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Shopping Model of the Time-Sensitive Consumer

U. N. Umesh
College of Business and Economics, Washington State University, Pullman, WA 99164-4725
Kathy L. Pettit
College of Business and Economics, University of Idaho, Moscow, ID 83843
Carl S. Bozman
College of Business and Economics, University of Delaware, Newark, DE 19716

ABSTRACT

The shopping behavior of time-sensitive consumers has been modeled as an economic model of choice. Consumers are said to balance the costs of time spent commuting to the store and in the store with storage costs and other nontime costs of shopping. In so doing, these consumers tend to minimize their overall costs. Propositions are developed and tested using this economic model of shopping. The model is extended beyond time sensitivity to include deal proneness; further propositions are developed and tested using the extended model. The empirical results support the derived models.

Subject Areas: Brand Choice, Consumer Behavior, Marketing Management, and Marketing Segmentation.

INTRODUCTION

With a rising standard of living, retail managers are increasingly concerned with the value consumers place on time spent shopping. As time becomes scarce, consumers are often willing to trade other resources to acquire or save time [4]. Such trade-offs can be facilitated by retailers who design their offerings so consumers expend less time but pay higher prices or receive fewer amenities. Exact levels of trade-offs should depend on the retailer's cost of offering time-saving services relative to the importance the consumer places on saving time.

Only a few models of consumer behavior have incorporated time variables [12]. For instance, Becker [1] [2] explicitly included time in the utility function of a consumer. Likewise, time and money have been shown to be interchangeable [1] [14]. The true price of a product has been viewed as the sum of the opportunity cost of time and the market price of the product [15]. The inclusion of time in the analysis helps to explain the full range of consumer behavior, such as the "irrational" phenomenon of a consumer's willingness to pay more for a single purchase at a convenience store, rather than stand in line to purchase the same item at a lower price in a supermarket.

The area of a consumer's time sensitivity, while often neglected, is very relevant to the field of marketing. First, time sensitivity could be useful as a segmentation variable. By offering products in a setting that requires very little time to make purchases, a retailer could better (more profitably) serve time-sensitive consumers. Second, consumers who have limited time (such as working wives who work at nonhousehold jobs) tend to purchase certain products and services that are designed to save time [3] [17]. Marketing efforts could be targeted towards time-sensitive consumers who desire products and services that help save time. Third, less time-sensitive consumers might be willing to shop in distant retail locations [10] if they are attracted by certain characteristics (e.g., extension of credit or lower prices). Finally, as the number of families with both spouses employed increases, time sensitivity is likely to become a major factor that influences shopping behavior.

INVENTORY MODEL OF SHOPPING

The need to buy frequently purchased products such as everyday household grocery items is determined by two basic factors: the quantity of the product left from previous purchases and the rate of consumption of the product. If a household has run out of the product or plans to consume all of the remaining stock in the immediate future, there is a need to go to the grocery store soon to replenish the household stock of the product. Alternatively, if large quantities are on hand from a previous purchase and the household consumption rate is low, the shopping trip can be postponed to a later date. The consumption, purchase, and replenishment phases of household product usage are similar to the inventory models developed in production management [19]. Marketing researchers have explained consumer response to deals and rebates offered by stores using similar inventory models [5] [6].

In this paper, we attempt to use an inventory model to explain time sensitivity of shopping behavior for frequently purchased nondurable items. The model is developed using several assumptions about such shopping behavior. Consumers are assumed to use time and nontime resources to buy frequently purchased goods. Consumers can shop with any frequency and purchase any quantity (or size) of the product they desire. Consumers purchase fresh supplies of a product when they completely run out of the product. The usage rate of the product is assumed to be steady and deterministic. Most important, consumers optimize their shopping habits based on their time sensitivity. This optimization is based on minimizing both time and monetary costs. The model developed here would not be applicable to durables or one-time purchases because the concepts of consumption and replenishment do not apply, at least in the short run.

Deal Proneness and Shopping Behavior

Deal proneness, the tendency of consumers to use coupons or refer to newspaper-advertised specials when purchasing common household products, has been researched extensively in the last 25 years [7] [16] [20] [21]. Previous researchers have attributed deal proneness partly to the availability of and the value placed on time [5] [6]. That is, since dealing activities require time inputs, it has been assumed that extreme deal proneness can only occur when time sensitivity is low. However, time sensitivity of shopping behavior is a broader concept than deal proneness. A highly time-sensitive shopper will attempt to minimize all elements of shopping time. If there are two stores, each offering the same deal for the products being purchased, the time-sensitive shopper will prefer the store that requires the least time to shop. A time-sensitive shopper is willing to trade amenities such as friendly personnel and numerous specialty items for a store that provides quick service.

