Consumer Choices and Welfare Gains from New, Healthy Products:

A Virtual Prices Approach[1]

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Abstract
This paper models consumer food choices with respect to different margarine and spread brands that include a new healthy brand. The results show that the older and smaller size households with higher income and higher education are more likely to purchase the healthy brand. An Almost Ideal Demand System for six brands was estimated and the coefficients were used to calculate price and brand expenditure elasticities in order to examine the responsiveness of the consumers to economic variables.

Key words: scanner data, demand for healthy food

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Introduction

The consumer's choice over quantity and quality of many products increases every year through improvements in existing goods and the production of new goods. There have been significant changes in markets in response to consumer preferences, regulations for food safety, and new technologies for producing and manufacturing of foods that meet consumer demand for improved food attributes. Many recent changes address consumer interest in foods that promote good health. Information on consumer choices and the value that consumers place on improved (health-promoting) foods provides better understanding of consumer decisions and willingness to pay for healthy food choices. In addition, investment in new technologies and market innovation requires valuing improvements from new and re-designed foods.

To improve understanding of the evolving consumer food market for product enhancements, we evaluate consumer preferences and food choices with specific attention to food groups that entail value added processes to enhance the nutritional attributes of products. The product of interest is reformulated margarine that contains plant sterol or plant stanol esters to reduce the risk of coronary heart disease (CHD).

Coronary heart disease, one of the most common and serious forms of cardiovascular disease, causes more deaths in the U.S. than any other disease (FDA, 2000). High total cholesterol levels and high levels of low-density lipoprotein (LDL) cholesterol are risk factors for CHD. There is some evidence that information about cholesterol and health influences decisions about whether to consume eggs and how much to consume (Brown and Schrader 1990; Yen, Jensen and Wang

1996). Dietary fat intake is also associated with the increased risk of chronic diseases, including CHD, cancer, and stroke. Chern et al. (1995) model the impact of health information (the knowledge of the link of fat intake and CHD) on demand for fats and oils and find that the health information increases the consumption of margarines and decreases the consumption of butter and lard. Kim and Chern (1995) use a characteristics demand model to estimate the value consumers place on various fatty acids and to examine the impact of health information on demand for fats and oils. They find that the implicit values for unsaturated fats are much higher than saturated fat implying changes in consumer tastes. Increased information on fat influenced these changes.

Studies by Hausman (1997a, 1997b), Petrin (2002), Nevo (2003) have estimated price index impacts and consumer welfare impacts of new products using estimated demand system. New, health-promoting products, including those with an effect on cholesterol and on reducing CHD can be considered as such a new product introduction.

In this paper we model the consumer food choices with respect to margarines and spreads based on economic, ethnic and other socioeconomic characteristics, and consider specifically demand for new products that reduce CHD. The new product introductions of interest are the health-promoting brands: Benecol and Take Control. In estimating consumer preferences we account for the introduction of new brands by using the virtual price approach. We calculate virtual prices for the new brands Benecol and Take Control using Hausman's approach (1997) and evaluate the change in consumer welfare from the introduction of a nutritionally enhanced product. The new product introduction in the U.S. market occurred in 1999, when the two products Benecol and Take Control were approved by the Food and Drug Administration. Because the timing of introduction was very similar (May-June 1999), we treat the two as one

"healthy brand" and estimate the model using data from the A.C. Nielsen 1999 HomeScan retail scanner panel for that year.

The paper is organized in the following manner. First, we provide a theoretical model of household's consumption decisions. The next section provides the empirical specification and estimation methods. Following a section that describes data and variables, we present results and conclusions.

Theoretical Model

Consider a model of household demand with new brands. The household maximizes utility $U(q_1 + \sum_{j=2}^{k} q_j + q_{k+1})$ subject to a budget constraint $E = p_1 q_1 + \sum_{j=2}^{k} p_j q_j + p_{k+1} q_{k+1}$, where q_1 is a new brand, q_j are the other brands, q_{k+1} is a composite good of all other products, and p is the price. The optimal demand equations (Marshallian demands) are functions of prices and budget. Alternatively a household can make decisions by minimizing a cost C subject to utility level U. We can derive the Hicksian demands as functions of prices and utility.

