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In an attempt to bring consumer psychology theories into research on the timing of repurchase of consumer durables, the authors suggest that attitude functions (knowledge, value expressive, social adjustive, and utilitarian) can help explain and predict interpurchase intervals. Adopting an interactionist perspective, the authors propose that the effect of the attitude functions is contingent on contextual factors, which they theorize as the nature of the product (along public–private and luxury–necessity dimensions) and the nature of the decision (forced or unforced purchase decision). Hypothesis testing is facilitated by survey data on actual purchase decisions and hazard models that incorporate individual heterogeneity. The results support the suggested role of attitude functions in explaining and predicting interpurchase intervals and suggest means by which managers can position their products to shorten interpurchase intervals.

The Timing of Repeat Purchases of Consumer Durable Goods: The Role of Functional Bases of Consumer Attitudes

Firms that sell consumer durable products face two unique challenges: (1) Durables typically cost substantially more than nondurable products and thus entail greater financial risk for consumers, and (2) the purchase of durable products is characterized by a buyer purchasing a product and then staying away from the market for a long period, only to return to the market for a short time either to purchase an additional item or to replace an existing durable. Therefore, because consumers are in the market for a short period and spend a substantial dollar amount in that period, it becomes critical for marketers to identify the right consumer at the right time in order to target and market their products effectively.

Accurately predicting the timing of the purchase of consumer durables helps marketers better target their communications and promotions. For example, direct marketing campaigns typically have low response rates of approximately 2% (McIntyre 1991), which implies that there is much room for improvement. As a result, many researchers have attempted to understand the timing of the purchase of consumer durables (Deaton and Muellbauer 1980; Jain and Vilcassim 1991; Raymond, Beard, and Gropper 1993). However, much of the consumer durable research has focused primarily on demographic and economic variables as the main explanatory variables for the timing of the purchase of consumer durables (Bayus and Mehta 1995; Haldar and Rao 1998) and has been devoid of theories of consumer behavior. To move beyond demographic variables and to enrich consumer durable research with psychological variables, we adopt an interactionist perspective, which suggests that consumer behavior depends on (1) the context, (2) the individual differences, and (3) the interaction between the two (Dickson 1982; Punj and Stewart 1983). As such, our research endeavor is similar in spirit to recent research that integrates insights from behavioral and marketing science research (e.g., Hutchinson, Kamakura, and Lynch 2000; Simonson and Winer 1992).

Even though the primary focus for the choice of contextual and individual difference variables in our research is from the demand-side perspective, we acknowledge that many supply-side factors, such as the rate of technological advances and the durability of the products, influence the timing of the repurchase of consumer durables (e.g., Mahajan, Mueller, and Bass 1990). Throughout this article, we underscore the importance of relevant supply-side variables

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and notably control for product category effects and innovativeness in a product category. To capture the context, we study two variables. First, we study the influence of the nature of the durable, which we investigate along public–private and luxury–necessity dimensions (Bearden and Etzel 1982). Second, consistent with research on consumer durable products, we examine the nature of the decision, which we view as either a forced or an unforced purchase decision (Bayus 1988).

We rely on theories of the functional bases of attitudes to conceptualize and operationalize the individual difference variables that are likely to influence the timing of purchases of consumer durables. Functional theories suggest that people possess attitudes because of the psychological benefits they derive from doing so (Eagly and Chaiken 1993, 1998; Kardes and Cronley 2000; Katz 1960). Attitudes enable people to meet specific needs, thereby facilitating the planning, implementation, and attainment of goals (Herek 1986, 1987; Katz, 1960; Shavitt 1990; Smith, Bruner, and White 1956; Snyder and DeBono 1987, 1989). Moreover, the same product may provide different benefits and fulfill different goals for different consumers. For example, an automobile serves a social-adjustive function for some consumers but a utilitarian function for others. When social-adjustive concerns are salient, consumers are motivated to own the latest and most prestigious models because such products help them fit into desired social situations. In contrast, products that serve the utilitarian function merely serve as a means to an end. Consumers who hold a utilitarian attitude toward their automobiles view the automobiles as machines that take them from Point A to Point B. Appearance, style, prestige, and esteem are irrelevant when attitudes toward products serve a utilitarian function.

We use survey data and hazard models with individual heterogeneity to test the research model. Our primary theoretical contribution is the integration of the literature on the influence of contextual factors on durable buyer behavior and theories of attitude functions. From a managerial perspective, we provide insights into the factors that explain the timing of purchases of consumer durables. It may be possible for managers to use our results to position specific durable goods and to influence the rate of repurchase of the durables.

CONCEPTUAL BACKGROUND AND RESEARCH HYPOTHESES

The timing of a purchase decision for a consumer durable product is directly related to the age of the consumer's current durable. Typically, as the age of the current durable increases, the likelihood of the consumer either purchasing an additional item or replacing the current durable also increases. Thus, research has focused on determining and reducing the interpurchase interval (e.g., Bayus 1988; Bayus and Mehta 1995; Haldar and Rao 1998). In addition, information on interpurchase intervals is important in the targeting of marketing communications and promotions and in brand positioning. To study this theoretical and substantive issue, we suggest that contextual factors and attitude functions performed by durables influence the duration of the interpurchase intervals.

Contextual Factors

Nature of the product. Classic research in consumer behavior indicates that durable goods differ from one another in terms of reference group influences. In a consumer domain, reference groups reflect consumers' attempts to orient their purchase behavior toward other consumers with whom they interact. A product decision is likely to be affected by reference groups if the product (1) is seen by others at some point during its consumption episode and (2) is exclusive in some way. "Publicly consumed products are seen by others, while privately consumed products are not," and luxury products are more exclusive, relative to necessities (Bearden and Etzel 1982, p. 184).

Nature of the decision. Consumer durable research suggests that consumers purchase durables for two main reasons. The first is what Bayus (1988) refers to as a "forced" purchase and what DeBell and Dardis (1979) call "performance obsolescence." The motivation for this type of a purchase decision stems from the poor performance of the current durable such that the durability and the reliability of products influence their performance. The second type of purchase decision is "unforced" (Bayus 1988) or "fashion/technological obsolescence" (DeBell and Dardis 1979). In this case, innovations and enhancements in a product category generate excitement among consumers and motivate them to repurchase a durable. The importance of supply-side dynamics is evident here. Supply-side factors influence the nature of the decision because the pace of technological advances affects unforced purchase decisions, and durability and reliability influence forced purchase decisions. Nonetheless, the reason for purchasing a durable determines the way a consumer formulates the purchase decision. Formulation of the decision problem influences the relative attractiveness of various alternatives. Unforced (rather than forced) formulation generates greater excitement and intrinsic interest.