However, offering deals is one of the principal promotional tools used by retailers to induce purchase. Given the widespread prevalence of dealing opportunities and deal proneness among the population, it is appropriate to study the effects of time sensitivity and deal proneness on purchase behavior. Thus, this study's main focus is time sensitivity and the interaction of deal proneness and time sensitivity is a secondary focus. Although some researchers have preferred to use the term "dealing" to refer to temporary price cuts, we use the term to encompass price cuts and coupon use.

The principal aims of the research are as follows:

1. To model shopping behavior as a set of rational economic decisions based on minimizing time and monetary costs. An inventory model of shopping activity is used to explain the strategies used by more and less time-sensitive consumers.
2. To develop propositions on time sensitivity and its influence on shopping behavior based on this inventory model.
3. To develop a measure of time sensitivity and test the propositions using survey data.
4. To develop an extended inventory model of shopping behavior that includes both time sensitivity and deal proneness and test any derived propositions.

INVENTORY MODELS OF SHOPPING BEHAVIOR

The household inventory models of shopping behavior presented here include time and monetary costs of shopping, monetary savings from buying products on deals, and the cost of storing products at home.[1] The consumer is said to balance these competing costs and benefits and optimize the quantities purchased, the products purchased on deals, and the frequency of shopping. The optimal behavior of a consumer depends on the degrees of time sensitivity and deal proneness. The model applies for frequently purchased grocery and household products.

To model the consumer's purchase decision, the following variables are defined for a single product category.

D = Annual (or monthly) usage of the product measured in number of units purchased in the household.
q = Quantity purchased each shopping trip (number of units).
h = Cost of holding a fixed quantity of goods for a unit of time such as a year; includes marginal cost of storage (e.g., running freezer, cost of loss in discretionary income tied in inventory, spoilage or waste costs, credit card charges, and interest costs). This number is treated as a percentage of the product's cost.
c = Full price for the product. This price varies across stores as a function of service level and ease of shopping.
k = Nontime cost of shopping for the product or fixed cost of shopping for the product (e.g., if each shopping trip costs \$10 and leads to the purchase of 100 products for \$100, then cost of shopping per product is 10¢). This cost includes nontime costs of shopping such as automobile operation and maintenance costs.
w = Cost of time. This is a function of wage rate, employment level of spouse, and other demands on an individual's time.
t_1 = Time spent commuting to store. This includes going to and returning from the store.
t_2 = Shopping time in store. This is the time spent in the store, including time spent moving around the store and standing in the checkout line.
T = Total cost of shopping per unit time.

The consumer has a fixed demand D over a certain time period such as a year or a month. The consumer purchases a quantity q on each of the D/q shopping

[1] In this study we have modeled time and monetary costs. There are other plausible costs not modeled here. These include psychological costs such as stress from being in crowds, frustration with parking facilities, and irritation with poor customer service.

occasions during the predefined time period. The consumer incurs a fixed cost of k, a variable commuting time cost of wt_1, and an in-store time cost of wt_2. The cost of holding the product (i.e., storage cost) at any point in time is proportional to the average number of units held, which is $q/2$. This quantity times the price paid for each product times the holding cost per unit of time equals the total inventory cost. Gains from dealing are the discounts from full price and the decreased costs of holding the products.

Time Sensitivity Model

The first model of shopping identifies consumer behavior characteristics when no dealing is present. The total cost of shopping (D/q times) in a predefined time period (such as a year) is total cost per unit time = total time cost of shopping + nontime cost of shopping + cost of holding product, where total time cost = commuting time costs + in-store time costs. Total cost per unit of time can be written as

$$T = D/qw(t_1 + t_2) + D/qk + 1/2\ qch. \tag{1}$$

Total cost per unit time is minimized by taking the partial derivative (δ) of T with respect to q:

$$\delta T/\delta q = (-D/q^2)w(t_1 + t_2) - (D/q^2)k + 1/2\ ch = 0.$$

To simplify this equation, we designate the optimal quantity purchased to be

$$q = \sqrt{[\ \frac{2D[w(t_1 + t_2) + k]}{ch}\ ]}, \tag{2}$$

and the optimal number of shopping trips per unit time to be

$$D/q = \sqrt{[\ \frac{chD}{2w(t_1 + t_2) + 2k}\ ]}. \tag{3}$$

Shoppers will optimize the quantities purchased (and frequency of purchase) to minimize total cost. Those who are time-sensitive will place particular emphasis on minimizing time components of the total cost. Further, a time-sensitive consumer has a high cost of shopping time.