For the pre-introduction period the correct price for the new brand is the virtual price p_1^v. The concept of virtual prices in demand theory under rationing was the fundamental contribution of Neary and Roberts (1980). For a new brand the ration level is zero. In terms of a new brand, the virtual price p_1^V for the new brand q_1 is $0 = q_1^c(U_0, p_1^V, p_2)$, where $q_1^c(U_0, p_1^V, p_2)$ is the Hicksian demand function of the new brand and p_2 is a vector of prices of the other brands. Bettendorf and Barten (1995) refine the virtual price approach and apply the Neary and Roberts (1980) model for analysis of rent controls. Hausman (1997a) uses the virtual price approach to examine the impact of new goods on the Consumer Price Index (CPI). Based on an example of a

new cereal brand, Hausman finds that the CPI may be overstated for cereal by about 25 percent if the new cereal brand is neglected. Huffman and Johnson (2002, 2004a, b) have explored the virtual approach for rationed goods and show that welfare losses during the transition from a centrally planned to a market economy in Poland are overestimated when one does not account for the costs of rationing.

An Empirical Model of Margarine Brand Choice

To estimate an empirical model of brand choice we use a two-stage model of demand. The first stage is the overall demand for margarine and spreads using a price index for margarine and spread relative to other goods. The second stage is the choice of brand, conditional on purchasing margarine.

The econometric specification at the brand demand (the second stage) is the Linear Approximate Almost Ideal Demand System (LA/AIDS) of Deaton and Muellbauer (1980), which allows for a second order flexible demand system. For each brand the LA/AIDS specification is

$$w_{it} = \alpha_{i0} + \sum_{s=1}^{S} \delta_{is} D_{st} + \sum_{j=1}^{J} \gamma_{ij} \log p_{it} + \beta_i \log(E_{Bt} / P_t) + u_{it}, \text{ i=1,…, J and t=1,…,12.} \qquad (3)$$

w_{it} is the share of brand *i* in period *t*, D_{st} is a vector of demographic variables, p_{it} is the price of brand *i* in period *t*, E_{Bt} is the brands total expenditures in period *t*, P_t is the Stone price index. We use a two step estimation procedure based on all observations to estimate the censored demand system. In the first step, we obtain ML probit estimates of likelihood of making a purchase of a particular brand

$$\Pr ob(brand_i = 1 = yes) = \frac{1}{\sqrt{2\pi}} e^{-Z\eta^2/2} \qquad (4)$$

where Z is a vector of income and household demographic characteristics, including size, age, kids, education, married, race, region of residence. We calculate the inverse Mills ratio, λ, which is the cumulative density function divided by the probability density function. In the second step, the expenditure share equations are stacked into the Seemingly Unrelated Regressions (SUR) model, including the selectivity term, λ.

Deaton and Muellbauer have shown that the LA/AIDS has desirable aggregation properties and it is used widely for analyzing micro data. Consumer demand theory imposes the homogeneity and symmetry restrictions. The adding up property means that only if the additive disturbance terms u_{it} in equations (3) satisfy the usual stochastic assumptions (the errors are independently and identically distributed with zero mean and constant variance), ordinary least squares can be applied to estimate the expenditure share equations. However, if the errors are contemporaneously correlated across equations, then the generalized least squares procedure can be used to gain an asymptotic efficiency.

The widely used estimator for sets of expenditure share equations is the SUR method. The SUR method results in consistent and asymptotically more efficient parameter estimates, and is asymptotically equivalent to the maximum likelihood estimation (Barten, 1969). The latter results are invariant to the equation dropped or residually computed to accommodate the singularity of the error covariance matrix. The share equation for the last brand (or brand 6) is dropped for this application and its parameters are recovered using the adding up restrictions. In this version of the paper the symmetry restriction was not imposed.

Calculation of Virtual Prices

The correct price to use for the new brand in the pre-introduction period is the virtual price, which sets quantity demanded equal to zero. Thus, calculating the virtual prices is critical to the results of the analysis. In our analysis we follow Hausman's (1997a) approach for determining the virtual prices for new brands. Given the demand function, Hausman solves implicitly for the virtual price that causes the demand for the new good to be equal to zero in the pre introduction period. In this paper the virtual prices are imputed from an estimate of the second stage brand level demand system. Virtual prices are calculated for the new health-promoting brand: Benecol and Take Control margarines. Here the preferences with actual prices are first estimated. Next, using these estimated coefficients we "back-out" the implied virtual prices that support the pre-introduction data, as the prices at which the shares are zero. These prices are then averaged across households in each month of the pre-introduction period.

