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PATTERNS OF REINFORCEMENT AND THE ESSENTIAL VALUE OF BRANDS: II. EVALUATION OF A MODEL OF CONSUMER CHOICE

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We employ a behavioral-economic equation put forward by Hursh and Silberberg (2008) to explain human consumption behavior among substitutable food brands, applying a consumer-choice model—the behavioral perspective model (BPM; Foxall, 1990/2004, 2005). In this study, we apply the behavioral-economic equation to human economic consumption data. We attempt to find the variation pattern of essential value across brand groups differing in utilitarian reinforcement and informational reinforcement. The BPM denotes that consumers show less price responsiveness in closed settings and more price responsiveness in open settings. We also examine whether consumers are more sensitive to price changes in an open setting, where many alternatives are available, and vice versa. We find that (a) essential value varies across different brand groups within the same products; (b) brands with higher levels of utilitarian reinforcement showed larger essential value; (c) brands with higher levels of informational reinforcement showed larger essential value; and (d) the essential value of brands varies inversely with the degree of openness of consumer settings.

Key words: essential value, behavioral perspective model, consumer behavior analysis, humans

Behavioral economists explain consumption choices by measuring the relative values of simultaneously available reinforcers (Hursh & Silberberg, 2008). Indices of the strength of reinforcers include response rate (Ferster & Skinner, 1957), relative response rate (Herrstein, 1970), ratio breakpoint (Hodos, 1961; Hodos & Kalman, 1963; Nevin, 1992), behavioral momentum (Nevin, 1992; Nevin & Grace, 2000; Nevin, Grace, Holland, & McLean, 2001) and the slope of the demand curve (Allison, 1983; Hursh, 1980, 1984; Lea, 1978). Demand analysis provides advantages over alternative methods by offering a more straightforward measure, elasticity of demand, which indicates how sensitive the level of

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consumption is to changes in price. Demand analysis, like the microeconomic framework to which it belongs, also has the advantage of avoiding reference to hypothetical factors such as deprivation, value, strength, or probability (Christensen, Silberberg, Hursh, Huntsberry, & Riley, 2008; Christensen, Silberberg, Hursh, Roma, & Riley, 2008; Elsmore, Fletcher, Conrad, & Sodetz, 1980; Foster, Sumpter, Temple, Flevill, & Poling, 2009; Hursh, 1991; Jacobs & Bickel, 1999).

Although demand analysis provides a promising way to measure reinforcer value (Foxall, Oliveira-Castro, & Schrezenmaier, 2004; Hursh, 1980, 1984; Kagel, Battalio, & Green, 1995; Lea, 1978; Rachlin, Green, & Battalio, 1976), it has been criticized for its use of direct comparisons of demand elasticity among reinforcers (Hursh, 1984; Killeen, 1995). The main problem is that elasticity of demand changes continuously with changes in price (Killeen, 1995): First, the rate of change varies among products; second, the log-linear model does not fit real-world data, which are normally presented curvilinearly. Moreover, elasticity of demand is determined not only by price points and the log-linear formulation but also by the nature of the commodity, the species of consumer, the availability of substitutes, and the degree of openness of the economic context (Hursh, 1984).

Several attempts have been made to model the demand curve (Hursh & Silberberg, 2008; Hursh & Winger, 1995) on the basis of the rate of change of a measure of reinforcer value, which Hursh and Silberberg (2008) style “essential value”:

$$LogQ = LogQ_0 + k(e^{-a_1 P} - 1), \tag{1}$$

where Q is consumption, Q_0 refers to the maximum consumption at zero price, k indicates the range of the dependent variable in logarithmic units, and P denotes the cost of consumption. Minimum consumption is calculated as $LogQ_0 - k$, and $-a$ is the rate of change in the exponential function. Equation 1 has been modified into Equation 2 by normalizing demand:

$$LogQ = LogQ_0 + k(e^{-aQ_0 C} - 1), \tag{2}$$

where C is the varying cost of the reinforcers. Hursh and Silberberg (2008) show that a is a single parameter that determines the slope of the demand curve. More important, a is capable of representing the essential value of a reinforcer. This equation has been tested in a range of closed settings with hens, pigeons, and rats (Christensen, Silberberg, Hursh, Huntsberry, et al., 2008; Christensen, Silberberg, Hursh, Roma, et al., 2008; Christensen, Kohut, Handler, Silberberg, & Riley, 2009; Foster et al., 2009; Hursh & Silberberg, 2008). Foster et al. (2009) examined different behavioral economic models (all proposed and defined by Hursh & Silberberg, 2008) for what they describe as “qualitatively different” reinforcers, meaning alternative formulations of cereal-based feedstuffs for hens. Hursh and Silberberg (2008) employed data for rats choosing different levels of food and drugs collected by Hursh in 1984 and 1988, and data from Elsmore et al. (1980) for baboons choosing from cocaine and food. Christensen, Silberberg, Hursh, Huntsberry, et al. (2008); Christensen, Silberberg, Hursh, Roma, et al. (2008); and Christensen, Kohut, Handler, Silberberg, and Riley, 2009 investigated food versus cocaine consumption in rats. Hitherto, the equation has not been applied to human behavior. Our research also uses Hursh and Silberberg’s (2008) exponential equation but differs significantly from these earlier investigations: It examines (a) human economic consumption in (b) natural settings for (c) qualitatively distinct products and brands. These considerations arise from earlier work that incorporated a model of consumer choice that describes the contingencies of reinforcement in terms of both the utilitarian benefits, which are the functional outcomes of using specific products, and the informational benefits, which derive symbolically from the social meanings of those economic goods (Foxall, 1990/2004). This is the behavioral perspective model (BPM; Foxall, 2005; Foxall et al., 2004), to which we now turn.

A Behavioral Model of Consumer Choice

Most previous investigations of human consumption have focused on the consumer-related characteristics, demographics—that is, age, social class, gender, income, education, family size, and psychographics (i.e., price consciousness, low-quality consciousness, and store loyalty; Ailawadi & Harlam, 2004; Ainslie & Rossi, 1998; Coe, 1971; Dillon & Gupta, 1996; Gabor & Granger, 1961; Murphy, 1978), but no consensus has been reached over whether and in what combination these characteristics influence buying behavior. In addition, it is rare for researchers to explain choice in terms of the attributes of the products themselves and the benefits they confer. The behavioral perspective model (see Figure 1) embodies the idea that different attributes of a product are antecedents of buying behavior (Foxall, 2005; Foxall et al., 2004). Empirical evidence suggests that the value of different product attributes determine its value to the consumer and thus alter the consumer's propensity to purchase (Foxall et al., 2004).