The model provides several implications that are presented in the form of propositions.

> *Proposition 1*: Those who are highly time sensitive tend to purchase larger quantities per shopping trip, holding size of family and storage capacity constant.

This follows from the likely strategy of time-sensitive individuals to purchase larger quantities on each shopping trip rather than make frequent trips to purchase a few items at a time. Needless to say, those with large families and those with adequate storage facilities at home are likely to purchase larger quantities of household products on each shopping trip. Therefore, the effect of time sensitivity on quantity purchased must be studied holding these two factors constant in the current proposition, as well as in Propositions 2 through 5.

Proposition 2: The total amount of commuting time per time period (e.g., monthly) for grocery shopping purposes is inversely related to the time sensitivity of the consumers.

The amount of time spent on commuting for shopping trips is equal to the product of travel time and the number of trips in that given time period. Time-sensitive consumers will try to minimize this value.

Proposition 3: The amount of in-store time inputs is inversely related to the time sensitivity of the shopper.

For instance, highly time-sensitive consumers would be expected to shop with cash more frequently to save time spent writing checks.

Proposition 4: Those who are time sensitive are expected to value their leisure time highly.

Although there is not likely to be a one-to-one relationship between time sensitivity and value of leisure time, the relationship between the two constructs is expected to be significantly positive. That is, what a consumer is willing to accept in trade for an hour of leisure time should be directly related to time sensitivity.

Proposition 5: Consumers who are time sensitive are likely to patronize convenience stores more frequently than their less time-sensitive counterparts.

Time-sensitive consumers are expected to frequent both convenience stores and regular grocery stores. However, holding other factors constant, they are expected to visit convenience stores with greater frequency than nontime-sensitive consumers as such stores represent a trade-off between time and money.

Model of Time Sensitivity and Deal Proneness

Consumers often encounter deals at retail outlets. Those who have a tendency to take advantage of these deals are referred to as "deal prone." The time sensitivity model developed in equations (1) through (3) is expanded to include consumer's dealing behavior.

The following terms are defined with respect to the expanded model of shopping behavior.

t_3 = Dealing time (hours). This includes time required to consult newspapers for advertised specials before each shopping trip and time spent clipping, storing, and redeeming coupons.

s = Dollar value of discount from coupon redemption or from purchasing each unit of a featured special.

The total cost per unit time = commuting time cost + in-store time cost + nontime cost of shopping + cost of holding product + time cost of dealing − price reduction from deals. In other words, the total cost per unit time can be written as

$$T = D/qw(t_1 + t_2) + (D/q)k + (1/2)q(c-s)h + (D/q)wt_3 - Ds. \quad (4)$$

Total cost per unit time is minimized by taking the partial derivative of T with respect to q:

$$\delta T/\delta q = -Dw/q^2(t_1+t_2)-(D/q^2)k+(1/2)(c-s)h-Dwt_3/q^2=0.$$

To simplify this equation, we designate the optimal quantity purchased by

$$q=\sqrt{[\frac{2D[w(t_1+t_2+t_3)+k]}{(c-s)h}]} \tag{5}$$

and the optimal number of shopping trips per unit time by

$$D/q=\sqrt{[\frac{(c-s)h\ D}{2w(t_1+t_2+t_3)+2k}]}. \tag{6}$$

Proposition 6: Those who are deal-prone purchase larger quantities than those who are not deal-prone.

One of the rationales of offering deals is to allow some consumers to buy more and increase the inventory in the household.

Proposition 7: All consumers are time sensitive but not all are deal-prone.

Time is valuable and there are few, if any, consumers who have no value at all for time. Although all consumers would like to buy at a lower price, some consumers may have no desire to indulge in deals because of the trade-off of time inputs required for dealing.

Proposition 8: Time sensitivity and deal proneness are expected to have separate influences on shopping behavior. Since the effects on time sensitivity and deal proneness are additive as described in equations (5) and (6), they are expected to have no interactive effects on shopping behavior.

The proposition does not necessarily suggest that deal proneness and time sensitivity are unrelated. As an analogy, it is possible for the two independent variables (such as time sensitivity and deal proneness) in a regression to be correlated with each other and yet have no interactive effect on the dependent variable (such as quantity purchased).

METHODOLOGY

The data were collected from a survey of shoppers in four stores in Latah county in Northern Idaho.[2] Interviewers asked every fourth adult (screened for primary household shopper status) entering a store to complete a questionnaire. Potential respondents were informed that the survey was a university class research project. To make the sample representative of the population, respondents were interviewed during the mornings, afternoons, and evenings of weekdays and weekends. A total of 394 completed questionnaires were received.