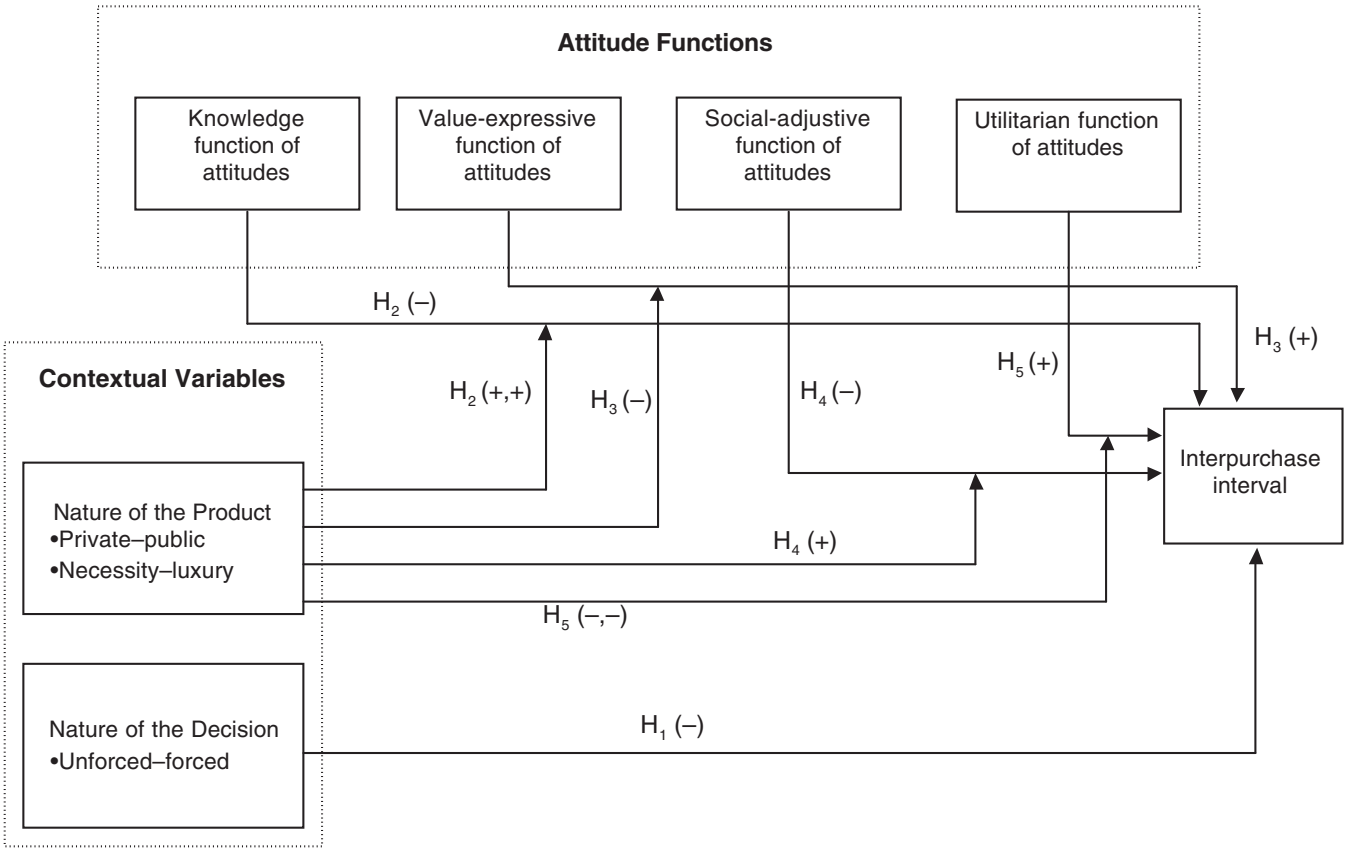
H_1: Unforced formulation results in shorter interpurchase intervals than forced formulation.

Functional Bases of Attitudes

Functional theories of attitudes (Eagly and Chaiken 1993, 1998; Kardes and Cronley 2000; Katz 1960) suggest that people hold attitudes because they are useful. Attitudes serve many functions, including the facilitation of decision making (the knowledge function), communication (the value-expressive function), social interaction (the social-adjustive function), and the fulfillment of hedonistic goals (the utilitarian function). Prior research has demonstrated the importance of attitude functions in explaining consumer behavior. For example, research on attitude change suggests that an understanding of attitude functions is important because persuasion is greater when the type of message that is presented matches (rather than mismatches) the type of attitude that a consumer is attempting to change (Clary et al. 1994; Petty and Wegener 1998). Moreover, we suggest that attitude functions exert an important influence on the timing of durable repeat purchase. For a summary of the hypotheses, see Figure 1.

Attitudes that serve the knowledge function help consumers organize, structure, and summarize large amounts of complex information about an attitude object. Attitudes serving this function help consumers make decisions quickly and easily without referring to all the specific information that they initially used as a basis for attitude formation. To some extent, all attitudes serve this fundamental function (Fazio 1989). Attitudes serving the value-

Figure 1
PROPOSED MODEL



Notes: We controlled for several demographic and economic variables (for details on the variables, see Table 4).

expressive function help consumers express their central values, idiosyncratic preferences, and self-perceptions to others (Katz 1960; Shavitt 1990). Such attitudes facilitate interpersonal communication and help consumers identify like-minded consumers. Attitudes serving the social-adjustive function conform to the expectations of others to permit social interactions to run smoothly and more efficiently (Smith, Bruner, and White 1956; Snyder and DeBono 1989). Finally, some attitudes serve the utilitarian or instrumental (e.g., means to an end) function, which helps consumers maximize rewards and minimize punishment (Herek 1987; Katz 1960).

Knowledge Function of Attitudes

In the product domain, the knowledge function distinguishes between consumers who have high levels of product-relevant knowledge (experts) and consumers who have relatively low levels of product-domain knowledge (novices). Compared with novices, experts possess "the ability to perform product related tasks successfully" (Alba and Hutchinson 1987, p. 411) because they have both a richer store of prior knowledge that is manifest in finely differentiated and hierarchically organized cognitive representations and well-developed consumption rules with firmly entrenched beliefs and expectations about product performance (Brucks 1985; Sujan 1985).

Experts also "have extensive attitude-relevant beliefs and prior experiences available in memory to evaluate new information and to inform their attitude judgments" (Biek, Wood, and Chaiken 1996, p. 547). Research shows that the beliefs and attitudes of experts can initiate two different types of evaluation processes: biased-defensive processing (Petty, Priester, and Wegener 1994) and critical-objective processing (Wood and Kallgren 1988). In the context of consumer decision making about durables, defensive processing results in the one-sided or selective search for evidence that provides favorable evaluative implications pertaining to a currently owned durable and the neglecting of negative information (Alba and Hutchinson 2000). Such selective processing is made possible by sentiments associated with the currently owned durable (Kirmani, Sood, and Bridges 1999). In contrast, an objectively motivated consumer processes information in a more balanced (rather than selective) manner and focuses on both favorable and unfavorable information (Chaiken, Giner-Sorolla, and Chen 1996; Petty and Cacioppo 1986). Affect plays an important role in determining the processing route (biased or critical) that a consumer is likely to use (Biek, Wood, and Chaiken 1996; Val-

lone, Ross, and Lepper 1985). Therefore, the ability of a product to evoke positive affect determines the processing route and the interpurchase interval.