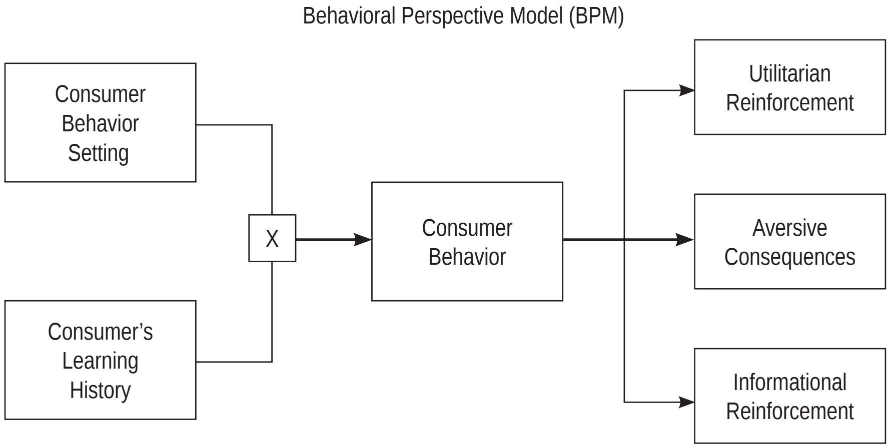

Figure 1. The behavioral perspective model (BPM). *Note*. From *Consumer Psychology in Behavioral Perspective* (p. 206), by G. Foxall, 1990, London, England: Routledge.

Utilitarian Reinforcement

According to the BPM, purchase and consumption are shaped positively by patterns of utilitarian and informational reinforcement, and negatively by price, which is a useful operational measure of the aversive consequences of buying. All of these are shown on the right-hand side of the model. Learning history and the consumer behavior setting are antecedents of buying behavior presented on the left-hand side of the model. Consumer behavior is the outcome of the benefits and costs that derive from buying and consuming products; each of these is primed by the consumer's learning history, which acts upon previously neutral stimuli in the setting, transforming some of them into discriminative stimuli and motivating operations for choice (Alhadeff, 1982; Foxall, 2005; Foxall & Yani-de-Soriano, 2005; Hursh, 1984; Hursh & Silberberg, 2008). Consumer behavior is always punished, as a result of the price that is paid (Alhadeff, 1982), as well as reinforced (i.e., there is a tendency for it to be enacted less frequently in future, which vies with the tendency for it to be enacted more often). Price is an indication of opportunity costs, the utility the consumer could have obtained by spending the money on the next best alternative.

Utilitarian reinforcement (UR) is mediated by the product itself, deriving from its practical application, and inheres in primary reinforcement and influences the rate of both human and nonhuman performance. Hence, it represents the functional rewards that a consumer gains directly from the product itself in purchase and consumption (e.g., drinking a bottle of orange juice, eating a can of baked beans). Utilitarian reinforcement can be measured, at least qualitatively, in terms of the level of functional benefit the consumer receives. A lower level of utilitarian benefit relates to the product formulations that serve the basic functions (e.g., plain baked beans, plain muffins). A higher level of utilitarian benefits is discerned from additional attributes of a product (e.g., baked beans with sausages, chocolate muffins). Different levels of utilitarian benefits are analogous to different attributes of reinforcers in animal experiments (e.g., wheat vs. puffed wheat, lower drug UR vs. drug reinforcers of varying potency).

Research Proposition. The BPM predicts that the higher the relative utilitarian benefit provided by a brand, the greater the probability that this brand will be bought rather than a substitute. There is, moreover, evidence that this is the case: Oliveira-Castro et al. (2010), in a behavioral-economics study based on matching analyses, found that consumers increased the amount they spent in order to obtain a higher level of utilitarian reinforcement. Behavioral-economics research with nonhumans indicates that a reinforcer with greater essential value has a greater probability of being consumed than do reinforcers with lower essential value (Christensen, Silberberg, Hursh, Huntsberry, et al., 2008; Christensen, Silberberg, Hursh, Roma, et al., 2008). Putting these two findings together, we would expect that a brand that provides relatively more utilitarian reinforcement than other brands in its product category would, therefore, exhibit a higher level of essential value than those other brands. This hitherto untested proposition is examined in this article.

Informational Reinforcement

Informational reinforcement (IR) is conveyed by the symbolic attributes of the product: It is socially mediated, reflecting the status and esteem which are accorded by a group to members who display approved patterns of purchase and consumption. For instance, a 20-year-old Corolla transports a consumer from A to B, and it serves this function well. However, a brand new Mazda sports car serves not only the transportation function but also signals social status.

Informational benefit is more difficult than utilitarian to ascertain intersubjectively: It is likely to vary considerably from consumer to consumer, depending on the consumers' learning histories and values. As a generalization, however, it is assumed that consumers who choose well-known brands receive more informational benefits. Choosing Heinz baked beans over other brands, consumers are able to enjoy not only utilitarian (functional/biological) benefits—which are probably very similar to those provided by almost any member of the product category—but also the informational benefits that derive from perceptions of a good, socially acceptable brand. Therefore, informational benefits are conveyed by the brand but mediated by other people and, ultimately, by the consumer's self-approval. Increased informational benefit is a characteristic of brands that possess higher perceived quality and/or a more established and prestigious brand name and image.

Research Proposition. According to the BPM, a brand's sales are directly proportional to the informational benefits it confers on the consumer. We would expect, therefore, that a brand conferring higher levels of informational reinforcement would have a higher essential value. A further objective of this study is thus to examine this proposition.