[2]Studies in the area of consumer deals have often used panel data to empirically validate their models. Panel data have advantages such as a large number of observations and a record of actual choices. However, panel data do not have measures of time sensitivity and are therefore not used here.

Four 11-point semantic differential scales were used to assess the consumer's time sensitivity. Similarly, four other 11-point semantic differential scales were used to assess deal proneness. Consumers provided details on aspects of their purchasing behavior. Each respondent provided details on household demographic and socio-economic variables.

Most of the respondents (74 percent) were female and their average age was 38. About 80 percent were employed, 7 percent were retired, and 13 percent were unemployed (including adult full-time students who did not work). The mean household income was about $26,000.

The sample characteristics were similar in most respects to those obtained from population census reports for Latah county [18]. The sample had more women than the population at large because respondents were screened to ensure that they were the household's primary shoppers. As expected, the primary shoppers were predominantly women. After household gross income was deflated by the consumer price index to make comparisons across years, the average age, income, and marital status distributions were virtually identical in the sample and the population.

Measures Used

Time sensitivity of shoppers was measured using consumers' responses to a survey. Survey-based measures of time sensitivity have been good predictors of preference [11]. To obtain reliable results, Churchill [9] suggested using a multiple-item scale rather than a single-item scale. Consequently, the responses to four questions relating to time sensitivity were combined to produce the time sensitivity measure. Respondents rated the importance of the following four attributes of grocery stores on an 11-point scale: layout of store for fast and easy shopping, lack of crowding within store, fast check-out services, and extended hours of operation. These attributes were selected based on discussions with shoppers. The sum of the four ratings resulted in a time sensitivity scale with reliability characteristics as described in Table 1. Some researchers have recommended Cronbach's alpha as the best single measure of reliability, although they also suggested additional measures such as coefficient theta and unidimensional factor analysis [8]. The standardized Cronbach's alpha for the scale was .669. The scale appears to be reliable based on suggested Cronbach's alpha values for marketing applications [13]. Coefficient theta was .671, providing more evidence of the measure's reliability (the adequacy of the magnitude of theta is judged similarly to the alpha values). All four time variables loaded on the first factor, suggesting that they are measuring the same construct. The principal component solutions satisfied the four properties expected of a set of items measuring a single phenomenon [8].[3] Further, all item-to-sum correlations were acceptable and significant ($p < .01$). Overall, the measure of time sensitivity appears to be reliable.

To study the effects of deal proneness using the model developed here, a deal proneness measure was defined. The measure was made up of responses to four questions: likelihood of redeeming at least one coupon on each grocery trip, likelihood of consulting a newspaper for advertised store specials, importance of low

[3]The four conditions are (1) the first extracted factor should explain a large portion of the variance (>40%), (2) subsequent factors should explain fairly equal proportions of the remaining variance except for a gradual decrease, (3) all or most of the items should have substantial loadings on the first component (>.3), and (4) all or most of the items should have higher loadings on the first component than on subsequent components.

Table 1: Reliability of time sensitivity and deal proneness measures.

	Time Sensitivity (1-factor solution)	Item-to-Sum Correlation (Corrected)
a. Reliability of Time Sensitivity Measure		
Factor Loadings		
ICONVEN (Fast and easy shopping)	.760	.499
ICROWD (Lack of crowding)	.731	.467
IQCHECK (Fast check-out service)	.713	.447
I24HRS (Extended hours of operation)	.625	.374
Eigenvalue	2.013	
Standardized Cronbach's Alpha		.669
Coefficient Theta		.671
b. Reliability of Deal Proneness Measure		
Factor Loadings		
COUPON (Coupon redemption)	.693	.454
SPCLS (Consult newspapers)	.793	.560
ILOW$ (Low prices)	.610	.341
ISALES (Frequent sales)	.711	.434
Eigenvalue	1.986	
Standardized Cronbach's Alpha		.658
Coefficient Theta		.662

prices in store, and importance of frequent sales in the grocery store. Each was rated on an 11-point scale and the sum of the responses made up the deal proneness measure. As shown in Table 1, the reliability of the deal proneness measure was similar to that of the time sensitivity measure. The standardized Cronbach's alpha was .658 and coefficient theta was .662. All four deal proneness measures loaded on the first factor, indicating that they are measuring the same construct. Again, all four item-to-sum correlations were acceptable; thus, the deal proneness measure appears to be reliable as well.