Benecol and Take Control were introduced during the month of June 1999. Therefore, we use monthly data (t = 1, 2, 3, …, 12) for the year 1999. Using the virtual prices for the health-promoting brand (Benecol and Take Control) for the months of January through May and the actual prices for the rest of the year we estimate a new set of equations. Based on this set of coefficients we estimate the welfare gains from the introduction of the new healthy brand. The Compensating Variation (CV) given by the difference in cost functions $CV= C(p^1, U^0)-C(p^0, U^0)$ can be evaluated for each household directly. Negative differences indicate that the household experiences a welfare gain as a result of the introduction of the new brand.

Data and Variables

Scanner data provide opportunities for improving economic measurement by providing information on quantity and prices, and allowing for estimates of the demand for more disaggregated commodities/brands. The data also contain detailed information on products' attributes. The advantage of the scanner data is the large datasets, more frequent observations and many attributes of the products (existing and new brands), all valuable in analysis of differentiated product brands. To estimate our model we use the AC Nielsen household scanner panel for dairy purchases. The panel data include household product purchases and household demographics for 1999. The data include information on purchase date, brand, quantity (packages); price paid on deal; price paid non-deal; coupon value; and product attributes. We match the household data with the household purchases, and exclude from our sample any households that did not have any dairy purchases for two consecutive months. The household characteristics include household size, income, age, education, and employment of female and male head, marital status, race, region of residence.

In this study we focus on the margarine and spread purchases, and particularly on six brands. The variables created to estimate the model in (3) are prices (unit value) for the six brands of interest as household expenditure per month divided by household quantity in pounds purchased per month, where the individual expenditure was calculated by subtracting the value of any coupons used in the purchase. We look at the monthly purchases and calculated household specific monthly prices (unit values). Prices for the households that do not consume the brand are not available. To replace the missing prices for the non consuming households we created monthly regional average prices among the consuming households where the regions are defined by four geographical divisions (East, West, Central and South). The households living in the

same regions are likely to pay similar prices and the monthly regional averages reflect regional price variations.

The panel data include 5,820 households with observation of margarine and spread purchases during each of the months in the 12-month period. Of these, 5032 households had expenditures at some time during the year on one of the (6) brands under investigation. The product of particular interest in this study is the health promoting brand: either Benecol or Take Control. We treat these two brands as one product (the "healthy" brand). Eight percent of the households (477) purchased this product during 1999; the average monthly expenditure on the health brand by consuming households was $4.52, with an average unit value of $7.55 per pound (see Table 1). The other five brands (brand 2 through 6) each had a larger share of households purchasing the product (27–37%). Also, the average pounds purchased were higher and the average monthly expenditure lower (hence a lower average unit value) for households purchasing each of the other brands.

Figure 1 presents the percent of the households that have purchased any of the six brands. Only 8 percent of the households in the sample purchased the healthy product Benecol or Take Control; while the largest share of households purchased brands 2 (36 percent) and 6 (37 percent). The greatest number of households that purchased the healthy brand was in June and July of 1999 just after the health brand products were introduced and promoted in the market (Figure 2). Figure 2 shows the number of households that purchased any of the six brands by month in 1999.

Table 2 presents the definitions of the variables in the model. Table 3 presents the means for the variables used in the model for the different brands. The average household income is $51,283. The highest average income is for the households who purchased the healthy good, an average of $54,371. The average household size for the sample is 2.8; 34 percent of the sample

are households with children, and 75 percent are married couple households. Households with purchases of the healthy brand were relatively smaller in size than the average consumer of other brands.

Empirical Results

First we estimated the probability of purchasing the brands of interest as a function of the demographic characteristics such as household size, income, age, kids, marital status, race (as white, black and Hispanic) as in equation (4), which is the first step of estimation. Since the healthy brand was introduced in the market during the month of May, we use data from June through December 1999. The results of the estimation of the six probit equations, for the six brands are presented at Table 4. We also include a time trend.

Most of the demographic household characteristics are statistically significant. Higher income, smaller household size, older age and having college and post college degree increase the probability of purchasing the healthy brand. For brand 2, 4 and 6, which are relatively less expensive (see the unit values in Table 1), the effect of income is negative, while for brand 3 and 5 is positive and statistically significant at the 1% level. Household size has a positive effect on the probability of purchasing brand 2 and brand 4, the relatively cheaper brands. We also have statistically significant regional effects on the likelihood of purchasing the different brands.