Attitudes serving the knowledge function help consumers "organize and categorize the world in a meaningful and consistent fashion, providing order, clarity, and consistency in one's frame of reference" (Herek 1987, p. 285; Katz 1960). This conceptualization is consistent with Webster and Kruglanski's (1994) need for cognitive closure such that knowledge function assesses the desire for knowledge, any knowledge, rather than confusion and ambiguity (see also Kruglanski 1989). Thus, on average, experts would be able to process information more objectively than would novices. This efficient information processing should manifest in lower interpurchase intervals for experts than for novices. Furthermore, in terms of affect, currently owned public products should engender higher levels of positive affect than privately consumed products, because the public goods are more susceptible to reference group and other interpersonal influences (Bearden and Etzel 1982). Thus, biased processing would ensue for both experts and novices. When consumers are highly knowledgeable about a particular product category, the criteria they use in judgment are more likely to be well defined and stable across contexts (Bettman, Luce, and Payne 1998). As a consequence, for highly knowledgeable consumers, context effects should be reduced and more satisfying product choices should be made across contexts. The consistent application of standards for judgment enables consumers to make choices that are more rewarding and satisfying in the long run. Such choices induce positive affect that is interpreted as a cue indicating that the decision is of high quality and does not require reevaluation (Schwarz and Clore 1996). Consequently, experts (rather than novices) are more likely to maintain their current choices and to postpone repurchase. Therefore, positive affect and the ability to keep the current durable should manifest in longer interpurchase intervals for experts than for novices for public goods rather than private goods. Similarly, luxury products, because of their exclusiveness, are more likely to arouse affect than are necessities, thereby resulting in longer interpurchase intervals for luxuries than for necessities.

H_2: As the knowledge function performed by attitudes increases, the interpurchase interval decreases, and this effect is less pronounced for publicly (rather than privately) consumed durables and for luxuries (rather than necessities).

Value-Expressive Function of Attitudes

Value-expressive attitudes help consumers express their central values and self-identities to others. Consumers who possess attitudes that perform the value-expressive function make consumption decisions based on their self-identity and their expectations of how others will react to their purchase decisions (DeBono 1987; Shavitt 1989a, b, 1990; Snyder and DeBono 1989). Consequently, when value-expressive concerns are highlighted, consumers believe that they should explain or justify their product-related judgments and decisions to others. Prior research on the effects of the need to justify decisions to others has shown that accountability increases the magnitude of the status quo effect (Tetlock and Boettger 1994). A pharmaceutical product that provides significant health benefits and risks (side effects) was described as being currently on the market or as being considered for introduction to the market. As accountability increased, subjects recommended keeping the product on the market if it was already on the market (thereby maintaining the status quo) or keeping the product off the market if it was currently off the market (thereby maintaining the status quo). Thus, consumers perceived the product as desirable or undesirable depending on its current market status. Moreover, as risk increased, accountable subjects were more likely to postpone decision making (procrastination) and to recommend that someone else make the decision (buck-passing). As the extent to which an attitude serves the value-expressive function increases, a consumer's need to justify decisions to others should increase, and this should delay decision making and postpone repurchase.

The mere ownership effect is also likely to contribute to longer interpurchase intervals for consumer durables. Prior research on the mere ownership effect has shown that consumers develop a strong emotional attachment to products that are linked to central personal values, and emotional attachment decreases the willingness to replace a currently owned possession with a new one (Beggan 1992). Together, the status quo effect and the mere ownership effect suggest that consumers are often reluctant to abandon currently owned durables in favor of newer and potentially superior models. This pattern should be less pronounced for publicly (rather than privately) consumed durables, because accountability is higher for publicly consumed products across levels of the degree to which the value-expressive function is activated.

H_3: As the value-expressive function performed by attitudes increases, the interpurchase interval increases, and this effect is less pronounced for publicly consumed durables than for privately consumed durables.

Social-Adjustive Function of Attitudes

Attitudes that serve the social-adjustive function help consumers gain approval in social settings (Grewal, Mehta, and Kardes 2000; Shavitt 1989a; Snyder and DeBono 1987, 1989). Social-adjustive attitudes are highly susceptible to normative influence, that is, the "tendency to conform to [the] expectations of others" (Bearden, Netemeyer, and Teel 1989, p. 474; see also Burnkrant and Cousineau 1975; Deutsch and Gerard 1955; Park and Lessig 1977). Products that fulfill the social-adjustive function help consumers achieve desired social goals by providing them with the characteristics they believe they lack (e.g., Belk 1988; Shavitt 1989a). As concern about social approval increases, the desire to replace outdated durables with prestigious new models should increase (Schlenker 1980).

However, on the basis of the literature pertaining to the endowment effect, we expect a different dynamic for public goods. The value of a product increases when it becomes a part of consumers' endowment (Knetsch and Sinden 1984; Thaler 1980). With prospect theory as the underlying theoretical motivation, endowment effects manifest because a consumer's willingness to accept a price for a currently owned good (loss framing) is much greater than the willingness to pay for that good (gain framing; Kahneman, Knetsch, and Thaler 1990). Thus, losses loom larger than gains of similar magnitudes (Kahneman and Tversky 1979).

For public goods that perform the social-adjustive function, compared with private goods that perform the social-adjustive function, loss framing is more likely. In other words, as other people (reference groups) are more aware of the consumption of public goods, the public goods endow their owners with the ability to achieve social goals. Because achieving social goals is more critical for consumers for whom the product performs the social-adjustive function, these consumers frame the repurchase decision of a public durable as a loss because the currently owned durable has been central to their value system for achieving desired social goals. Thus, we expect a higher interpurchase interval for public durables that perform the social-adjustive function than for private durables that perform the social-adjustive function.

H_4: As the social-adjustive function performed by attitudes increases, the interpurchase interval decreases, and this effect is less pronounced for publicly consumed durables than for privately consumed durables.

Utilitarian Function of Attitudes

Attitudes that serve the utilitarian function are linked to vested interests, and such attitudes help consumers maximize rewards resulting from consumption experiences. The utilitarian attitude function focuses on the hedonic consequences of consumption (Herek 1987; Shavitt 1989b, 1990). To the extent that consumers' attitudes toward a durable serve the utilitarian function, the durable is perceived as a mere extrinsic means to an end, and intrinsic factors (e.g., appearance, style, prestige, esteem) become irrelevant. The lack of intrinsic interest in a durable category reduces the emotional appeal of new models and encourages consumers to adopt a pragmatic "if it ain't broke, don't fix it" perspective. However, the strength of the utilitarian attitudes should vary with the nature of the product (Eagly and Chaiken 1998; Petty and Krosnick 1995). Utilitarian attitudes should be less pronounced for publicly (rather than privately) consumed durables and for luxuries (rather than necessities) because publicly consumed durables are more likely to be associated with multiple attitude functions, and benefits of luxuries, because of their exclusivity, surpass those needed to satisfy simple utilitarian attitudes.

H_5: As the utilitarian function performed by attitudes increases, the interpurchase interval increases, and this effect is less pronounced for publicly (rather than privately) consumed durables and for luxuries (rather than necessities).

METHOD

Sample and Data Collection

We used the survey approach and mailed questionnaires to a random sample of employees of a large eastern university. We mailed a cover letter along with a copy of the research instrument to a random sample of 3600 potential respondents from a sampling frame of more than 16,000. The cover letter stated that the purpose of the study was to understand buyer behavior in durable goods. We offered the respondents a chance to win one of four possible prizes of $100 as an incentive for responding. Of the 3600 surveys mailed, we received 774 responses, giving us a response rate of 21.5%. There were four versions of the questionnaire, which made it possible for us to collect data on eight products (i.e., each version had questions on two products). We selected the eight product categories on the basis of the literature (Bearden and Etzel 1982) and a pretest.[1] For the eight product categories (i.e., cameras, cars, vacuum cleaners, wristwatches, digital videodisc [DVD] players, refrigerators, televisions, and golf bags) we received 137, 201, 185, 173, 175, 134, 152, and 40 complete responses, respectively. Because most of our respondents did not own golf clubs, we deleted this product category from our analysis, which resulted in a sample size of 1157.