RESULTS

Test of Model for Time Sensitivity

The propositions developed in the earlier sections are tested using the time sensitivity and deal proneness measures. Based on the ratings on these scales, consumers were classified as low, medium, or high time sensitive (or deal-prone). The propositions were tested by using analysis of covariance (ANCOVA); the test results of the first five propositions are listed in Table 2. In each one-way ANCOVA, time sensitivity was employed as the single independent variable, with family size and household storage capacity used as covariates. The joint significance of all five propositions was determined using multiple analysis of covariance (MANCOVA).

Propositions 1 and 2. Propositions 1 and 2 are interrelated. As the number of grocery shopping trips decreases (increases), holding family size and stored inventories constant, the quantity purchased per trip must necessarily increase (decrease). For Proposition 1, the quantity of goods purchased on each shopping occasion was operationalized as expenditure per trip. Other measures of quantity such as number of items or number of grocery bags were considered less suitable because there was too much variability introduced by size, shape, and type of products purchased.

Because family size and adequacy of storage capacity in the residence are likely to mediate the relationship between time sensitivity and quantities purchased, they

Table 2: Test of time sensitivity for first to five propositions.

Effect/Dependent Variable	Sum of Squares	Mean Squares	$F_{2,368}$	Wilks' Lambda	$F_{10,1830}$
Time Sensitivity					
Expenditure levels per trip	5,072.93	2,536.46	2.40*		
Monthly Shopping Commuting Time	488,692.82	244,346.41	2.73*		
Use of cash in grocery purchasing	102.82	51.41	5.13***		
Subjective value of leisure time	299,805.82	149,902.91	3.08**		
Patronage of convenience stores	37.78	18.89	3.04**		
Multivariate significance (main effect)				.94	3.58***
Covariates					
Expenditure levels per trip	48,888.63	24,444.31	23.12***		
Monthly shopping commuting times	6,830.18	3,415.09	.04		
Use of cash in grocery purchasing	36.82	18.41	1.84		
Subjective value of leisure time	8,026.04	4,013.02	.08		
Patronage of convenience stores	20.47	10.23	1.65		
Multivariate significance (covariates)				.88	11.59***
Residual					
Expenditure levels per trip	389,079.04	1,057.28			
Monthly shopping commuting times	32,042,495.79	89,504.18			
Use of cash in grocery purchasing	3,689.94	10.03			
Subjective value of leisure time	17,896,097.60	48,630.70			
Patronage of convenience stores	1,385,387.50	3,764.64			

Note: The significance of the F value is represented by the asterisks: *=$p<.1$, **=$p<.05$, and ***=$p<.01$.

were treated as covariates. Both covariates were highly significant ($p<.01$). After accounting for the effect of the covariates, the expenditure levels on each trip were found to increase as time sensitivity increased. However, the result ($F_{2,368}=2.40$, $p<.10$) was not significant at normally accepted probability levels ($p<.05$) for the entire sample. Despite the nonsignificant result of the overall effect of time sensitivity on quantity purchased per trip, Duncan's multiple range test revealed that highly time-sensitive shoppers purchased significantly larger quantities per trip than did those classified as low in time sensitivity ($p<.05$). Those moderately time sensitive did not differ significantly from either extreme group in terms of quantities purchased per occasion.

Proposition 2 suggests that those with high time sensitivity will minimize commuting time. According to equation (1), the time component of the total cost per period (such as a month) is minimized by reducing commuting time and number of trips. Monthly commuting time was calculated by multiplying the time for a typical commute (a function of distance from home or work to the grocery store) and the number of trips. Monthly commuting time tended to decline with increased time sensitivity. Although the result was as predicted directionally, it was not significant at normally accepted probability levels ($F_{2,368}=2.73$, $p<.10$). However, Duncan's Multiple Range Test indicated that there was a clear separation between those of low and high time sensitivity ($p<.05$), with total commuting time minimized by the highly time-sensitive group. Neither extreme time-sensitive group differed from those classified as moderately time sensitive.

The reason a stronger relationship is lacking in Propositions 1 and 2 may be related to the somewhat dichotomous nature of the sample. The majority of the respondents lived within town (62 percent) and indicated an average commuting time per trip of up to ten minutes. However, a sizable portion of the respondents lived in outlying rural areas as indicated by their longer commuting times. When those respondents who lived out of town (commuting time$\geq$15 minutes) were

removed from the sample and Propositions 1 and 2 were retested, both were significant and directionally as predicted. More highly time-sensitive shoppers purchased significantly higher quantities per trip ($F_{2,226}=4.12$, $p<.01$) and engaged in significantly less monthly commuting time to and from the grocery store ($F_{2,226}=3.86$, $p<.05$) than did those of lesser time sensitivity. It appears that the imposed constraints of long commuting distances for rural shoppers overwhelm any effects of time sensitivity on shopping behavior. Thus, the results support Propositions 1 and 2.