Next, we estimated the second step of our empirical model, the demand system as in equation (3). In application of the AIDS, the dependent variables were the budgeted shares for the six brands: i) Healthy brand; ii) Brand 2; iii) Brand 3; iv) Brand 4; v) Brand 5; and vi) Brand 6. The explanatory variables for the AIDS model are logarithms of (relative) prices, household total brands expenditure and household demographic characteristics. The highest mean shares

from all six brands are for Brand 3 (24%) and Brand 6 (23%), while the smallest are for the healthy brand (7%) (Table 6). Several of the demographic characteristics have a statistically significant effect on the brands shares. For example, income and age have significant negative effects on the Brand 2 budget share; being married and white have positive and significant effects on the budget share of the healthy brand.

Finally, the household responsiveness to economic variables of price and brand expenditure elasticities were computed. The elasticities are functions of the estimated coefficients β_i and γ_{ij} from the demand model in (3). Table 6 presents our estimates of the own- and cross-price elasticities of the household brands' demand. All the compensated and uncompensated own-price elasticities are negative consistent with the theory. All the compensated own-price elasticities are less than 1. The demand for Brand 3 was the most price inelastic while the demand for Brand 6 was most price elastic. Most of the cross-price elasticities are small. The lower values of the cross-price effects indicate that consumers are more responsive to own-price rather than prices of the other brands. Table 6 presents also the brand expenditure elasticities. The brand expenditure elasticity for Brand 2, Brand 3, Brand 4, Brand 5 are larger than one; the expenditure elasticity for Brand 6 is smaller than one, and for the healthy brand is negative. The negative brand expenditure elasticity suggests possible interaction effects with household demographic or other variables. This possibility is under investigation.

The next step will be to calculate the virtual prices using the coefficients from the estimated demand system for the Healthy Brand for the months January through May since the Healthy Brand was not on the market. The AIDS will be estimated using data from January to December of 1999, with the monthly virtual prices for the Healthy Brand for the months when it

was not on the market. We also will evaluate the changes in consumer welfare from the nutritionally enhanced product changes, i.e. the introduction of the new healthy brand.

Conclusions

Understanding of consumer choices of healthy food products is important in time of increased obesity and relatively high rate of CHD in the United States. The quantity and quality of many products including the introduction of new goods or brands increase every year. It is important to understand the choices consumers make with respect to healthy food products and formulate policies encouraging making healthy choices. There is relatively little market-based information on the demand parameters for health-promoting brands.

The goal of this paper is to model the consumer food choices based on economic and socioeconomic characteristics with respect to different margarine and spread brands, and in particularly a new healthy brand recently introduced to the market. The results show that older and smaller size households with higher income and higher education are more likely to purchase the healthy brand. An AIDS was estimated and the coefficients were used to calculate price and brand expenditure elasticities in order to examine the responsiveness of the consumers to economic incentives. The own-price elasticities are all negative and consistent with theory and the magnitude suggests relatively strong (price inelastic) demand for the healthy food product. In estimating the consumer preferences we account for the introduction of the new healthy brands using the virtual price approach.

Notes

1. Gould 1997, 1998, models consumer demand for butter, margarine and blends and the factors affecting the purchases and the timing of the purchases.
2. The data were made available under a cooperative agreement with the Economic Research Service, USDA.

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Table 1. Distribution of Households that Purchased a Particular Dairy Brand, Margarine and Spreads and Average Purchases and Expenditure for those Making Purchases

Product Category	Number of Households (Unweighted)	Percent of Households	Average Monthly Quantity (pounds)*	Average Monthly Expenditure ($)*	Average Unit Value ($/lb)*
Margarine and Spreads	5820	100%	3.78	3.09	1.04
Healthy Brand	477	8%	0.65	4.52	7.55
Brand 2	2080	36%	2.90	1.70	0.60
Brand 3	1918	33%	2.26	2.83	1.26
Brand 4	1593	27%	2.90	1.89	0.67
Brand 5	1643	28%	2.28	2.30	1.01
Brand 6	2126	37%	2.89	2.22	0.85

* Estimates are only for the households that make purchases.