Measures

When possible, we used existing measures (e.g., private–public products; for exact measures, see Appendix A); otherwise, we developed multi-item measures using established scale development procedures (e.g., Churchill 1979). We used Bayus and Mehta's (1995) two-step procedure to measure interpurchase interval.[2] To measure the nature of the decision, we used a six-item measure that assessed the reason for repurchase. The items emphasized the reason for repurchase as either the functioning or obsolete nature of the currently owned durable or enhancement in new models. To assess the innovativeness in a product category, we used a six-item measure that measured perceived technological changes. In addition, we used a six-item measure to assess future outlook at the time of the purchase; three items framed the future outlook as optimistic, and three items framed it as pessimistic.

The measure for the knowledge function of attitudes assessed the extent to which the durable makes life more predictable by structuring and organizing the environment and by providing a sense of security in an uncertain world. The measure for the value-expressive function of attitudes assessed the extent to which the durable reflects a consumer's self-image, self-identity, and self-concept. The measure for the social-adjustive function of attitudes assessed the extent to which the durable is perceived as a

[1]The objective of the pretest was to select durable products with variance along the public–private and luxury–necessity dimensions. Using measures developed by Bearden and Etzel (1982) and a procedure similar to that used in the main study, we mailed surveys to a random sample to collect data on six products. Of the 100 surveys mailed, we obtained 34 responses, of which 33 were complete and usable. For the potential products (camera, car, computer, microwave oven, television, and vacuum cleaner), the means on the public–private continuum (1 = "public" and 6 = "private") were 2.80, 1.58, 4.63, 4.92, 4.64, and 5.24, respectively. The means for the same products on the luxury–necessity dimension (1 = "luxury" and 6 = "necessity") were 3.15, 4.61, 3.28, 3.10, 3.52, and 4.84, respectively. From these results, we chose cameras, cars, televisions, and vacuum cleaners. In addition, on the basis of the literature (Bearden and Etzel 1982), experience of the researchers, and reviewer feedback, we collected data on golf bags, wristwatches, DVD (and VCR) players, and refrigerators.

[2]As an illustration, for cars, we asked the respondents whether they had replaced their car or purchased an additional car. If they responded yes to either replacing or purchasing an additional car, we asked them to state the age of the old car. If they responded no to both questions, we asked them the age of the oldest car they owned. We measured age in eight three-year intervals (i.e., 0–2, 3–5, 6–7, 9–11, 12–14, 15–17, 18–20, and 21+). Consistent with the duration modeling approach (Sinha and Chandrashekaran 1992), if the response to both the questions was no, we treated the observation as censored; otherwise, the observation was complete or uncensored.

symbol of social status and aids in fitting into important social situations. The six-items we used to measure the utilitarian function assessed the extent to which the durable (1) maximizes rewards, (2) instills confidence, (3) puts the consumer at ease, (4) minimizes punishments, (5) increases poise, and (6) aids in managing worries (for measures, see Appendix A).

Estimation Framework

Because interpurchase interval was our dependent variable, a hazard model approach seemed appropriate (e.g., Helsen and Schmittlein 1993; Jain and Vilcassim 1991). With the hazard function at its core, the hazard model approach focuses on the conditional probability of an event occurring given that it has not yet occurred. This approach also makes it possible to incorporate censored observations, which in our case represent respondents who did not replace the durable (Kiefer 1988). Consistent with this approach, we define the hazard function as $h(t) = f(t)/S(t) = \{-\partial[\ln S(t)]/\partial t\}$, where f(t) is the density function, and S(t) is the survivor function. Furthermore, $S(t) = 1 - F(t)$, where F(t) is the cumulative probability function.

Literature suggests that the probability of a consumer replacing the durable, that is, the hazard, should exhibit positive duration dependence and monotonically increase with time (e.g., Haldar and Rao 1998). In other words, $[\partial h(t)/\partial t] > 0$. As a result, scholars have recommended use of the Weibull distribution to model the interpurchase interval (e.g., Bayus 1988, 1991; Haldar and Rao 1998; Sinha and Chandrashekaran 1992). The Weibull distribution is a two-parameter distribution $\{S[t] = \exp[-(\lambda t)^{\rho}]\}$ that can accommodate positive ($\rho > 1$), negative ($\rho < 1$), and zero ($\rho = 1$) duration dependence (Kiefer 1988).

However, to account for unobserved and unmeasured variables, we must incorporate individual heterogeneity into the Weibull hazard function (e.g., Haldar and Rao 1998; Jacobson 1990). Failure to incorporate heterogeneity can result in inconsistent and inefficient estimates (Gourieroux, Monfort, and Trognon 1984; see also Kiefer 1988; Heckman and Singer 1984). Specifically, to incorporate individual heterogeneity, we specify the survivor function as follows:

$$S(t/\nu) = \nu\{\exp[(-\lambda t)^{\rho}]\}, \tag{1}$$

where ν is a random variable with distributed generalized gamma with mean of 1 and variance $\tau = 1/\kappa$. (Note that by assuming a mean of 1, no generalizability is lost if the model contains a constant; Greene 1997.) Therefore:

$$f(\nu) = \frac{\kappa^{\kappa}}{\Gamma(\kappa)} \times \exp(-\kappa\nu)\nu^{\kappa-1}. \tag{2}$$

Thus, we obtain the survivor function by integrating out the heterogeneity term:

$$S(t) = \int_0^{\infty} \nu S(t/\nu) f(\nu) d\nu. \tag{3}$$

The result is

$$S(t) = [1 + \tau(\lambda t)^{\rho}]^{-1/\tau}. \tag{4}$$

The generalized gamma distribution offers flexibility in modeling the error term, because the distribution can take various shapes and it nests other distribution, such as the Weibull ($\kappa = 1$), among others, and thereby contains a low risk of misspecification (Haldar and Rao 1998). On the basis of the survivor function in Equation 1, we derived the likelihood function (Appendix B) and maximized it to obtain parameter estimates.

RESULTS

Measure Validation

To maintain sufficient sample size to number of parameters estimated, we used three confirmatory factor analysis models, with maximally similar scales in each model, to validate our measures (Anderson and Gerbing 1988). The first model consisted of the four attitude functions (knowledge, value expressive, social adjustive, and utilitarian), the second model consisted of the three product variables (private–public, necessity–luxury, and degree of innovativeness), and the third model consisted of the purchase-decision formulation variable and future outlook at the time of purchase of the durable. Table 1 summarizes the results from the confirmatory factor analysis models. The results show good convergent properties for the three models. In addition, the reliabilities for all constructs are greater than the recommended value of .7 (Nunnally and Bernstein 1994). Finally, the 95% confidence interval around the phi-squares across the four product categories does not contain 1 (or –1), thereby establishing discriminant validity for the measures (Anderson and Gerbing 1988). We present the descriptive statistics of

Table 1
CONFIRMATORY FACTOR ANALYSIS RESULTS

Measurement Model	*Range of Standardized Factor Loadings*	*GFI*	*NNFI*	*CFI*	*RMSEA*	χ^2 *(d.f., p-value)*
Attitude functions[a]	.75–.96	.98	.97	.98	.056	1272.8 (269, $p < .01$)
Nature of product[b]	.66–.99	.99	.99	.99	.085	1269.6 (132, $p < .01$)
Framing and financial situation[c]	.71–.99	.99	.99	.99	.147	1424.4 (53, $p < .01$)

[a]This measurement model consisted of the four attitude function variables with reliabilities of .97, .98, .99, and .98 for utilitarian attitudes, knowledge attitudes, value-expressive attitudes, and social-adjustive attitudes, respectively.