Proposition 3. Proposition 3 suggests that time-sensitive consumers might prefer to use cash to make their grocery store purchases to save time at the checkout counter. Further, the consumer might save additional time since the use of cash gives the widest possible choice of stores. Some time might be saved by going to a geographically closer store that accepts only cash. The results suggest that time-sensitive consumers are more likely to use cash in their grocery shopping. The effect is highly significant ($F_{2,368}=5.13$, $p<.01$). Thus, Proposition 3 appears to hold.

Proposition 4. Those who are time sensitive in terms of shopping behavior are expected to value highly their leisure time. The value of leisure time was obtained by asking consumers to place a subjective dollar value on that time. That is, participants were asked what monetary compensation they would willingly exchange for one hour of their leisure time. The rated values of leisure time varied widely across respondents. However, time-sensitive consumers place a higher value on their leisure time. The resulting $F_{2,368}=3.08$ was significant at $p<.05$ and thus supports Proposition 4.

Proposition 5. Consumers who wish to save time when shopping for a few goods at a time can do so by going to convenience stores. Although the prices are relatively high and the range of product offerings is limited, convenience stores offer the advantage of quick service. Therefore, time-sensitive consumers can be expected to frequent such stores. The consumer-rated frequency of convenience store patronage was significantly higher for time-sensitive consumers ($F_{2,368}=3.04$, $p<.05$). The results support Proposition 5.

An overall test of the model involves testing all five propositions simultaneously. Overall support of the model would suggest that equations (1) through (3) are a reasonable representation of potential adjustments to shopping behavior engaged in by time-sensitive consumers. A MANCOVA test of the five propositions yielded $F_{10,1830}=3.58$, significant at $p<.01$ (Table 2). Further, the MANCOVA results indicated that purchasing behavior was strongly influenced by the two covariates, family size and adequate household storage ($F_{10,1830}=11.59$, $p<.01$). When tested individually, all five propositions were significant as long as only those shoppers living within a 15-minute commute of their grocery store were counted when testing the first two propositions. Furthermore, when the five propositions were tested simultaneously, the data for all shoppers supported the inventory model. The latter test is most appropriate to assess the validity of the model since an individual can minimize total time inputs through small adjustments to any of several individual aspects of time usage. A simultaneous test of all five propositions provided an indication of the net effect of all factors.

Test of Combined Model

The combined model of time sensitivity and deal proneness introduced in equations (4) through (6) resulted in Propositions 6, 7, and 8. These propositions integrate the effects of time sensitivity and deal-proneness on purchase behavior.

Proposition 6. Consumers were classified into three equally sized groups of low, medium, or high deal-proneness. An ANCOVA test indicated that the mean expenditures in the three groups were significantly different ($p<.05$) with the highly deal-prone shoppers purchasing larger quantities per shopping trip. Size of the family and adequate storage facilities were again the covariates in the analysis. The results confirm Proposition 6.

Proposition 7. Proposition 7 can be evaluated theoretically and empirically. From equation (4), the costs and benefits of dealing can be separated from those related to time usage. If only the cost and benefits of dealing are considered, equation (4) can be written as

$$(D/q)wt_3+1/2\ q(c-s)h-Ds. \tag{7}$$

If equation (7) exceeds zero, the costs of dealing exceed the related benefits and the consumer gains by not engaging in dealing. Therefore, some consumers are not expected to be deal-prone. However, the total cost (equation (4)) is always minimized by reducing time t_1 and t_2. Therefore, all consumers are time sensitive, albeit to different extents, so an average consumer is more likely to be time sensitive than deal-prone.

The empirical results confirm the theoretical findings. The average time-sensitivity rating exceeded the deal-proneness rating for the consumers in the low, medium, and high deal-prone categories ($p<.01$). The differences were most pronounced for the low deal-prone category. Proposition 7 is supported by the results.

Proposition 8. Propositions 1 through 5 were retested using both time sensitivity and deal proneness as independent variables in a MANCOVA. There were no significant interactive effects of the two constructs on any of the five dependent shopping behavior variables. While the inclusion of deal proneness in the inventory model does not undermine its predictive usefulness, the effects of time sensitivity and deal proneness on shopping behaviors appear to be independent. Thus, Proposition 8, which is based on the additive nature of the model in equations (4) through (6), is supported empirically.

