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RESEARCH REPORTS AND UPDATES

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PREDICTING SUPERMARKET IMAGE FROM INDIVIDUAL STORE CHARACTERISTICS

by

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Retail food stores have a host of characteristics which differentiate them from one another. For example, some stores emphasize no frills and low prices, while others emphasize total one-stop shopping and assortment. The retail food store is simply a conglomeration of many characteristics. This conglomeration of characteristics is what consumers use in their decision of where to shop for food.

The purpose of this paper is to investigate whether information about consumers can be used to predict the characteristics they desire in the grocery store they shop. If it is possible to predict consumer desires through general demographic characteristics, then grocery stores can adjust their operations to match consumers wants.

Procedure

Consumer demand for six different characteristics of a grocery store are analyzed. They are consumer demand for:

1. an in-store bakery
2. an in-store deli
3. generic products
4. private label products
5. a warehouse format
6. manufacturer's coupons

Data for the analysis came from a series of consumer surveys for areas in and around a Southeastern SMSA (Standard Metropolitan Statistical Area). The surveys were sent out by mail, completed by consumers and returned to the analyst. A total of 884 observations are used in the analysis. Demographic information gathered included age, income, household size, and dollars spent on food (per week). These demographic variables were all collected using intervals instead of actual values (i.e., the age of a respondent might be 18-25 instead of 23). Interval means were used to estimate an exact number for each demographic observation. Dummy variables were formed to classify the respondent's hometown, by type. Classifications were urban centers (within an SMSA), urban support centers (that serve as "bedroom" communities to the urban center), regional trading centers (that attract customers from outlying areas), and local trading centers (that are distant from urban centers and attract only local customers). The exact wording of the questions used to arrive at the dependent variables appear in Table 1.

The dependent variables were all dichotomous, (dummy variables) as consumers either used the service or not (e.g., either purchased generic products or did not).

TABLE 1. Questions Used to Arrive at Value for the Dichotomous Variables

| Dependent Variable | Question |
|--------------------|--|
| Bakery | Do you prefer an in-store bakery? |
| Deli | Do you buy deli items? |
| Generics | Do you buy generic (unbranded) food items? |
| Private Labels | Do you buy private label products? |
| Warehouse | In what grocery store do you buy most of your food? (then identify the store as a warehouse store or not) |
| Coupons | Do you use manufacturer's coupons? |

Regression analysis was used to examine the relationships. The general form was:

$$(1) Y_{ij} = f(\text{AGE}_j, \text{INCOME}_j, \text{HH}_j, \text{FBILL}_j)$$

where Y_i is the value of the i th dependent variable (store characteristic), AGE is the age, INCOME is the family income, HH is the household size, and FBILL is the amount spent on food per week. The j subscript denotes the j th respondent. Also included in the specifications for equation (1) are the home-town dummy variables described earlier.

Because the dependent variables were dichotomous the procedure developed by Nerlove and Press was used to obtain coefficients. This procedure eliminates problems with heteroscedasticity and with predictions lying outside the 0 to 1 interval.

In-Store Bakery

Table 2 shows the coefficient estimates and standard errors for the six different store attributes. The results for in-store bakeries show that younger people with high food bills tend to like in-store bakeries more than other people. Income level and number of people in the household were not found to significantly affect the preference for in-store bak-

eries. People living in local trading centers are more likely to prefer an in-store bakery than people living in urban areas. This is interesting because these are the people who are least likely to have a nearby store which includes a bakery department. People living in local trading centers are probably more rural-oriented, and are therefore more likely to prefer fresh baked goods. People living in regional trading centers and urban support areas are not significantly more or less likely to prefer in-store bakeries than those who live in urban centers.

Table 3 shows the elasticity estimates for the regression equations. All elasticities are calculated at the mean. As a person's age increases by 10%, their preference for an in-store bakery will decrease by 4%. As the family's food bill increases 10%, their preference for an in-store bakery will increase by almost 3%. Note that income elasticity is extremely small (-.002).