[b]This measurement model consisted of private–public products (reliability = .99), necessity–luxury products (reliability = .99), and degree of innovativeness (reliability = .97).

[c]The reliabilities for framing and financial situation were .92 and .99, respectively.

Notes: We report composite reliabilities using the formulas recommended by Bagozzi and Yi (1988). GFI = goodness-of-fit index, NNFI = nonnormed fit index, CFI = comparative fit index, and RMSEA = root mean square error of approximation. We used asymptotic covariance matrices as input matrices for the three measurement models.

product-specific variables in Table 2 and demographic variables in Table 3.

Overall Model Fit and Predictive Validity

Table 4 summarizes the maximum likelihood estimates for the Weibull model with individual heterogeneity. To account for product-specific factors, we included product-specific dummy variables. To assess the overall model fit, we estimated three models that the hypothesized model nests. Specifically, we estimated Model 1 with only product-specific constants; Model 2 also contained the demographic and economic variables, and Model 3 also contained the three contextual variables (i.e., private–public, necessity–luxury, and the formulation of the purchase decision). A series of likelihood ratio tests showed that the hypothesized model outperformed the three submodels (Model 1: χ^2 = 261.5, degrees of freedom [d.f.] = 23, $p < .01$; Model 2: χ^2 = 187.1, d.f. = 17, $p < .01$; and Model 3: χ^2 = 21.2, d.f. = 10, $p < .05$).

To assess the predictive validity of the hypothesized model in relation to the three submodels, we divided the sample into two equal parts randomly and then reestimated the model with the first part and predicted the repurchase duration for the second part. Toward the bottom of Table 4, we present the prediction accuracy for the four models. As is evident from the root mean square error (RMSE), mean absolute error (MAE), and Theil U statistic (TUS), the hypothesized model outperforms the three submodels. An issue that arises in prediction analysis in duration models is that of data censoring (22.4% of our data was censored). Data censoring makes the predictions measures (i.e., RMSE, MAE, and TUS) we used less reliable. We took two measures to ensure the reliability of our prediction analysis. First, we deleted the censored cases in the holdout sample and recalculated the forecasting statistics. Again, the hypothesized model outperformed the other three (RMSE was 4.764, 4.349, 4.335, and 4.271 for Models 1–3 and the hypothesized model, respectively; MAE was 1.701, 1.622, 1.604, and 1.596 for Models 1–3 and the hypothesized model, respectively; and TUS was .336, .292, .288, and .282 for Models 1–3 and the hypothesized model, respectively). Second, we subjectively compared the quartiles in the holdout sample with the predictions of the four models (for a similar prediction exercise, see Chandrashekaran et al. 2000). Specifically, the first quartiles are 3.00, 3.12, 2.88, 3.00, and 3.09 for actual holdout data, Models 1–3, and the hypothesized model, respectively; the second quartiles are 5.00, 3.68, 4.06, 4.36, and 4.56 for actual holdout data, Models 1–3, and the hypothesized model, respectively; and the third quartiles are 7.00, 4.24, 5.24, 5.71, and 6.03 for actual holdout data, Models 1–3, and the hypothesized model, respectively. Thus, the prediction analysis reliably shows that the hypothesized model outperforms the other models.

Hypotheses Testing

We find support for H_1, such that interpurchase interval increases for forced formulation rather than unforced formulation (b = 1.540, $p < .01$). Products that perform the knowledge function tend to have shorter interpurchase intervals (H_2: b = –.300, $p < .05$), and as we hypothesized, luxuries that perform the knowledge function have longer interpurchase intervals than do necessities that perform the knowledge function (H_2: b = .042, $p < .05$). We find support for the hypothesis on the value-expressive function, such that durables that perform the value-expressive function have longer interpurchase intervals (H_3: b = .248, $p < .05$); however, public products that perform the value-expressive function have shorter interpurchase intervals than do private products that perform the value-expressive function (H_3: b = –.050, $p < .05$). We also find support for the hypothesis pertaining to the social-adjustive function, such that products that perform the social-adjustive function tend to have shorter interpurchase intervals (H_4: b = –.237, $p < .01$); however, public products that perform the social-adjustive function tend to have longer interpurchase intervals than do private products that perform the social-adjustive function (H_4: b = .038, $p < .10$). The hypothesis about the utilitarian function of attitudes is partially supported, such that luxuries that perform the utilitarian function tend to have shorter interpurchase intervals than do necessities that perform the utilitarian function (b = –.042, $p < .10$).

In terms of the demographic variables, our results show that households with a larger number of children younger than six years of age tend to have shorter interpurchase intervals (b = –.236, $p < .01$), and the longer a person resides at an address, the longer is the interpurchase interval (b = .180, $p < .01$). For economic variables, our results show that as price increases, interpurchase interval increases (b = .135, $p < .01$); as the future outlook becomes more pessimistic, the interpurchase interval increases (b = .078, $p < .05$), and as household income increases, the interpurchase interval decreases (b = –.050, $p < .01$). Note that the effects of product categories' dummy variables were statistically significant in the initial models (Model 1 and Model 2), but these effects vanish when we include the hypothesized variables. It seems that the hypothesized variables may mediate the effects of the product-category dummy variables.

DISCUSSION

We sought to develop a richer theoretical understanding of the timing of purchases of consumer durable goods by investigating the influence of contextual factors (the nature of the product and the decision) and the functional bases of attitudes on interpurchase intervals. From both descriptive (as shown by the likelihood ratio tests) and predictive perspectives, we find that the models with contextual and attitude-function variables outperform the model with demographic and economic variables. It seems that decision formulation plays an important role, such that the interpurchase intervals are much shorter for unforced formulation than for forced formulation. The importance of supply-side factors is evident in our study because fashion and technological obsolescence, which is primarily driven by organizational innovation activities, leads to shorter interpurchase intervals.

As we predicted, the interpurchase interval decreases as the importance of the knowledge function or the social-adjustive function increases, and it increases as the importance of the value-expressive function increases. The knowledge function of attitudes helps consumers structure and organize their environments and increases the efficiency with which they can assimilate new information. It seems that the gains in efficiency result in faster repurchase rates