Characteristics of Time-Sensitive Shoppers

If time sensitivity is to be a managerially useful construct, it is necessary to know the demographic variables that define segments of high and low time sensitivity. A discriminant analysis was run using time sensitivity as the dependent variable. Demographic variables were entered in a stepwise fashion based on how well they distinguished low time-sensitive consumers from highly time-sensitive consumers. At the .05 level, only two variables (employment level and level of education) were significant. However, the overall discriminant function was highly significant with a Wilk's lambda of .953, $p<.01$. Other demographic variables including marital status, sex, age, income, and primary earner status in the household were not significant. Thus, the stereotypic highly time-sensitive shopper is an individual who is highly educated and tends to be employed full-time outside the home.

A two-function discriminant analysis using both time sensitivity and deal proneness as dependent variables is described in the Appendix. The analysis establishes the two constructs as distinct. Furthermore, demographic variables associated with either construct are entirely different. The results of the latter discriminant analysis,

together with the results of Propositions 7 and 8, argue strongly for the interchangeability of monetary and time costs in the combined model. While all consumers may prefer to minimize total shopping costs, there are vastly different means to accomplish the desired end.

CONCLUSIONS

The results suggest that the overall inventory model of time sensitivity is justified by the data. The first five propositions were supported when tested jointly. When tested individually, the direction of all relationships agreed with the propositions' predictions. For Propositions 1 and 2, which concerned purchase quantities per shopping trip and total monthly shopping commuting times, the relationships were only significant for the urban shoppers.

The lack of stronger support for Proposition 1 may also be related to the measure used to test the proposition. For example, quantity purchased was approximated by dollars spent. Two consumers may buy the same quantity of goods but one may spend 50 percent more than the other. As discussed earlier, the other measures of quantity have their own problems. The intrinsic error in the measure leads to increased mean squared error. This may have produced a low value of the F statistic for Proposition 1 for the sample (the results were significant at $p<.05$ if rural residents were excluded). Future research employing multiple measures of quantities purchased and stratified by urban versus rural classification of shoppers might prove useful to further test Propositions 1 and 2 of the model.

IMPLICATIONS

Based on the results of tests of the series of propositions, there appear to be strongly differing patterns of shopping behavior exhibited by individuals of varying levels of time sensitivity. These time-sensitive shoppers (who are on average employed full-time and well educated) are becoming a larger element of the marketplace as more women are employed outside of the home.

Furthermore, shoppers exhibiting the behavioral characteristics of the highly time-sensitive consumer appear to be very desirable clientele to the retailer. Shoppers who are time insensitive buy lesser quantities per trip. Such smaller quantity purchases increase the per-item handling costs of the retailer; that is, the retailer will likely be required to maintain more employees (checkers and carry-out personnel) to handle the same dollar volume of purchases. Additionally, the time-insensitive shopper may split his purchases among a number of stores, thus limiting the profitability to any one retailer of that person's patronage. Lastly, the shopper low in time sensitivity, as well as those highly deal-prone, may pick and choose items more carefully and select items that are of low margin or are marked down. Thus, from the point of view of most retailers, it is most desirable to attract the time-sensitive segment.

With this end in mind, the results of the discriminant analysis are encouraging. Time-sensitive shoppers appear to be distinguishable from those who are less time sensitive by two factors: levels of education and employment. Thus, it should be a relatively easy task to promotionally target time-sensitive shoppers by depicting patronage of the store by sophisticated, "career-type" consumers.

Furthermore, time-sensitive shopping behavior was measured by the expressed absolute importance to shoppers of four grocery store characteristics: (1) convenience of layout for fast, easy shopping, (2) lack of crowding in the store, (3) availability

of quick-check services, and (4) extended hours of operations. Thus, time-sensitive shoppers will select stores offering these features, which can be stressed in promotional messages. Retailers appealing to the time-sensitive segment may find it particularly effective to add a "cash only" checkout line in addition to quick-check lines based on the number of items purchased.

Many stores are already making these recommended changes. Transitions to scanners, additions of more adequate lighting, and use of quick-check lines during peak periods are commonplace. However, further movement in this direction is desirable if the business of the lucrative, time-sensitive segment is to be captured. [Received: July 20, 1987. Accepted: October 19, 1988.]