Because the preference for in-store bakeries decreases with age and increases with the size of the food bill, it may be that in-store bakeries mainly serve single people or young-married people with no or a few children. In future research, family size classified by children's age would be hypothesized to be a significant variable in the preference for an in-store

TABLE 2. Coefficient Estimates and Standard Errors for Six Supermarket Attributes

| | Constant | Age | Income | HH | F Bill | D ₁ ^a | D ₂ | D ₃ |
|----------------|-----------------|-----------------|-------------------|-----------------|------------------|-----------------------------|-----------------|----------------|
| Bakery | .31* (.016) | -.11** (.03) | -.0001 (.0001) | -.06 (.03) | .006** (.002) | .13 (.09) | -.07 (.09) | .25* (.10) |
| Deli | .56** (.16) | -.12** (.03) | -.0001 (.0002) | -.11** (.03) | .010** (.002) | -.15 (.09) | .07 (.10) | -.15 (.10) |
| Generics | -.41* (.17) | -.05 (.03) | .0001 (.0002) | .17** (.046) | -.006* (.002) | .12 (.09) | -.05 (.10) | .007 (.110) |
| Private Labels | .41* (.17) | -.06* (.03) | .0003 (.0003) | .09** (.04) | -.005* (.002) | .14 (.10) | .08 (.10) | -.17 (.10) |
| Warehouse | .015 (.21) | -.11** (.04) | -.0005 (.0004) | .023 (.044) | -.004 (.003) | -.37** (.12) | -.89** (.18) | -.11 (.13) |
| Coupons | 1.06** (.25) | -.041 (.040) | -.0001 (.0004) | .16** (.06) | -.007* (.003) | .02 (.14) | .09 (.15) | -.04 (.16) |

^aD₁, D₂, D₃ are dummy variables identifying regional trading centers, urban support centers, and local trading centers, respectively.

*Significant at the 5% level.

**Significant at the 1% level.

TABLE 3. Elasticity and Probability Estimates for the Regression Equation

| | Age ^a | Income ^a | HH ^a | F Bill ^a | D ₁ ^b | D ₂ ^b | D ₃ ^b |
|----------------|------------------|---------------------|-----------------|---------------------|-----------------------------|-----------------------------|-----------------------------|
| Bakery | -.40** | -.002 | -.19 | .29** | .13 | -.07 | .25* |
| Deli | -.37** | -.017 | -.27** | .39** | -.12 | .05 | -.12 |
| Generics | -.26 | .021 | .75** | -.45* | .18 | -.06 | .01 |
| Private Labels | -.18* | .024 | .21** | -.18* | .10 | .06 | -.13 |
| Warehouse | -.64** | -.12 | .11 | -.64 | -.46** | -.80** | -.16 |
| Coupons | -.03 | -.01 | .10** | -.08* | .01 | .02 | -.01 |

^aThese elasticities are calculated at the mean.

^bThese probabilities are estimated using the change between zero and one for the variable.

*Significant at the 5% level.

**Significant at the 1% level.

bakery. Those who live in local trading centers may prefer in-store bakeries because when they do travel to urban or regional trading centers to shop, they may want to do as much shopping as possible in each store they visit. It should be mentioned that this question analyzed people who prefer in-store bakeries rather than people who buy bakery items. For this reason, people who frequent a store which has no in-store bakery (i.e. people from local trading centers) may be more likely to respond positively.

In-Store Deli

The results for the equation explaining whether a respondent buys deli items are very similar to the bakery results. Age is negatively related to the propensity to purchase deli items, and the size of the family's food bill is positively related. However, in the case of deli's, smaller households are significantly more likely to buy deli items than larger households. Again, the income coefficient was negative, small in absolute value, and not significantly different from zero.

Table 3, again, shows the elasticities for the variables. All three variables with significant coefficients also had relatively large elasticities. A 10% increase in the age and household size will decrease the probability of purchasing deli items by almost 4% and 3% respectively. The same 10% increase in a family's food bill will increase the probability of purchasing deli items by almost 4%. Younger people who, as a consequence, have smaller families, but who spend a lot on food are more likely to prefer deli's. Families with two working people which have been more frequent, may be a good example of the typical deli and bakery customer.

Generics, Private Labels and Coupons

The results in Table 2 for generic products indicate that larger families are significantly more likely to buy generic products, and families with large

food bills are significantly less likely. These signs are consistent with the idea that generic products are less expensive food alternatives. The coefficients for age and income were small enough, relative to their standard errors, that one cannot confidently conclude that they have an effect on the probability of purchasing generic products.

The elasticity estimates, Table 3, show that as the family's food bill increases by 10%, the probability that the family buys generic products decreases by 4.5%. A family that is 10% larger, everything else equal, is 7.5% more likely to purchase generic products.