Table 2. Variables and Definitions

Variable	Definition
Nhhlds	Number of households
Hhinc	Household income ($)
Hhsize	Household size
Mtotexp	Monthly total expenditure on all brands
Budget share	The expenditures on brand *i* divided by the total expenditure on all brands
Time	Time trend, equal to 1,…, 12.
Time^2	Time trend squared
	Dichotomous variables:
Age30	equal to 1 if a household member's age is under 30, and 0 otherwise
Age50	equal to 1 if a household member's age is between 30&49 and 0 otherwise
Age64	equal to 1 if a household member's age is between 50&64 and 0 otherwise
Age65	equal to 1 if a household member's age is 65 and older, and 0 otherwise
Emplf	equal to 1 if the female head is employed, and 0 otherwise
Edmhs	equal to 1 if the male head's education is high school or less, and 0 otherwise
Edmscol	equal to 1 if the male head's education is some college, and 0 otherwise
Edmcolpc	equal to 1 if the male head's education is college & post college, and 0 otherwise
Edfhs	equal to 1 if female head's education is high school or less, and 0 otherwise
Edfscol	equal to 1 if the female head's education is some college, and 0 otherwise
Edfcolpc	equal to 1 if female head's education is college &post college, and 0 otherwise
Married	equal to 1 if the family is married, and 0 otherwise
White	equal to 1 if the race is white, and 0 otherwise
Black	equal to 1 if the race is black, and 0 otherwise
Other	equal to 1 if the race is other, and 0 otherwise
Hispanic	equal to 1 if the family is Hispanic, and 0 otherwise
East	equal to 1 if the family lives in the East region, and 0 otherwise
Central	equal to 1 if the family lives in the Central region, and 0 otherwise
South	equal to 1 if the family lives in the South region, and 0 otherwise
West	equal to 1 if the family lives in the West region, and 0 otherwise
Urban	equal to 1 if the family lives in urban area, and 0 otherwise

Table 3. Variables and Means of the Six Brands

Variable	Sample	Healthy brand	Brand 2	Brand 3	Brand 4	Brand 5	Brand 6
Nhhlds	5032	477	2080	1918	1593	1643	2126
Budget share		0.03	0.19	0.25	0.15	0.14	0.24
Price	2.13	7.55	0.62	1.27	0.68	1.09	0.88
Hhsize	2.83	2.34	3.01	2.60	2.93	2.94	2.97
Hhincs	51283	54371	47978	53616	50067	53794	50391
Mtotexp	17.83	24.11	16.41	21.60	17.64	18.60	17.93
Kids	0.34	0.16	0.39	0.26	0.33	0.37	0.41
Emplm	0.62	0.48	0.63	0.57	0.58	0.67	0.66
Emplf	0.61	0.52	0.62	0.59	0.59	0.62	0.60
Edmhs	0.26	0.20	0.29	0.23	0.26	0.28	0.30
Edmscol	0.26	0.21	0.26	0.27	0.28	0.25	0.27
Edmcolpc	0.30	0.38	0.28	0.32	0.29	0.32	0.28
Edfhs	0.30	0.25	0.33	0.28	0.29	0.31	0.33
Edfscol	0.34	0.33	0.36	0.37	0.36	0.33	0.31
Edfcolpc	0.32	0.37	0.29	0.30	0.32	0.32	0.31
Married	0.75	0.73	0.78	0.74	0.76	0.78	0.75
White	0.86	0.91	0.86	0.91	0.85	0.86	0.85
Black	0.09	0.05	0.11	0.06	0.09	0.10	0.10
Other	0.04	0.04	0.03	0.03	0.05	0.04	0.05
Hispanic	0.06	0.05	0.05	0.04	0.07	0.06	0.07
East	0.15	0.19	0.12	0.19	0.10	0.16	0.14
Central	0.29	0.26	0.28	0.30	0.46	0.27	0.26
South	0.36	0.31	0.41	0.32	0.12	0.48	0.43
West	0.20	0.24	0.19	0.19	0.32	0.10	0.17
Urban	0.82	0.82	0.76	0.83	0.79	0.82	0.85