Incorporation of UR and IR into the Hursh-Silberberg Model

Equation 3 incorporates utilitarian and informational reinforcers and aversive outcomes as causal consequences of consumer choice:

$$LogQ = LogQ_0 + k(e^{-a_1 Q_0 C + a_2 IR + a_3 UR} - 1), \qquad (3)$$

where Q and Q_0 are the consumption unit and the consumption when price is zero, C is the standardized price, and UR and IR are utilitarian and informational reinforcers, respectively. The fifth objective is in line with the main purpose of this article, which is exploring the possibilities whether informational and utilitarian benefits are influential in predicting the brand-choice behavior.

Consumer Behavior Setting Scope

Consumer behavior settings, shown on the left-hand side of Figure 1, are antecedents of buying behavior, defined in terms of discriminative stimuli and motivating operations that set the occasion for consumer behavior. These variables, primed by the consumer's learning history, determine the scope of the setting, that is, the range of potential opportunities for behavior available to the consumer. Consumer behavior thus conforms to the scope of the setting (Foxall, 2005). More open consumer settings allow consumers more options for behavior while more closed settings offer limited choices. In the case of fast-moving consumer goods, an important characteristic of the consumer setting is the size of the store. A convenience store, such as a garage forecourt minimarket, is considered a more closed setting because of its limited selection of products and the time available to consumers to make their selection. In a relatively closed setting, consumers have fewer choices (e.g., a smaller range of brand substitutes). Hence, they are more constrained by the choices available to them. A supermarket is a more open setting because it stocks a wider variety of product categories and brand alternatives. In a relatively open setting, consumers have a greater selection of products and more substitutable brands from which to select.

Research Proposition. The continuum of consumer behavior settings posited by the BPM reveals additional influences on the elasticity of demand for food products, with the possibility that price elasticity varies with the degree of openness of the behavioral situation. The BPM suggests that consumers show less price responsiveness in a relatively closed setting (e.g., a convenience store), and more price responsiveness in a relatively open setting (e.g., a supermarket). Hence, our final quest is to examine whether consumers are more sensitive to price changes in an open setting, where many alternatives are available, and vice versa.

Derivation of Hypotheses

Based on the conceptual proposal and results reported in the literature, the following hypotheses can be elaborated in response to the purposes of this article. Our first objective is examining the behavioral-economic model in the context of consumer choice, involving interactions of different brand-related characteristics—informational and utilitarian benefits. Behavior analysts have shown that different reinforcers possess different levels of essential value, which ultimately influences the choice behavior of consumers (Christensen, Silberberg, Hursh, Huntsberry, et al., 2008; Christensen, Silberberg, Hursh, Roma, et al., 2008; Hursh & Silberberg, 2008). According to the BPM, brands, varying in different combinations of informational and utilitarian benefits, can be categorized into different brand groups. Previous research found that elasticity of demand varies across different brand groups (Foxall et al., 2004; Foxall, Yan, Oliveira-Castro, & Wells, in press; Foxall et al., 2004). This article aims to measure the essential value of food products and to determine whether the essential value varies across brand groups with different informational and utilitarian levels. Hence, Hypothesis 1:

H1: Essential value varies across different brand groups within the same products.

Furthermore, the BPM predicts that increases of utilitarian benefit are associated with the increased incidence buying behavior for the brand in question: Brands with higher utilitarian benefits are less price elastic and possess larger essential value. This leads to Hypothesis 2:

H2: The greater the utilitarian benefit provided by a brand, the larger will be the essential value of that brand.

Consumers' purchasing of brands that provide a higher level of informational (symbolic) benefit is less price elastic than that of brands having lower informational benefit (Foxall et al., 2004). In accordance with our second purpose, we expect to find that brands with higher informational benefit exhibit larger essential value than those with lower informational benefit. To fulfill this second objective, we examine whether products with higher informational benefits actually exhibit larger essential value. Hence, Hypothesis 3:

H3: The higher the informational level of brands, the larger the essential value of these brands.

Along the lines of the fourth purpose, we investigate whether brands in different consumer settings show different essential value. The BPM provides a theoretical basis to argue that buying decision changes according to the scope of the consumer setting. Moreover, the BPM denotes that more open consumer settings signal greater availability of alternative opportunities for purchase, and that in such settings brand buying shows greater price elasticity of demand (Foxall et al., in press). Hence, we expect that brands in more open settings have smaller essential value, while brands in more closed settings have larger essential value. We examine brands in more open settings, supermarkets, which present the consumer with many alternatives, and in more closed settings, convenience stores, which have fewer choices. Hypothesis 4 is thus designed to reveal the pattern of variation in essential value across consumer settings that differ in scope:

H4: The essential value of brands varies inversely with the degree of openness of the consumer setting.

Method

Data were obtained from the ACNielsen Homescan panel, including 10,000+ UK households in Great Britain, which require consumers to input information regarding their purchases using domestic barcode scanners, which feed data to the company's central computer. Information was analyzed for four product categories—baked beans, biscuits (cookies), fruit juice, and yellow fats (including margarine, yellow fat, and spreads). Data analyzed are for the 52 weeks from July 2004 and include purchases by 832, 1,594, 895, and 1,354 households for these four products, respectively, for each purchase, including information about the brand, store, item characteristics, pack size, amount spent, number of items, social class, and date.

The methods used for scaling the levels of informational and utilitarian benefits followed the methodology presented by Oliveira-Castro, Foxall, and James (2008); Oliveira-Castro, Foxall, James, Pohl, Dias, and Chang (2008); and Oliveira-Castro, Foxall, and Schrezenmaier (2005). Data obtained by a questionnaire completed by a convenience sample (33 participants) was used to measure informational benefit offered by each brand. Each brand was rated accordingly—first, on how well-known these participants judged it (0 = *not at all*, 1 = *a little*, 2 = *quite well known*, 3 = *very well known*) and, second, on their estimates of the brand's perceived quality (0 = *unknown*, 1 = *low*, 2 = *medium*, 3 = *high*). Scores for both pieces of information were combined, and a mean score for each brand was calculated.

Higher levels of utilitarian benefit (UR), evinced by additional product attributes, are considered to confer added-value on brands possessing them; such attributes are visibly advertised on the package or are included as part of the product name, and often serve as the rationalization for higher prices. UR was thus evaluated adopting the ranking procedure used in previous studies (Oliveira-Castro et al., 2005): Unadorned formulations of items were ranked as having lower utilitarian benefit (UR Level 1), whereas those embodying more sophisticated attributes were ranked as having higher utilitarian benefit (UR Level 2). Brands were classified into six groups, derived from the combination of two UR levels and three IR levels: (1) IR 1, UR 1; (2) IR 1, UR 2; (3) IR 2, UR 1; (4) IR 2, UR 2; (5) IR 3, UR 1; (6) IR 3, UR 2 (see also Foxall et al., in press).

