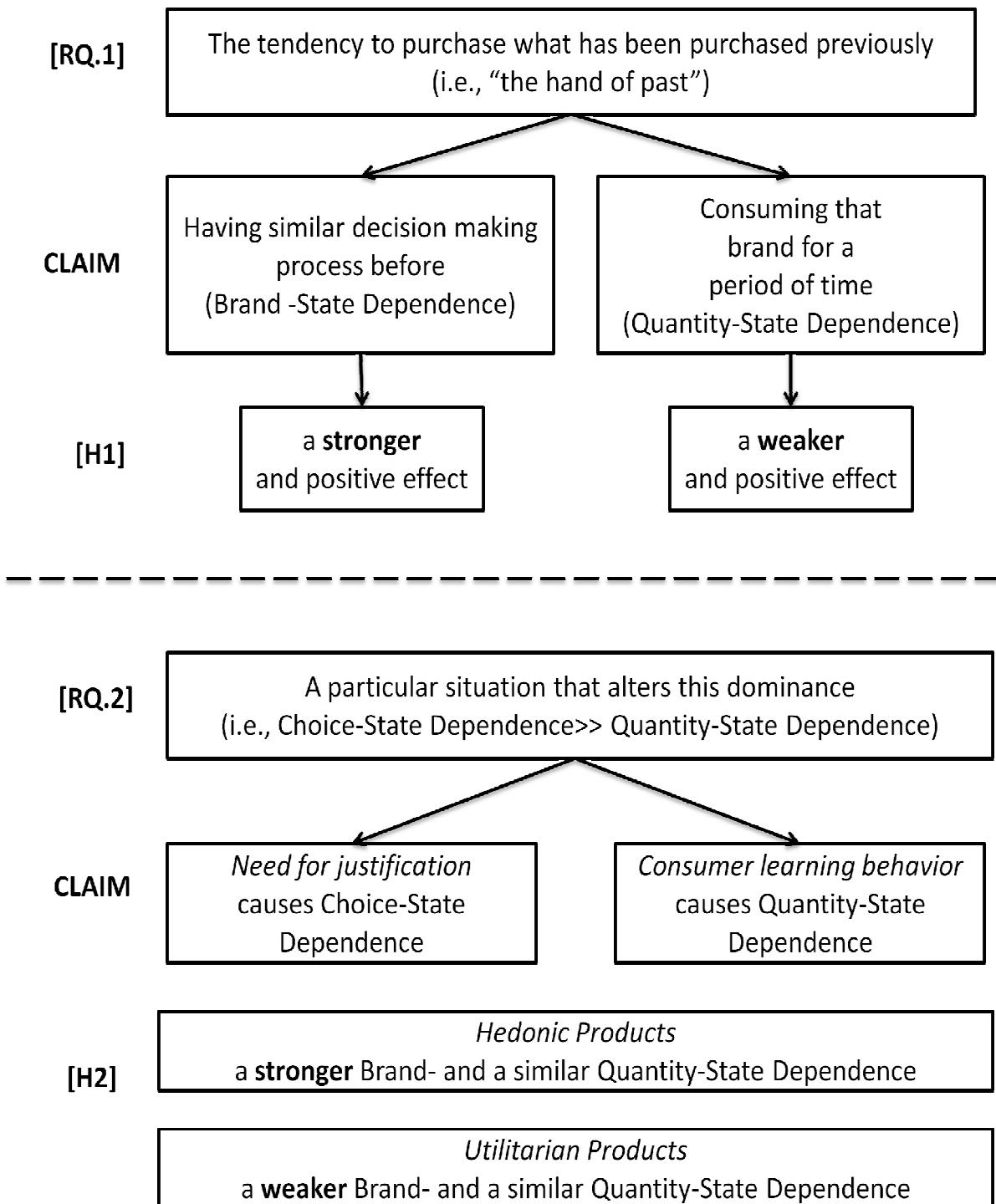


TABLE 1:

A COMPARISON OF THIS STUDY WITH OTHER DECOMPOSITION MODELS OF
STATE DEPENDENCE

Study	Past Brand-Choice Effect	Past Quantity Decision*	Past Price Discount Effect	Unobserved Heterogeneity	Behavioral Explanation
Rothchild and Gaidis (1981)	Yes	No	Yes	No	Behavioral learning
Guadagni and Little (1983)	Yes	No	Yes	No	---
Bettman and Park (1986)	No	Yes	No	No	Memory activation
Jones and Landwehr (1988)	Yes	No	No	Yes	---
Gupta (1988)	Yes	Yes	Yes	No	---
Tellis (1988)	Yes	Yes	Yes	No	---
Allenby and Lenk (1994)	Yes	No	No	Yes	---
Erdem (1996)	Yes	No	Yes	Yes	---
Roy et al. (1996)	Yes	No	Yes	Yes	---
Keane (1997)	Yes	No	Yes	Yes	Brand loyalty
Erdem and Sun (2001)	Yes	No	No	Yes	---
Erdem et al. (2003)	No	Yes	Yes	Yes	---
Moshkin and Shachar (2002)	Yes	No	No	Yes	Information search
Seetharaman (2004)	Yes	Yes	No	Yes	---
Hendel and Nevo (2005)	No	Yes	Yes	No	---
Osborne (2007)	Yes	No	Yes	Yes	Learning/ Switching cost
Ailawadi et al. (2007)	Yes	Yes	Yes	No	Consumer learning
Dubé, Hitsch, and Rossi (2010)	Yes	No	No	Yes	Loyalty
This Study	Yes	Yes	Yes	Yes	Justification/ Consumer learning

*Past quantity decision effect captures the effect of quantity-state dependence.

TABLE 2:

DATA DESCRIPTIVES FOR PRODUCT CATEGORIES IN HOUSEHOLD PANEL DATA

Category	Percent of HH's buying (%)	Purchase Cycle (days)	Storability	Percent of volume of any deal (%)	Average percent of price reduction (%)
Beer	29.9	67	medium	31.0	13.4
Carbonated Beverages	91.9	40	medium	58.2	23.6
Coffee	57.3	65	high	40.8	26.2
Cold Cereal	87.2	48	medium	43.4	30.7
Deodorant	53.4	94	high	35.5	28.0
Facial Tissue	59.9	70	high	38.9	25.1
Household Cleaner	70.0	82	high	22.7	25.0
Ketchup	71.2	91	high	32.4	28.3
Mayonnaise	72.8	95	high	41.1	29.1
Laundry Detergent	68.0	80	high	46.2	26.2
Margarine/butter	74.1	65	medium	29.3	27.0
Peanut Butter	61.0	82	high	32.9	25.3
Razors	9.2	87	high	34.0	20.6
Blades	28.5	106	high	20.3	21.5
Shampoo	55.2	87	high	35.1	22.5
Soup	90.3	45	high	38.5	29.0
Spaghetti/Italian souce	67.6	72	high	42.5	27.0
Sugar substitutes	21.7	82	high	14.4	23.2
Toothbrush	49.3	87	high	33.1	27.1
Toothpaste	62.8	89	high	40.1	25.8

Source: Bronnenberg, Kruger and Mela (2008)

TABLE 3:

HYPOTHETICAL PARAMETER ESTIMATES ON SEGMENT LEVEL

	Hedonic Product <i>(Mayonnaise)</i>	Utilitarian Product <i>(Toothbrush)</i>		
Parameter Estimates	Segment 1	Segment 2	Segment 1	Segment 2
β_3	1.33*	.9	.74	11.1
β_4	.36*	.3	.45	.8
β_5	-9.2*	-1.0	-.58	-.9
Population in the segment (%)**) 	.73	.17	.93	.7

* Mean values are adopted from Ailawadi et al. (2007) for yogurt category.

**Consumers are classified according to their past brand-choices.

TABLE 4:

*HYPOTHETICAL REPURCHASE PROBABILITY OF GIVEN BRAND DEPENDING ON
PREVIOUS PURCHASE*

	Hedonic Product <i>(Mayonnaise)</i>	Utilitarian Product <i>(Toothbrush)</i>
	Brand <i>j</i>	Brand <i>k</i>
<i>When brands are on promotion at next purchase occasion</i>		
Previous purchase is nonpromotion purchase of normal quantity	.79	.87
Previous purchase is promotion purchase of normal quantity	.56	.78
Previous purchase is promotion purchase of double the normal quantity	.66	.84
<i>When brands are with regular price at next purchase occasion</i>		
Previous purchase is nonpromotion purchase of normal quantity	.41*	.80
Previous purchase is promotion purchase of normal quantity	.22*	.76
Previous purchase is promotion purchase of double the normal quantity	.29*	.78

*Repurchase probabilities are adapted from Ailawadi et al. (2007) for yogurt category, Dannon brand.