Table 4. First-Step Probit Estimates

Variables	Healthy Brand	Brand 2	Brand 3	Brand 4	Brand 5	Brand 6
Intercept	-1.569**	-1.747***	-1.330***	0.278	-3.350***	0.681**
Hhincs	0.005***	-0.007***	0.005***	-0.002**	0.002***	-0.002***
Hhsize	-0.099***	0.045**	-0.119***	0.106***	0.004	-0.004
Time	-0.045	0.074	0.135**	-0.294***	0.464***	-0.231***
Time^2	0.003	0.000	-0.008**	0.019***	-0.025***	0.009**
Age50	-0.183**	0.041	-0.088**	-0.101**	0.041	0.126***
Age64	0.278***	-0.017	0.033	0.034	0.000	-0.100
Age65	0.142*	-0.149***	0.104**	0.044	-0.080	0.006***
Kids	-0.178**	-0.043	-0.026	-0.172**	-0.017	0.177***
Emplm	-0.117**	0.116**	-0.082**	-0.045	0.010	0.066*
Emplf	-0.064	0.047	0.052*	0.036	-0.034	-0.032
Edmhs	-0.174**	-0.108**	-0.102**	-0.034	0.028	0.174***
Edmscol	-0.160**	-0.129***	0.017	-0.017	-0.043	0.133***
Edfhs	-0.167**	0.016	0.020	-0.100**	0.016	0.052
Edfscol	0.045	0.012	0.103***	-0.051	-0.009	-0.068**
Married	0.014	0.070	0.018	0.063	-0.016	-0.068*
White	-0.050	0.348***	0.037	-0.169**	-0.044	-0.056
Black	-0.123	0.668***	-0.328***	-0.014	-0.041	-0.088
Hispanic	0.154	-0.006	-0.164**	0.0004	0.062	0.029
East	0.261***	-0.153***	0.196***	-0.622***	0.465***	-0.018
Central	-0.038	-0.224***	-0.096**	-0.011	0.365***	0.004
South	-0.136*	0.192***	-0.099**	-1.109***	0.579***	0.238***
Urban	0.085	-0.415***	0.073**	0.198***	-0.096**	0.105**

Note: * Statistically significant at the 10 % level;
** Statistically significant at the 5 % level;
*** Statistically significant at the 1 % level.