Table 2
DESCRIPTIVE STATISTICS: PRODUCT-SPECIFIC VARIABLES

	X1	*X2*	*X3*	*X4*	*X5*	*X6*	*X7*	*X8*	*X9*	*X10*	*X11*	*Y*
Price (X1)												
Future outlook (X2)	.07											
	.19**											
	.04											
	.19*											
	.05											
	–.05											
	–.10											
Innovativeness in product category (X3)	.10	.26**										
	–.04	–.02										
	–.09	–.06										
	–.01	.01										
	.10	.11										
	.08	–.06										
	.07	.28**										
Household income (X4)	.23**	.19*	.04									
	.50**	.16*	.01									
	.31**	.18*	–.16*									
	.26**	.13	.05									
	.08	.04	–.04									
	.15	.23**	–.01									
	.15	.13	–.06									
Private–public (X5)	.02	.06	–.06	.02								
	–.11	–.00	.02	–.09								
	–.06	–.12	.11	–.13								
	.04	.08	.07	.00								
	–.10	–.06	–.07	–.22**								
	.02	.12	–.09	–.07								
	–.11	–.07	.17*	–.15								
Necessity–luxury (X6)	–.02	.07	–.02	–.17*	–.04							
	–.01	.01	–.12	–.06	–.00							
	.08	–.12	.10	–.03	.13							
	–.10	–.00	–.05	–.19*	–.15*							
	.03	.04	–.07	–.13	.08							
	–.01	–.14	–.06	.11	–.09							
	.03	.16	.07	–.18*	.10							
Framing (X7)	–.34**	.16	–.04	–.02	.08	.09						
	–.25**	–.16*	.04	–.12	.10	–.05						
	–.02	–.07	–.01	.10	.12	–.11						
	–.26**	–.04	.00	–.09	–.10	–.02						
	–.26**	–.15*	–.11	.02	.01	–.06						
	–.25**	–.06	.19*	–.15	.07	.05						
	–.08	.00	–.11	–.02	.07	.06						
Utilitarian function (X8)	–.03	–.13	.08	–.06	.09	–.15	–.09					
	–.13	–.10	.24**	–.12	.06	–.11	.02					
	.01	–.26**	.22**	–.09	.12	.05	.01					
	.20**	–.06	.13	.08	.13	–.14	–.06					
	.09	–.01	–.03	.04	.05	–.02	–.04					
	–.01	.06	.15	.13	–.06	.12	–.07					
	.04	–.02	.10	–.06	.04	–.12	.03					
Knowledge function (X9)	–.06	–.34**	–.02	–.05	.02	–.15	–.14	.62**				
	–.15*	–.10	–.18*	–.17*	.07	–.19**	.12	.71**				
	–.05	–.06	.20**	–.01	.10	–.08	.04	.63**				
	.18*	.02	.15*	.07	.10	–.31**	–.00	.61**				
	.08	–.09	.06	–.02	.15	–.18*	–.00	.68**				
	–.04	–.08	.14	.03	–.02	.09	–.06	.67**				
	.11	–.07	.08	.04	.00	–.41**	–.09	.65**				
Value-expressive function (X10)	.15	–.12	.19*	.03	.10	–.16	–.15	.50**	.59**			
	.12	.01	.11	.03	.05	.02	–.09	.48**	.37**			
	.04	–.12	.19**	–.05	.11	–.04	–.02	.57**	.55**			
	.28**	.04	.15	–.01	.11	–.12	–.27**	.46**	.45**			
	.19*	–.00	.06	–.12	.17*	–.07	–.06	.70**	.66**			
	.04	–.07	.29**	.06	–.13	.07	–.12	.39**	.34**			
	.12	–.20*	.02	–.09	–.04	–.17*	.02	.56**	.49**			

Table 2
CONTINUED

	X1	*X2*	*X3*	*X4*	*X5*	*X6*	*X7*	*X8*	*X9*	*X10*	*X11*	*Y*
Social-adjustive function (X11)	.10	–.07	.09	–.03	.06	–.05	–.01	.57**	.45**	.44**		
	.08	–.01	.04	–.02	.13	.05	–.07	.41**	.29**	.59**		
	.00	–.06	.23**	–.13	.17*	.05	–.01	.40**	.45**	.41**		
	.32**	–.06	–.01	.16*	.13	–.04	–.27**	.48**	.31**	.57**		
	.35**	–.12	.12	–.03	.10	–.08	–.01	.50**	.46**	.65**		
	.07	–.10	.08	.06	–.01	.13	–.07	.38**	.34**	.50**		
	.10	–.07	.01	.03	–.12	–.09	–.11	.42**	.41**	.42**		
Interpurchase interval (Y)	–.03	.18*	–.02	–.07	.10	.04	–.03	.01	–.12	–.10	.02	
	–.01	–.04	–.12	.07	.09	–.05	.20**	–.05	–.03	.05	.03	
	.14	–.01	–.13	.01	.04	–.03	.02	–.05	.01	–.02	.06	
	.05	.05	.01	–.10	.01	–.08	.12	–.01	–.02	–.07	–.05	
	.14	–.00	–.10	–.09	–.01	–.11	.36**	–.13	–.08	–.13	–.17*	
	–.15	.09	.07	–.14	.18*	.05	.24**	.02	.06	.04	–.08	
	.09	.07	.05	.03	–.05	.14	.26**	–.09	–.04	.03	–.22**	
Mean	232.3	5.52	5.35	5.18	4.45	4.69	3.81	2.11	1.78	2.43	1.94	3.92
	18,064.6	5.70	4.63	5.75	5.43	2.50	3.96	3.09	3.84	2.86	3.02	3.29
	271.2	5.64	3.43	5.14	2.82	2.52	4.51	1.82	1.95	1.42	1.30	4.51
	65.4	5.46	3.60	5.39	4.99	2.70	3.87	2.09	3.29	2.33	2.01	3.04
	166.6	5.57	5.22	5.47	2.98	5.27	4.19	1.93	1.61	1.47	1.62	3.72
	712.4	5.43	3.38	5.28	4.46	2.09	4.15	2.16	2.81	1.51	1.45	5.34
	489.6	5.48	4.98	4.92	3.89	4.47	4.15	2.10	2.68	1.65	1.72	4.34
Standard deviation	199.3	1.05	1.01	2.76	1.51	1.28	1.10	.97	.94	1.33	1.13	2.34
	7980.4	1.06	1.18	2.98	1.14	.78	1.09	1.31	1.48	1.54	1.41	1.70
	341.3	1.15	1.18	2.85	1.50	1.03	.96	1.08	1.17	.91	.60	2.45
	97.1	1.20	1.22	2.95	1.38	1.10	1.14	1.20	1.43	1.48	1.24	1.88
	104.5	1.21	1.12	2.81	1.45	1.16	1.09	1.05	.98	.98	.92	1.96
	464.3	1.15	1.11	2.36	1.82	.87	1.30	1.16	1.21	.85	.72	2.20
	517.1	1.13	1.08	2.87	1.62	1.42	1.08	1.07	1.27	1.00	.98	2.18

*$p < .05$.
**$p < .01$.
Notes: We report the descriptive statistics in the following product order: cameras, cars, vacuum cleaners, wristwatches, DVD players, refrigerators, and televisions; for these products, the number of complete responses were 137, 201, 185, 173, 175, 134, and 152, respectively.

Table 3
DESCRIPTIVE STATISTICS: DEMOGRAPHIC VARIABLES (N = 1157)

	Z1	*Z2*	*Z3*	*Z4*	*Z5*	*Z6*
Number of adults (Z1)						
Number of children younger than age 6 (Z2)	–.01					
Number of children younger than age 18 (Z3)	–.03	.39*				
Spouse working (Z4)	–.19*	.01	–.04			
Credit card usage (Z5)	.03	.00	.04	.02		
Years at current address (Z6)	.20*	–.20*	–.22*	.04	–.02	
Mean	2.11	.17	.70	1.23	1.20	11.14
Standard deviation	.78	.48	1.00	.42	.43	10.06

*$p < .01$.

for necessities. Luxuries that perform the knowledge function, rather than necessities, have longer interpurchase intervals. We had reasoned that the knowledge function would induce biased-defensive information processing for luxuries, thereby manifesting in a longer interpurchase interval (Petty, Priester, and Wegener 1994). Our outcome of longer interpurchase interval bears out, emphasizing the need for further research to explore the validity of biased information processing. Value-expressive attitudes help consumers communicate their self-identities to others, and this encourages consumers to explain their decisions to others. Consistent with literature on mere ownership and status quo effects, the results support our expectations that consumers are reluctant to abandon the products that fulfill the value-expressive function, thereby resulting in longer interpurchase intervals. Furthermore, we had expected that greater accountability for publicly consumed (rather than privately consumed) durables would mitigate this effect. The data support this assertion, suggesting the need for further research to examine the accountability process.