Equation 1 was used to calculate essential value. The reliability of the results depends upon standardization of price over the various quantities that were purchased, pack sizes, variations in unit prices over time, and other marketing-based variations. Standardizing price is, therefore, helpful to facilitate the comparison of goods obtained on different occasions. In animal experiments, fair comparisons of the values of two or more qualitatively different drugs is achieved when each drug dose is converted to a normalized quantity for each dose expressed as a percentage of the average total daily drug consumption at the lowest FR (Hursh & Silberberg, 2008; Hursh & Winger, 1995). Hursh and Silberberg (2008) adopted an equivalent method by presenting price in terms of the number of responses per 1% of maximal consumption, called Q_0, a parameter representing consumption at zero price. In the case of packaged goods, we adopt unit price as the standardized price. The unit price is calculated as total money spent on one shopping occasion divided by the total quantity purchased at that time (i.e., total consumption). Therefore, the unit price varies across each shopping occasion, depending on the money spent and quantity of consumption of the product. The price is thus constant per unit; for example, .0001 penny/g for baked beans, yellow fats, and biscuits; .0001 penny/ml for juices. Hence, parameters of Equation 1 were calculated using the total quantity purchased of a brand on one shopping occasion and the unit price paid. Furthermore, the results presented below were obtained only from panel members who had purchased at least seven times.

The dataset contains information for 80 stores, four products, 49 stores for baked beans, 58 for yellow fats, 74 for biscuits, and 52 for juices. In order to categorize stores into two groups, those presenting open and closed settings, we distinguished "bigger" (open) and "smaller" (closed) stores on the following criterion. Stores like Tesco, Sainsbury, Asda, and Morrison were categorized as bigger stores because they are well-known supermarkets, while stores like Tesco forecourt, Sainsbury forecourt, and Asda forecourt were classified as smaller stores. The latter are more closed settings because, consistent with their status as convenience stores, they typically carry a smaller range of merchandise than do supermarkets.

Results

Essential Value Across Brand Groups

In order to identify how brand-related attributes influence choice, it is necessary to ascertain whether brand groups that present different amounts of informational and utilitarian benefit embody unique levels of essential value. This entails examining, first, the relationship between elasticity of demand and essential value and, second, the relationship between both sources of benefit (considered separately and in combination) and essential value.

In connection with the first, Foster et al. (2009) point out that the greater the elasticity, the larger the essential value. This relationship, while substantiated by Foster et al. in the context of animal behavior, needs further examination in broader situations (such as human purchasing of fast-moving consumer goods) if the limits of the Hursh–Silberberg equation to model economic choice are to be established. Hence, we depict the relationship between the a value and the elasticity of demand in the case of human consumer behavior. Derived from Equation 1, the absolute value of elasticity of the demand function is formulated as:

$$|Elasticity| = \frac{\partial C}{\partial Q} = aQ_0C * ke^{-aQ_0C}, \tag{4}$$

where a, Q, Q_0, k, and C are as in Equation 1. To find the relationship between $|Elasticity|$ and the a value, we take total differential of $|Elasticity|$ with respect to a and find:

$$\frac{\partial|Elasticity|}{\partial a} = (k - aQ_0C) * Q_0Ce^{-aQ_0C}, \qquad (5)$$

Since the value of Q_0, C, and e^{-aQ_0C} are positive individually, $Q_0Ce^{-aQ_0C}$ is constantly positive. As long as k minus aQ_0C is positive, the change of $|Elasticity|$ is in line with the direction of change of the a value. The value of $k - aQ_0C$ were all positive across four products in this article, therefore, it is valid that increases of the essential value is related to decreases of the elasticity of demand. Hence, the smaller the a value, the smaller the elasticity of demand and, accordingly, the larger the essential value.

Second, we examine the variation pattern of the a value for different brand groups. Data points of each six brand groups for four products were respectively fit into the Hursh–Silberberg exponential equation. Table 1 shows nonlinear regression results, presenting the a value, constant k value for each product, Q_0, the unit consumption when the price is in minimum value, the predictive adequacy R^2, F statistics, and the significant value of the F test.

Table 1 includes the percentages of variance accounted for each regressions (R^2), F statistic, probability of F test and the parameters of $LogQ$, Q_0, the a value and k, which is resulted from the data range of each product. As discussed in the method section, six brand groups are constituted of the interaction of informational and utilitarian benefit and show mixture effect of both benefits. Shown in Table 1, all regressions are significant at the 5% level ($p < .05$), except Group 6 in yellow fats (F statistics = 126.91, $p < .10$, significant at the 10% level). The k values had been determined by the range of datasets for each product, which were 10.8476, 1.86173, 3.19729, and 2.67799 for baked beans, yellow fats, biscuits, and juice, respectively. The second column shows that the a value varies across six brand groups for each product. The a value ranges from 0.000644 in Group 1 to 0.000509 in Group 6 for baked beans, 0.0036 in Group 1 to 0.0003 in Group 6 for yellow fats, 0.00134 in Group 1 to 0.00123 in Group 6 for biscuits, and 0.0013 in Group 1 to 0.0009 in Group 6 for juice. Considering the a value varies inversely to the essential value, it indicates that brand groups with the lowest levels of informational and utilitarian benefits obtain higher a value, bigger elasticity of demand function, and smaller essential value of commodities than brand groups with the highest levels of informational and utilitarian benefits. It is clear that the a value in Group 1 is higher than in Group 6 across all four products. Furthermore, Table 1 revealed that the a values were different among each brand groups; hence, Hypothesis 1 is accepted.

With the purpose of identifying individual effect of informational and utilitarian benefits on the a value, we divide data points into three groups based on the levels of informational benefits (IR) and into two groups based on the levels of utilitarian benefits (UR), respectively. Table 2 summarizes the regression results conducted with data points from three IR groups and two UR groups.