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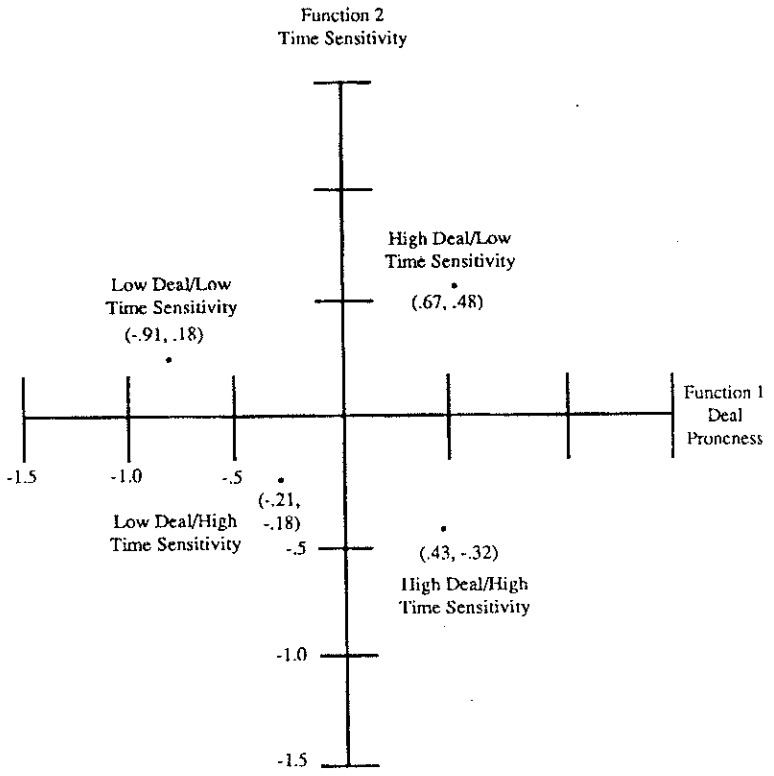
APPENDIX

Consumers were classified on both deal proneness and time sensitivity. Four classifications of consumers were included, each of which was composed of those shoppers who

were either high or low in both time sensitivity and deal proneness. In a two-function discriminant analysis, Wilk's lambda and its associated significance provide an estimate of the separation of the four groups. Wilk's lambda for the first and second functions indicated a significant separation between the four group centroids on both functions (Wilk's lambda = .639, $p < .01$ and Wilk's lambda = .872, $p < .05$, respectively). After the effects of the first and second discriminant functions were removed, the separation between the group centroids was not significant. Thus, the use of the two discriminant functions appeared to be sufficient to explain differences among the four groups.

The centroid of each group is plotted in Figure 1. The first function distinguishes between the most and least deal-prone shoppers and the second function separates consumers of low and high time sensitivity. The centroids of the low deal-prone segments are in the left quadrants and the centroids of the high deal-prone segments are in the right quadrants, suggesting that function 1 (x-axis) discriminates on the basis of consumers' deal proneness. Similarly, function 2 (y-axis) discriminates on the basis of consumers' time sensitivity.

Figure 1: Two-function discriminant analysis—Discriminant functions evaluated at group means (group centroids).



The first function was defined by several demographic variables. Consumers who were more deal-prone tended to be older, married women in lower income categories whose spouses were the principal wage earners of the family. Similarly, highly time-sensitive consumers (function 2) tended to be highly educated and employed full-time. The four-function discriminant analysis helps to elucidate the time sensitivity and deal proneness of consumers and explain differences in these characteristics with demographic variables. The significance of both functions suggests the importance of both of the constructs.

U. N. Umesh is Assistant Professor of Marketing at Washington State University. He received his Ph.D. in business administration from the University of Washington, an MBA from the University of

Rochester, and a B.Tech. in mechanical engineering from the Indian Institute of Technology, Madras. Dr. Umesh is a member of the American Marketing Association, Association for Consumer Research, and The Institute of Management Science. His papers have been published in such journals as the *Journal of Marketing*, *Psychometrika*, and *Journal of Business Research*.

Kathy L. Pettit is Associate Professor of Marketing at the University of Idaho. She received her Ph.D. in marketing from the University of Washington. Dr. Pettit's work has appeared in *Journal of Psychology and Marketing*, *Journal of Direct Marketing*, *Journal of Marketing Education*, and *Advances in Consumer Research*. Her research interests involve consumer information processing, particularly in response to various forms of advertising appeals.

Carl S. Bozman is Assistant Professor of Marketing at the University of Delaware. He received his M.A. in economics from the University of Victoria, British Columbia, and his B.A. in business administration from the University of Idaho. Mr. Bozman's work has appeared in the *AMA Educator's Proceedings* and *Advances in Consumer Research*.