Social-adjustive attitudes help consumers gain approval in desired social situations (Shavitt 1989a). The susceptibility to interpersonal influences results in pressures to conform to social norms and values, manifesting in shorter interpurchase intervals (Bearden, Netemeyer, and Teel 1989). For public durables that perform the social-adjustive

Table 4
RESULTS FROM WEIBULL MODEL WITH GAMMA HETEROGENEITY

Variable Category	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Product-Specific Constants				
Constant	1.552***	1.249***	1.449***	1.272***
	(.178)	(.384)	(.347)	(.358)
Car	.738***	.671***	–.094	–.077
	(.185)	(.255)	(.261)	(.268)
Vacuum cleaner	.497***	.419**	–.068	–.099
	(.168)	(.178)	(.184)	(.192)
Wristwatch	–.130	–.175	–.106	.023
	(.166)	(.169)	(.169)	(.186)
DVD player	–.037	.025	–.270**	–.249*
	(.162)	(.149)	(.136)	(.145)
Refrigerator	.858***	.661***	.278	.232
	(.189)	(.219)	(.207)	(.228)
Television	.224	.223	–.148	–.127
	(.170)	(.162)	(.145)	(.165)
Demographic Variables				
Number of adults	—	.000	.004	.001
		(.009)	(.006)	(.007)
Number of children younger than age 6	—	–.206**	–.226**	–.236**
		(.098)	(.091)	(.092)
Number of children younger than age 18	—	.041	.035	.034
		(.046)	(.043)	(.045)
Spouse working	—	.091	.048	.058
		(.104)	(.096)	(.099)
Credit card usage	—	.102	.107	.103
		(.105)	(.101)	(.097)
Years at current address[a]	—	.271***	.152***	.180***
		(.068)	(.045)	(.048)
Economic Variables				
Price[a]	—	.011	.118***	.135***
		(.043)	(.044)	(.045)
Future outlook	—	.069*	.083**	.078**
		(.037)	(.036)	(.036)
Innovativeness in product category	—	–.059	–.043	–.032
		(.037)	(–.034)	(.037)
Household income	—	–.046***	–.049***	–.050***
		(.017)	(.016)	(.017)
Contextual Variables				
Private–public (PUB)	—	—	–.002	.009
			(.027)	(.028)
Necessity–luxury (LUX)	—	—	–.037	–.043
			(–.034)	(.036)
Nature of the decision[a]			1.523***	1.540***
	—	—	(.133)	(.136)
Attitude Functions				
Knowledge function (KNOW)	—	—	—	–.300**
				(.140)
Value-expressive function (VEXP)	—	—	—	.248**
				(.133)
Social-adjustive function (SAF)	—	—	—	–.237**
				(.128)
Utilitarian function (UTF)	—	—	—	.124
				(.178)
Interactions Between Contextual Variables and Attitude Functions				
KNOW × PUB	—	—	—	.027
				(.022)
KNOW × LUX	—	—	—	.042**
				(.024)
VEXP × PUB	—	—	—	–.050**
				(.026)
SADJ × PUB	—	—	—	.038*
				(.028)
UTF × PUB	—	—	—	.007
				(.029)
UTF × LUX	—	—	—	–.042*
				(.029)

Table 4
CONTINUED

Variable Category	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Overall Model Fit				
Hazard shape (ρ)	2.220***	2.170***	1.836***	1.950***
	(.287)	(.238)	(.173)	(.178)
Heterogeneity parameter (τ)	3.831***	2.432***	.364	.600*
	(.287)	(.843)	(.346)	(.340)
Log-likelihood value	–694.61	–657.4	–574.46	–563.87
Prediction Analysis[b]				
RMSE[c]	4.855	4.473	4.403	4.383
MAE[d]	1.693	1.626	1.598	1.594
TUS[e]	.394	.347	.337	.333

*$p < .10$.
**$p < .05$.
***$p < .01$.

[a]For convergence purposes, we took the log-transform of the variable.

[b]To carry out out-of-sample predictions, we split the sample into two equal halves and used the first half to estimate and the second half as the holdout sample. We calculated the predicted value of interpurchase intervals as $\hat{t} = e^{X\beta}$, where t is the interpurchase interval, $\hat{t}$ is the predicted value of the interpurchase interval, X is a matrix of explanatory variables, and β is a vector for the effect of X on t.

[c]We calculated RMSE as follows:

$$\sqrt{\frac{\sum_{i=1}^{N}(t_i - \hat{t}_i)^2}{N}},$$

where N is the sample size (see Greene 1997, p. 372).

[d]We calculated MAE as follows (see Greene 1997, p.372):

$$\frac{\sum_{i=1}^{N}|t_i - \hat{t}_i|}{N}.$$

[e]We calculated TUS as follows (see Greene 1997, p.373):

$$\sqrt{\frac{1/N\sum_{i=1}^{N}(t_i - \hat{t}_i)^2}{1/N\sum_{i=1}^{N}t_i^2}}.$$

Notes: We report a one-tailed test for hypothesized effects in the correct direction; otherwise, we report two-tailed tests.

function, we expected that a higher frequency of loss framing than private durables would manifest in higher interpurchase intervals (Kahneman, Knetsch, and Thaler 1990). Our results support this expectation, suggesting the need for further research to explore the decision-framing (loss versus gain) process. Utilitarian attitudes help consumers achieve desired outcomes and avoid undesired outcomes. It seems that utilitarian attitudes play a less prominent role for luxuries (rather than necessities), such that the "if it ain't broke, don't fix it" perspective facilitated by utilitarian attitudes becomes weaker for luxuries than for necessities. Attitude functions that products perform play a critical role in explaining the interpurchase interval for consumer durables.

Implications

We begin by acknowledging the core limitations of our research. Primarily, we adopt a demand-side perspective, and even though we incorporate some supply-side factors, such as degree of innovativeness in a product category, further research should attempt to integrate demand-side and supply-side perspectives. Nonetheless, our research has theoretical implications for the literature on attitude functions and the marketing of consumer durables. Although the literature recognizes that attitudes can and do serve multiple functions, extant research focuses on only one or two functions at a time. By examining a more comprehensive framework, we show that attitude functions have distinctive influences on consumer behavior (e.g., value-expressive attitudes manifest in longer interpurchase intervals, whereas social-adjustive attitudes result in shorter interpurchase intervals) and that it is important to examine simultaneous influences. For example, we had reasoned that for luxuries, utilitarian attitudes would manifest in shorter interpurchase intervals because the benefits of luxuries exceed the benefits required

to fulfill simple utilitarian needs. These important trade-offs would have been masked had we examined the influence of one attitude function at a time.

Consumer durable research has focused on demographic and economic variables and has overlooked consumer psychological variables. To some extent, this lack of focus on psychological variables is driven by the availability of secondary data, such as panel data sets, on interpurchase intervals, demographics, and economic variables. Although the importance of observable variables such as demographics is evident for market segmentation, it is also important to model unobservable variables such as attitude functions, because these help in predicting and explaining interpurchase intervals. It is evident from the results that consumer psychological variables are needed to supplement the demographic and economic variables that are typically used in consumer durables research.