Shown in Table 2, F statistics range from 234.598 to 56,647.5 across all brand groups for four products, and significant values of F tests are all less than 0.05, indicating that all regressions were significant at the 95% level. R-square ranges from 0.0776 to 0.4944 across all brand groups, which means the predictor Price explains from 7.76% to 49.44% of the variance of the dependent variable $LogQ$. The standard deviation of regression error (SER) varies from 0.435 to 0.672 across all brand groups, so the SER values are relatively small, indicating that prediction of $LogQ$ by using the predictor Price is often accurate by a large amount. The k value remains the same, which is predetermined by the data range of each product category.

Examining the second column from the left in Table 2, the a value varies across different brand groups with different informational benefit levels. The a value for baked beans is 0.00053, 0.00043, and 0.00039 in IR Group 1, 2, and 3, respectively. The a value for yellow fats is 0.00347, 0.00221, and 0.0017 in IR Group 1, 2, and 3, respectively. The a value for biscuits is 0.00136 in IR Group 1, 0.00134 in IR Group 2, and 0.00127 in IR

Table 1
Variations of the a *Value (the Reciprocal of Essential Value) Across 6 Brand Groups*

Baked Beans	*a*	$LogQ_0$	Q_0	*k*	R^2	*F* statistics	Sig.
Group 1	0.000644	7.05620	1,160.02	10.8476	0.036	3,060.36	.000*
Group 2	0.000511	7.08771	1,197.17	10.8476	0.036	297.72	.000*
Group 3	0.000592	7.15980	1,286.65	10.8476	0.036	6,831.54	.000*
Group 4	0.000398	6.89816	990.45	10.8476	0.036	483.46	.000*
Group 5	0.000321	8.76772	6,423.54	10.8476	0.036	2,088.07	.000*
Group 6	0.000509	7.14549	1,268.38	10.8476	0.036	3.59	.000*
Yellow Fats							
Group 1	0.0036	7.18947	1,325.4	1.86173	0.302	886.68	.000*
Group 2	0.0019	6.66157	781.78	1.86173	0.207	165.26	.000*
Group 3	0.0021	7.03860	1,139.79	1.86173	0.191	2,385.57	.000*
Group 4	0.0028	7.30877	1,493.34	1.86173	0.302	540.18	.000*
Group 5	0.0026	7.48903	1,788.31	1.86173	0.207	1,134.71	.000*
Group 6	0.0003	6.12133	455.47	1.86173	0.191	126.91	.097**
Biscuits							
Group 1	0.00134	6.18187	483.89	3.19729	0.543	28,158.6	.000*
Group 2	0.00141	6.26371	525.16	3.19729	0.383	15,034.2	.000*
Group 3	0.00135	6.14318	465.53	3.19729	0.496	1,802.91	.000*
Group 4	0.00120	7.55992	1,919.7	3.19729	0.543	699.43	.000*
Group 5	0.00154	6.59484	731.31	3.19729	0.383	3,485.3	.000*
Group 6	0.00123	6.83806	932.68	3.19729	0.496	10,193.9	.000*
Juice							
Group 1	0.0013	7.81539	2,478.46	2.67799	0.148	886.68	.000*
Group 2	0.0009	7.57012	1,939.37	2.67799	0.1844	165.256	.000*
Group 3	0.0012	7.88657	2,661.29	2.67799	0.0911	2,385.57	.000*
Group 4	0.0008	7.60154	2,001.28	2.67799	0.148	540.185	.000*
Group 5	0.001	8.05094	3,136.75	2.67799	0.1844	1,134.71	.000*
Group 6	0.0009	7.65708	2,115.57	2.67799	0.0911	126.914	.000*

Note. Regression results based on Equation 1: $LogQ = LogQ_0 + k(e^{-aQ_0C} - 1)$, across 6 brand groups for baked beans, yellow fats, biscuits, and juice, respectively. Presenting variation of the *a* value across brand groups in 6 combinations of informational and utilitarian benefit levels, adjusted R^2, *F* statistics, significant value of *F* test, the *a* value, the maximum consumption Q_0, and the *k* value.
*The regression is significant at 5% level.
**The regression is significant at 10% level.

Group 3. The *a* value for juice is 0.00121, 0.00118, and 0.0009 for IR Group 1, 2 and 3, respectively. Figure 2 shows the patterns for the variation of the *a* value across the informational benefits levels for baked beans, yellow fats, biscuits, and juice, respectively.

The lines shown in Figure 2 present the pattern and changes of the *a* value when the informational benefits go up for four products for each product. All four lines are

Table 2
Variation of the a *Value (the Reciprocal of Essential Value) Across IR Groups and UR Groups*

Baked Beans	*a*	*LogQ*$_0$	*Q*$_0$	*k*	R^2	*F* statistic	Sig.*	SER
IR 1	0.00053	7.00168	1,098.48	10.8476	0.0836	234.598	.000	0.611
IR 2	0.00043	7.01369	1,111.74	10.8476	0.1314	878.573	.000	0.632
IR 3	0.00039	8.18934	3,602.33	10.8476	0.5337	5,990.22	.000	0.578
UR 1	0.00053	7.26461	1,428.82	10.8476	0.1921	2,373.2	.000	0.672
UR 2	0.00047	6.99555	1,091.77	10.8476	0.2845	1,444.27	.000	0.562
Yellow Fats								
IR 1	0.00347	7.15693	1,282.97	1.86173	0.2873	3,309.85	.000	0.467
IR 2	0.00221	7.08147	1,189.72	1.86173	0.2315	4,151.07	.000	0.461
IR 3	0.00170	6.88225	974.814	1.86173	0.1837	1,798.02	.000	0.443
UR 1	0.00249	7.10927	1,223.25	1.86173	0.2199	6,831.54	.000	0.477
UR 2	0.00124	6.48010	652.037	1.86173	0.0776	483.461	.000	0.435
Biscuits								
IR 1	0.00136	6.21140	498.398	3.19729	0.4763	36,207.2	.000	0.476
IR 2	0.00134	6.33253	562.578	3.19729	0.4314	56,647.5	.000	0.493
IR 3	0.00127	6.64762	770.949	3.19729	0.3748	15,184.9	.000	0.513
UR 1	0.00135	6.22410	504.768	3.19729	0.4944	34,585.0	.000	0.492
UR 2	0.00133	6.34431	569.242	3.19729	0.3618	22,435.0	.000	0.492
Juice								
IR 1	0.00121	7.74333	2,306.13	2.67799	0.1438	1,169.98	.000	0.570
IR 2	0.00118	8.00048	2,982.39	2.67799	0.1229	1,412.88	.000	0.594
IR 3	0.00090	8.03519	3,087.73	2.67799	0.2473	1,423.05	.000	0.554
UR 1	0.00093	7.80460	2,451.86	2.67799	0.1120	2,385.57	.000	0.593
UR 2	0.00089	7.62830	2,055.55	2.67799	0.1793	540.185	.000	0.536