Families which were younger, larger, and with smaller food bills were significantly more likely to purchase private label products, Table 2. The results for private labels are very similar to the results for generic products, as one would expect because both are considered low-cost food products.

The magnitude of the elasticities for the variables are fairly similar to the other estimated equations with two exceptions. The first is the large decrease in magnitude of the elasticity for household size. Given a 10% increase in household size, the probability of buying private labels increases by 2.1% (instead of 7.5% with generic products). The other exception is the much less negative elasticity for the family's food bill. Families with a 10% larger food bill, everything else being equal, are 1.8% less likely to purchase private labels (they were 4.5% less likely to purchase generics).

Private label products are more commonly purchased than are generics. The results may be indicating that generic products are the resort of those who work hard to keep their food bill down or must do so because they have a large family. The result that young people are not significantly more likely to buy generics may indicate that cost-conscious young people view generics as a lower quality product.

The final equation was used to explain the use of manufacturer's coupons. The results for this equation are very similar to the equations explaining the use of generic and private label products. Larger households with lower food bills are significantly more likely to use manufacturer coupons. The coefficients for all other variables were very small relative to their standard errors, thus indicating that they are not important variables in explaining which individuals use coupons.

The elasticity estimates are quite small for all variables, Table 3. The largest elasticity was for household size and it was only .10. One of the main reasons for this is that the large majority (87%) of respondents used manufacturer's coupons and therefore there was very little variation left to be explained by the independent variables.

Warehouse Stores

Warehouse-type stores are supposed to have a much larger market area than the typical supermarket. The results, presented in Table 2, lend some support to this proposition. People living in regional trading centers and urban-support centers are significantly less likely than those living in urban centers to shop at a warehouse-type store. The elasticities in Table 3 show that people living in regional trading and urban-support areas are, respectively, 46% and 80% less likely to shop at warehouse stores than their urban counterparts. The only warehouse stores were in the urban area. The magnitudes of these elasticities are somewhat surprising for the urban support centers, where many people work in the SMSA or could easily make a weekly trip to a warehouse store once a week. People living in local trading areas were not significantly less likely to shop at a warehouse store than people in urban centers. Older people are also significantly less likely to shop there.

With age comes less mobility or at

least less desire to drive distances to shop. However, it is surprising that people from local trading centers are just as likely to shop warehouse stores as the urban populace but people from urban support centers and regional trading centers are much less likely to shop there.

Support centers were, by definition, closer to the urban center (and therefore closer to the warehouse stores than either the regional or local centers). The sampled population from local centers were somewhat more distant from the urban center than the regional centers. Consequently, those closest and farthest from the warehouse stores shop there and those between do not.

It could be that many price-conscious people in regional trading centers and urban support areas have grocery stores nearby which have low enough prices that a trip to the SMSA for a warehouse-type store would not result in enough savings to warrant the trip. However, those people living in a local trading center must travel at least 10 to 20 miles before they can get these low prices at the regional or urban support centers. Therefore, what these families do is choose to coordinate their grocery trips, at least for non-perishables, with other shopping and leisure activities in the SMSA.

SUMMARY AND CONCLUDING REMARKS

The main objective of this study was to determine if demographic attributes are useful in explaining the demand for certain grocery store characteristics. It was found that younger people seem to be more cost-conscious in their purchasing behavior (they are more likely to buy generic and private label products, to use coupons and warehouse outlets), yet they are more likely to patronize speciality departments within a store (bakeries and deli's). Large households also tend to be cost-conscious, but they are less likely to use speciality departments. Families which have large food

bills (and to the extent that this variable reflects a high family income) tend to enjoy specialized departments, but shun ways of cutting food costs. The analysis found little difference between the residence classifications except where customers from both regional trading centers and urban support areas were much less likely to shop at a warehouse-type store.

Because today's grocery store relies so heavily on the image it has with the customers, any data concerning changes in consumer demographics or changes in operations is valuable. Such changes as

these easily add to or subtract from overall store acceptability. This analysis provides very general information--a beginning--on how various classes of consumers might react to a specific set of supermarket characteristics.

REFERENCE

Nerlove, Marc and S. James Press. "Univariate and Multivariate Log-Linear and Logistic Models." R-1306-EDA/NIH. The Rand Corporation. December, 1976.