From a substantive standpoint, firms need to tailor their communications and positioning strategies to target the appropriate attitude functions. For example, firms should educate consumers to increase their knowledge about the product, because knowledge tends to shorten the interpurchase intervals; however, such a strategy is likely to backfire for luxury goods. Similarly, communications and positioning strategies that help consumers achieve social goals and help them fit into desired social settings would help firms speed up the rate of repurchase of consumer durables. In contrast, communications and positioning strategies that emphasize self-expression should only be pursued for publicly consumed durables, whereas strategies that stress the hedonic aspects of products would be more appropriate for luxury goods.

APPENDIX A
MEASURES

We illustrate the inventory for cars; replacing cars with another product would provide the scale for the remaining products.

Knowledge Function of Attitudes (New Scale)
(Items are anchored at 1 = "disagree" and 7 = "agree.")

KNOW1: My car makes my world more predictable.
KNOW2: My car makes it easier for me to structure and organize my daily life.
KNOW3: My cars facilitates in understanding what happens in everyday life.
KNOW4: If I woke up and realized that I no longer had my car, I would be totally lost.
KNOW5: My car makes me feel secure and safe in an uncertain world.
KNOW6: I would be confused without my car.
KNOW7: My car makes it easier for me to comprehend my surroundings.

Value-Expressive Function of Attitudes (New Scale)
(Items are anchored at 1 = "disagree" and 7 = "agree.")

VEXP1: Cars reflect the kind of person I see myself to be.
VEXP2: My car helps ascertain my self-identity.
VEXP3: My car makes me feel good about myself.
VEXP4: My car is an instrument of my self-expression.
VEXP5: My car plays a critical role in defining my self-concept.
VEXP6: My car helps me to establish the kind of person I see myself to be.

Social-Adjustive Function of Attitudes (New Scale)
(Items are anchored at 1 = "disagree" and 7 = "agree.")

SADJ1: It is important for my friends to know the brand of car I possess.
SADJ2: Cars are a symbol of social status.
SADJ3: My car helps me in fitting into important social situations.
SADJ4: I like to be seen with my car.
SADJ5: The brand of car that a person owns, tells me a lot about that person.
SADJ6: My car indicates to others the kind of person I am.

Utilitarian Function of Attitudes (New Scale)
(Items are anchored at 1 = "disagree" and 7 = "agree.")

UTF1: Cars make it possible for people to maximize life's rewards.
UTF2: My car instills confidence in me.
UTF3: Whenever I am using my car, I am at ease.
UTF4: My car helps in minimizing life's punishments.
UTF5: I become more poised knowing that I own my car.
UTF6: With cars daily worries vanish.

Private–Public Product (Adopted from Bearden and Etzel [1982])
(Items are anchored at 1 = "disagree" and 6 = "agree.")

We are interested in knowing whether **cars** are publicly or privately consumed. We define public and private products are defined as follows:

- A **public** product is one that other people are aware you possess and use. If others want to, they can identify the brand of the product with little or no difficulty.
- A **private** product is used at home or in private at some location. Except for your immediate family, people would be unaware that you own or use the product.

Cars are a:

PUB1: Public product for everyone.
PUB2: Public product for almost all people.
PUB3: Public product for the majority of people.
PUB4: Private product for the majority of people. (reverse-scored)
PUB5: Private product for almost all people. (reverse-scored)
PUB6: Private product for everyone. (reverse-scored)

Necessity–Luxury Product (Adopted from Bearden and Etzel [1982])
(Items are anchored at 1 = "disagree" and 6 = "agree.")

We are interested in knowing whether **cars** are luxury or necessity products. We define luxuries and necessities as follows:

- **Luxuries** are not needed for ordinary, day-to-day living.
- **Necessities** are necessary for day-to-day living.

Cars are a:

LUX1: Luxury for everyone.
LUX2: Luxury for almost all people.
LUX3: Luxury for the majority of people.
LUX4: Necessity for the majority of people. (reverse-scored)
LUX5: Necessity for almost all people. (reverse-scored)
LUX6: Necessity for everyone. (reverse-scored)

Nature of Purchase Decision (New Scale)
(Items are anchored at 1 = "disagree" and 7 = "agree.")

NAT1: The old car was NOT functioning well and needed to be replaced.

NAT2: Poor performance of the old car was the main reason for the purchase.
NAT3: The old car was obsolete in terms of technology.
NAT4: The old car was obsolete in terms of style.
NAT5: New style and fashion prompted me to buy the car. (reverse-scored)
NAT6: Newer technology was available in the market, which prompted me to repurchase the car. (reverse-scored)

Innovativeness in Product Category (New Scale)
(Items are anchored at 1 = "disagree" and 7 = "agree.")

In your opinion, how would you rate the pace of technological innovation in CARS:

INV1: Car technology is changing at a very fast pace.
INV2: Compared to other consumer durable products, car technology is changing fast.
INV3: I have NOT seen significantly new technology in cars for sometime. (reverse-scored)
INV4: Innovations in cars are very frequent.
INV5: Pace of technological innovations in cars is high.
INV6: Technological innovations and cars don't go hand in hand. (reverse-scored)

Future Outlook (New Scale)
(Items are anchored at 1 = "disagree" and 7 = "agree.")

At the time you of your most recent CAR purchase, your overall sentiment about the future was:

FOUT1: I was optimistic about the future.
FOUT2: I thought good times lay ahead.
FOUT3: The future seemed bright.
FOUT4: I was skeptical about the future. (reverse-scored)
FOUT5: I was pessimistic about the future. (reverse-scored)
FOUT6: I though good times were passing by. (reverse-scored)

APPENDIX B
DERIVING THE LOG-LIKELIHOOD FUNCTION

For each individual consumer i, we observed the interpurchase interval (PUR_i) and whether the consumer (1) purchased (or did not purchase) an additional item or (2) replaced (or did not replace) the current durable. We used a dummy variable (d_i) to code this information such that d_i = 1 if consumer i either purchased an additional item or replaced the current durable, and $d_i = 0$ if consumer i either did not purchase an additional item or did not replace the current durable.

In the language of duration models, $d_i = 1$ implies that the observation is complete, and $d_i = 0$ implies that the observation is censored. For censored observations, we have the information that the interpurchase interval for consumer i is greater than PUR_i, whereas for complete observations, we have the information that the interpurchase interval equals PUR_i. Thus, the likelihood function for complete/uncensored observations is as follows:

$$(B1) \qquad L_{\text{Uncensored}} = \prod_{i=1}^{n_u} f(PUR_i/\theta),$$

where

$L_{\text{Uncensored}}$ = the likelihood value for complete/uncensored observations,
$f(\cdot)$ = the probability density function,
θ = the vector of unknown parameters for the probability distribution function, and
n_u = the number of complete/uncensored observations.

Similarly, the likelihood function for the censored observation is

$$(B2) \qquad L_{\text{Censored}} = \prod_{i=1}^{n_c} S(PUR_i/\theta),$$

where

L_{Censored} = the likelihood value for censored observations;
$S(\cdot)$ = the survival function, which is given as 1 – $F(\cdot)$, where $F(\cdot)$ is the cumulative distribution function; and
n_c = the number of censored observations.

By combining the complete and censored observations, we have the sample likelihood function, as follows:

$$(B3) \qquad L_{\text{Duration}} = \prod_{i=1}^{n_u} [f(PUR_i/\theta)]^{d_i} + \prod_{i=1}^{n_c} [S(PUR_i/\theta)]^{(1-d_i)},$$

where L_{Duration} is the likelihood value for both the complete/uncensored and censored observations. We maximized this likelihood function using standard procedures to obtain parameter estimates.

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