Note. Regression results based on Equation 1: $LogQ = LogQ_0 + k(e^{-aQ_0C} - 1)$, across 3 informational benefit (IR) levels and 2 utilitarian benefit (UR) levels for baked beans, yellow fats, biscuits, and juice, respectively. Presenting variations of the *a* value across brand groups differing in informational benefit (IR) and utilitarian benefit (UR), adjusted R^2, *F* statistics, significant value of *F* test, the *a* value, the maximum consumption Q_0, and the *k* value.
*The regression is significant at 5% level.

downward-sloping, indicating that the *a* value decreases when the informational benefits of the brand group increases. Therefore, the increase of informational benefits in brand groups was associated with the decrease of the *a* value. Since the *a* value is reciprocal to the essential value, the decrease of the *a* value positively associates with the increase of the essential value. Hence, increases of informational benefits in brands are positively associated with increases of the essential value. Accordingly, increases of informational benefits in brands were positively associated with decreases of the price elasticity. Hence, Hypothesis 2 is accepted.

Shown in Table 2, the *a* values differ across brand groups with different utilitarian benefits. The *a* value ranges from 0.00053 to 0.00047 in UR Group 1 and 2 for baked beans. The *a* value varies from 0.00249 for UR Group 1 to 0.00124 in UR Group 2 for

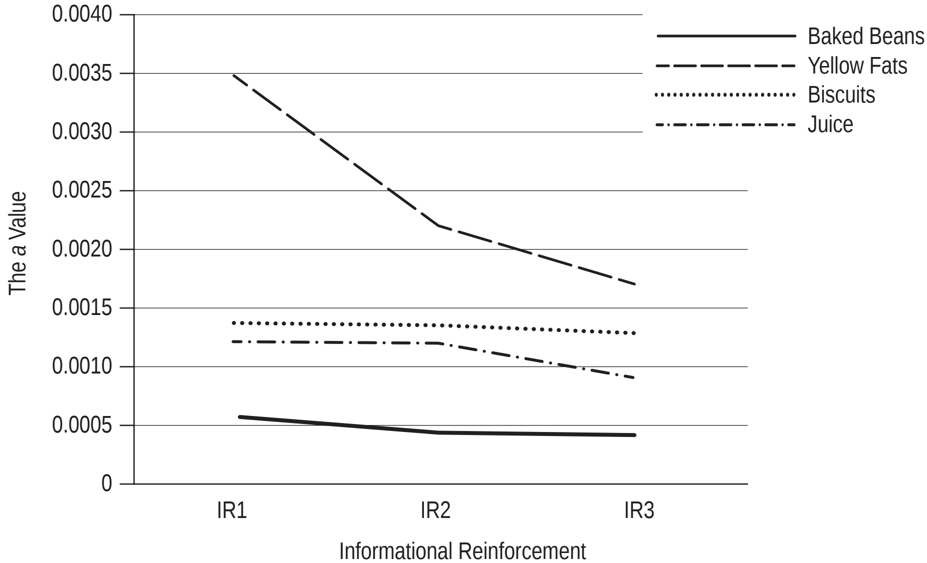

Figure 2. Patterns of the *a* value versus the informational benefit levels for baked beans, yellow fats, biscuits, and juice.

yellow fats. The *a* value for biscuits is 0.00135 and 0.00133 for UR Group 1 and 2, respectively. The *a* value ranges from 0.00093 in UR Group 1 to 0.00089 in UR Group 2 for juice. Figure 3 presents the patterns of *a* value variations with increases in the utilitarian benefits for baked beans, yellow fats, biscuits, and juice.

All lines shown in Figure 2 are downward sloping, indicating that the *a* value decreases when the utilitarian benefits level increases. Hence, the increase in the utilitarian benefits in brand groups is associated with the decrease of the *a* value. This implies that increases of utilitarian benefits in brands were associated with increases of the essential value. Hence, Hypothesis 3 is accepted.

Essential Value Variations Across Consumer Settings

We test price elasticity across two different consumer settings: open and closed. Such tests are required to ascertain whether between-group differences occur for each

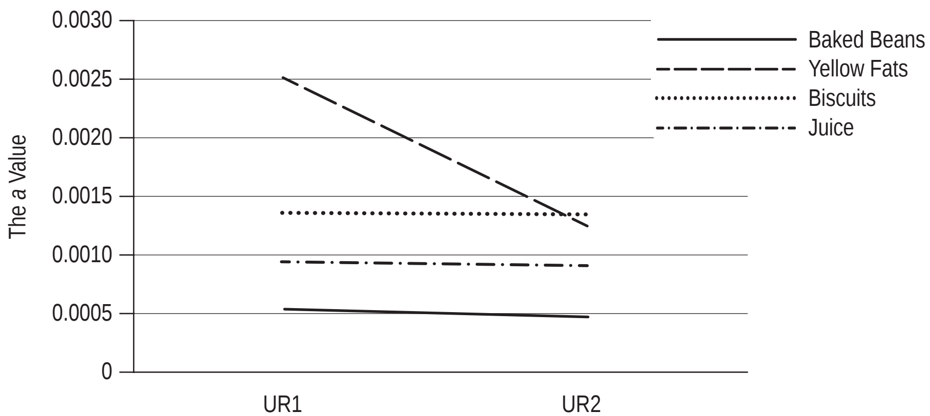

Figure 3. Patterns of the *a* value versus the utilitarian benefit levels for baked beans, yellow fats, biscuits, and juice.

of these settings. In order to accomplish this, the data must be divided for each product: Consumer Settings 1 (more closed) and Consumer Settings 2 (more open). As described above, the model tested is an exponential formulation, signaling a fixed elasticity for selected data points. All regressions are based on the Hursh–Silberberg model (Equation 1) applied to data for open and closed consumer settings for baked beans, yellow fats, biscuits, and juice, respectively. Regression results are summarized in Table 3.

Table 3
Variation of the a Value (the Reciprocal of Essential Value) Across Consumer Settings

Baked Beans	*a*	$LogQ_0$	Q_0	*k*	R^2	*F* statistic	Sig.*
Open	0.00050	7.86500	2,604.5	10.8476	0.247	1,652.42	.000
Closed	0.00048	8.021288	3,046.9	10.8476	0.348	110.798	.000
Yellow Fats							
Open	0.00428	7.76960	2,367.51	1.86173	0.002	181.257	.000
Closed	0.00295	7.51043	1,827	1.86173	0.067	39.2547	.000
Biscuits							
Open	0.00134	6.32301	557.247	3.19729	0.381	20,870.7	.000
Closed	0.00127	6.05853	427.745	3.19729	0.251	996.415	.000
Juice							
Open	0.00163	8.38515	4381.52	2.67799	0.047	508.898	.000
Closed	0.00118	7.90836	2719.92	2.67799	0.021	7.59903	.000

Note. Regression results based on Equation 1: $LogQ = LogQ_0 + k(e^{-aQ_0C} - 1)$, presenting variation of the *a* value across consumer groups in open and closed consumer settings, adjusted R^2, significant value of *F* test, the *a* value, the maximum consumption Q_0, and the *k* value.
*The regression is significant at 5% level.

All regressions are significant at 5% level ($p < .05$). R^2 ranges from 0.247 to 0.348 for baked beans, from 0.002 to 0.067 for yellow fats, from .251 to .381 for biscuits, and from .021 to .047 for fruit juice. Hence, R^2 differs between small ranges within the same product, indicating that predicative adequacy is constant across different subcategories of data. Variations in essential value across consumer settings are shown in Table 3. The *a* value across each consumer setting for four products is presented in the second column from the left, ranging from .0005 to .00048 for baked beans, from 0.00428 to 0.00295 for yellow fats, from 0.00134 to 0.00127 for biscuits, and from 0.00163 to 0.00118 for juice, from open to closed. Since *a* value is the reciprocal of essential value, distinctions among the *a* value equal variations of essential value across consumer settings. Two considerations emerge from these results. First, the regressions show that essential value varies across consumer settings. Second, the results reveal how *a* values vary across consumer settings for the four products. Increases in the closedness of consumer settings are associated with decreases in *a* value. Since increases of *a* value are associated with increases in price elasticity, the more closed the consumer setting, the smaller is price elasticity (Figure 4).

The four lines shown in Figure 4 are all downward sloping from left to right, indicating that increases of the closedness of the consumer setting is associated with decreases in *a* value. Hence, increases in the openness of the consumer setting are associated with increases in price elasticity. The choice behavior of consumers in more open settings is more price elastic than that of consumers in more closed settings. Hence, Hypothesis 4 is accepted.

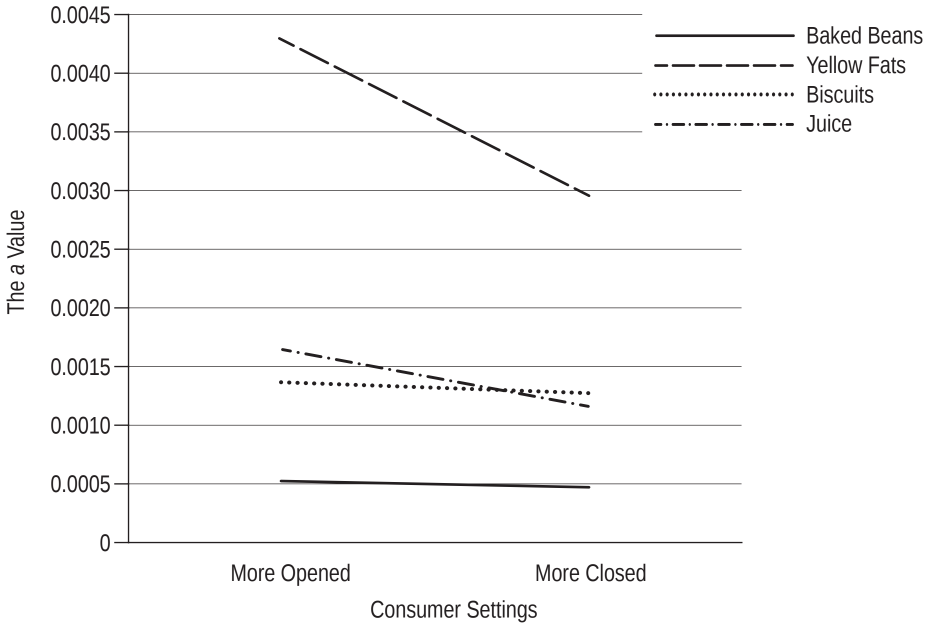

Figure 4. Variation of the *a* value across consumer settings (from closer setting to opener setting) for baked beans, yellow fats, biscuits, and juice.

Discussion

The value of a brand reflects the level of utilitarian and informational benefits it provides (Foxall et al., 2004; Oliveira-Castro et al., 2006). Like price, informational and utilitarian benefits influence the level of buying behavior (i.e., quantity of consumption). This finding is in accordance with the theory that brand groups, classified by different informational and utilitarian benefits, attract consumers by offering various levels of functional and symbolic reward. Aggregated analyses revealed distinct levels of essential value across brand groups within each product category. Variation in essential value across brand groups implies that levels of buying behavior from brand group to brand group differ in response to the pattern of the reward sought by consumers. This is in line with the theoretical anticipation that brand-related characteristics determine choice behavior. This result corroborates the findings of Foxall et al. (in press), who employed the traditional demand curve, which show that brand groups, defined by the patterns of reinforcement that maintain their consumers' purchase behavior, have distinct elasticities of demand.

Results imply that consumers maximize their utility not only by paying less money but also by gaining more functional and/or nonfunctional benefits from the product. As defined in the BPM, utilitarian benefit is related to biological satisfaction that is directly mediated by the brand itself. The more attributes a brand provides, the larger the essential value of the brand, and the smaller the price elasticity. Unlike utilitarian benefits, informational benefits were nonbiological satisfactions mediated by other people or through self-appraisal by the consumer. The more well-known or higher quality the brand, the more informational benefit the consumer obtains. Thus, purchasing and consuming brands with higher levels of informational benefit brings consumers extra satisfactions in addition to the fulfillment of their functional needs. The findings show consistency with the theoretically expected patterns for the aggregated level of analysis. The individual effects of informational and utilitarian benefits on the choice behavior are clearly indicated: increases in utilitarian benefit are associate with increases in essential value; increases in informational benefit are also related to increases in essential value. The basis of this aggregated analysis was established by splitting data into three groups differing in informational benefits level and two groups differing in utilitarian benefits level. Brands embodying a certain level of combined informational and utilitarian benefit were treated as homogeneous. The essential value for each group specifies different levels of price elasticity and dissimilar ability to maintain levels of buying behavior. Results show that the higher level of informational or utilitarian benefits, the larger essential value. This is consistent with the finding that the essential value of Group 6 (IR 3, UR 2) is larger than that of Group 1 (IR 1, UR 1). Hence, increases in informational and utilitarian benefit are associated with increases in the essential value, indicating that combination of informational and utilitarian benefit is a key to understanding what consumers maximize.

Coming to the role of situational influence on consumer choice, our starting point is the widespread observation that changes in experimental conditions are responsible for the modification of both animal and human behavior. The BPM proposes that situational influences reflected in the scope of the consumer behavior setting affect choice. This is paralleled in the experimental analysis of behavior by the finding that the availability of rewards in open as opposed to closed economies determines such aspects of behavior as its sensitivity to schedule parameters and hence varying elasticities of demand (Hursh, 1980, 1984; Hursh & Silberberg, 2008; see also Elsmore et al., 1980; Foxall & Greenley, 1999; Giordano et al., 2001). The animal laboratory provides a closed setting that enhances observation of the antecedents and outcomes of behavior; in this milieu, situational influences are under the rigorous control of prearranged types of reinforcer and other aspects of the nexus of learning contingencies to which the experimental participant is subjected. In the human operant laboratory, participants are presented with a less closed setting, from which participants can escape or in which they can at least modify their behavior or select among a range of behaviors that are not compelled (e.g., by food deprivation or other unusual constraints). Even where deprivation (e.g., of drugs) is a part of the experimental design, it is limited by ethical considerations, and as a last resort the participant can exit the situation. One consequence of this is that experimental results in less closed settings are more ambiguous, in that they may be amenable to multiple explanations, than are those gained in more closed settings.

The research we have reported clarifies the different patterns of behavior consumers perform in more closed as opposed to more open settings. The consumer behaviors investigated all occurred in natural settings that varied in scope, though all would be considered toward the more open end of a continuum of research settings. In more open settings of this kind, the difficulty of defining responses, let alone the stimulus conditions that control them, is far greater than is the case in animal experiments taking place in the closed confines of the operant chamber. Nevertheless, we classified naturally occurring consumer behavior settings into two groups, based on the distinction of store size and characteristics of store functions (i.e., supermarkets for routine shopping and convenient stores for occasional needs). The results indicate differences between these two types of consumer settings by highlighting differences between the essential values of brands purchased in each environment. The essential value of purchased brands differs between closed and open settings: Essential value of brands purchased in closed settings is larger than that of brands purchased in open settings. Since the larger the essential value, the smaller the price elasticity, this means that brands in closed settings show smaller price elasticity than those in open settings. It implies that consumers are more sensitive to the prices charged in open settings than to those in closed settings; no doubt this reflects differences in the number of brands available in each, the lack of competitive pressures in closed settings, and the limitations imposed on consumer decision processes in closed settings (e.g., shortage of time). It also validates the characteristics of open and closed consumer settings. Numerous options among brands are available in the typical supermarket, in which the consumer is exposed to several brands and configurations of any given product. By contrast, a convenience store is less open: the consumer has less choice. Our results confirm the theoretical expectation of the BPM that consumers are more price sensitive when confronted by more options and less deterred by higher prices in closed settings, where choices are more limited.

Summary and Conclusion

All choice behavior is affected by its costs and benefits, but in the case of animal experiments and human research involving addiction, biological costs and benefits are paramount. Human choice behavior for food brands is far more complex than this, since it is the outcome of numerous social as well as biological influences. The BPM portrays biological and nonbiological satisfactions in terms of utilitarian benefits (which consist principally in primary reinforcement) and informational benefits (which are for the most part based upon secondary reinforcement). In the case of human consumption, the combination of both sources of benefit is reflected in the “value” of products and the patterns of buying behavior. Moreover, as is the case in animal experiments, the scope of the behavior setting is a crucial influence on choice.

Using Hursh and Silberberg’s (2008) model for behavioral-economic demand curves, our results show that the higher the informational benefit level, the larger the essential value, and the higher the utilitarian benefit level, the larger the essential value. Crudely put, from the marketer’s viewpoint, this suggests that the greater the levels of utilitarian and informational reinforcement provided consumers, the higher will be the prices they are willing to pay for the brand. The presentation of benefits in the form of utilitarian and information reinforcers creates a consumer surplus, which increases the attractiveness of the brand in question to the consumer; however, the marketer is able to capture some of this surplus by charging a higher price. In addition, consumer choice is affected by the degree of openness of the behavior setting: Consumers show higher price responsiveness in open settings as opposed to closed. In summary, we have shown that the depiction of the contingencies of reinforcement portrayed by the BPM (i.e., the pattern of utilitarian and informational reinforcement and the scope of the consumer behavior setting) provides a new understanding of the complexities involved in human choice behavior, occurring in natural settings, for a variety of reinforcers and combinations of reinforcers. Moreover, the settings investigated reflect a variety of competitive market situations, contingencies that cannot be reproduced in animal and human addiction studies; consumer behavior settings also entail controlling factors, such as advertising, distribution, and product and brand differentiation, which are not present in traditional behavior-analytic studies, which are confined to considerations of price effects but necessarily ignore the remainder of the marketing mix.

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