Table 5. Second-Step Demand System Parameter Estimates and t-values*

Variables	Healthy Brand		Brand 2		Brand 3		Brand 4		Brand 5	
Intercept	0.2351	(1.62)	0.2877	(3.7)	0.4911	(5.9)	0.3708	(5.32)	-0.0262	(-0.24)
Hhsize	0.0139	(2.21)	0.0077	(2.57)	-0.0131	(-3.75)	0.0105	(2.94)	0.0021	(0.74)
Hhincs	0.0000	(0.04)	-0.0015	(-8.9)	0.0001	(0.56)	-0.0001	(-0.71)	0.0002	(1.24)
Age50	-0.0051	(-0.37)	-0.0281	(-3.43)	0.0302	(2.92)	-0.0057	(-0.71)	0.0282	(3.52)
Age64	0.0052	(0.35)	-0.0211	(-2.87)	-0.0037	(-0.41)	-0.0027	(-0.4)	0.0113	(1.59)
Age65	0.0133	(1)	-0.0565	(-5.77)	-0.0030	(-0.26)	0.0081	(0.93)	0.0106	(1.14)
Time	-0.0088	(-0.88)	-0.0088	(-0.64)	-0.0294	(-1.76)	-0.0235	(-1.81)	0.0573	(4.02)
Time^2	0.0007	(1.33)	0.0006	(0.83)	0.0013	(1.42)	0.0015	(2.06)	-0.0030	(-3.88)
Kids	-0.0053	(-0.75)	-0.0043	(-0.52)	0.0389	(3.62)	-0.0280	(-3.22)	0.0021	(0.26)
Emplm	-0.0317	(-5.68)	0.0136	(1.79)	0.0111	(1.2)	0.0075	(1.07)	0.0153	(2.11)
Emplf	-0.0164	(-3.88)	0.0107	(1.81)	-0.0044	(-0.62)	-0.0082	(-1.5)	0.0094	(1.63)
Edmscol	-0.0021	(-0.42)	-0.0128	(-1.85)	0.0018	(0.21)	-0.0041	(-0.64)	-0.0065	(-0.93)
Edmcolpc	-0.0088	(-0.8)	0.0037	(0.51)	-0.0078	(-0.83)	-0.0098	(-1.45)	-0.0136	(-1.94)
Edfscol	-0.0044	(-0.37)	-0.0037	(-0.59)	-0.0130	(-1.58)	0.0023	(0.38)	0.0052	(0.84)
Edfcolpc	-0.0023	(-0.23)	0.0160	(2.33)	0.0003	(0.03)	0.0221	(3.27)	0.0017	(0.25)
Married	0.0365	(3.56)	0.0230	(3.04)	-0.0190	(-2.08)	-0.0032	(-0.46)	-0.0110	(-1.49)
White	0.0334	(3.15)	0.0566	(3.67)	-0.0065	(-0.38)	-0.0465	(-3.41)	-0.0072	(-0.52)
Black	0.0159	(1.19)	0.1182	(5.83)	-0.0049	(-0.25)	-0.0248	(-1.64)	0.0134	(0.85)
Hispanic	0.0024	(0.2)	0.0017	(0.14)	0.0250	(1.68)	0.0022	(0.19)	-0.0012	(-0.1)
East	-0.0192	(-1.3)	-0.0251	(-2.72)	-0.0013	(-0.12)	-0.0822	(-5.03)	0.0484	(2.9)
Central	-0.0050	(-0.8)	-0.0179	(-1.98)	-0.0329	(-3.37)	0.0181	(2.4)	0.0182	(1.32)
South	-0.0143	(-1.57)	0.0336	(3.99)	0.0387	(3.63)	-0.1211	(-4.51)	0.0759	(3.97)
Urban	0.0015	(0.21)	-0.0705	(-6.9)	0.0042	(0.48)	0.0433	(5.5)	-0.0150	(-2.04)
Price Healthy Brand	0.0432	(7.93)	-0.0120	(-1.59)	0.0254	(2.79)	-0.0043	(-0.61)	-0.0199	(-2.71)
Price Brand2	0.0044	(0.61)	0.0502	(5.06)	0.0327	(2.74)	-0.0256	(-2.77)	-0.0282	(-2.92)
Price Brand3	-0.0144	(-2.51)	-0.0414	(-5.21)	0.1477	(15.43)	-0.0420	(-5.66)	0.0179	(2.32)
Price Brand4	-0.0125	(-1.65)	-0.0058	(-0.55)	-0.1513	(-12.0)	0.0763	(7.83)	-0.0067	(-0.66)
Price Brand5	-0.0202	(-3.87)	-0.0154	(-2.13)	-0.0016	(-0.18)	-0.0211	(-3.12)	0.0654	(9.29)
ln(expenditure)	-0.0929	(-37.8)	0.0337	(9.84)	0.0661	(16.06)	0.0171	(5.36)	0.0090	(2.71)
Λ	-0.0865	(-1.44)	-0.0203	(-0.92)	-0.1688	(-5.35)	-0.0617	(-2.16)	-0.0822	(-2.18)

*Note: The t-values are in parentheses.

Table 6. Estimated Demand Elasticities

Brand	Healthy Brand	Brand 2	Brand 3	Brand 4	Brand 5	Brand 6
			Marshallian Elasticities			
Healthy Brand	-0.2896	0.3011	0.1132	0.0078	-0.1033	0.2972
Brand 2	-0.0798	-0.7546	-0.2750	-0.0584	-0.1118	0.0926
Brand 3	0.0864	0.0869	-0.4505	-0.6691	-0.0451	-0.2840
Brand 4	-0.0390	-0.2047	-0.3289	-0.4719	-0.1674	0.0901
Brand 5	-0.1465	-0.2127	0.1127	-0.0629	-0.6731	-0.0814
Brand 6	-0.1310	-0.1203	-0.2610	0.4584	0.0690	-0.8718
			Hicksian Elasticities			
Healthy Brand	-0.3124	0.2423	0.0349	-0.0379	-0.1490	0.2221
Brand 2	0.0033	-0.5409	0.0099	0.1078	0.0543	0.3657
Brand 3	0.1757	0.3164	-0.1444	-0.4905	0.1335	0.0093
Brand 4	0.0395	-0.0028	-0.0596	-0.3148	-0.0104	0.3481
Brand 5	-0.0721	-0.0211	0.3681	0.0860	-0.5242	0.1633
Brand 6	-0.0710	0.0340	-0.0554	0.5783	0.1889	-0.6748

	Brand Expenditure Elasticity	*Mean Share*
Healthy Brand	-0.3264	0.07
Brand 2	1.1870	0.18
Brand 3	1.2755	0.24
Brand 4	1.1219	0.14
Brand 5	1.0639	0.14
Brand 6	0.8568	0.23

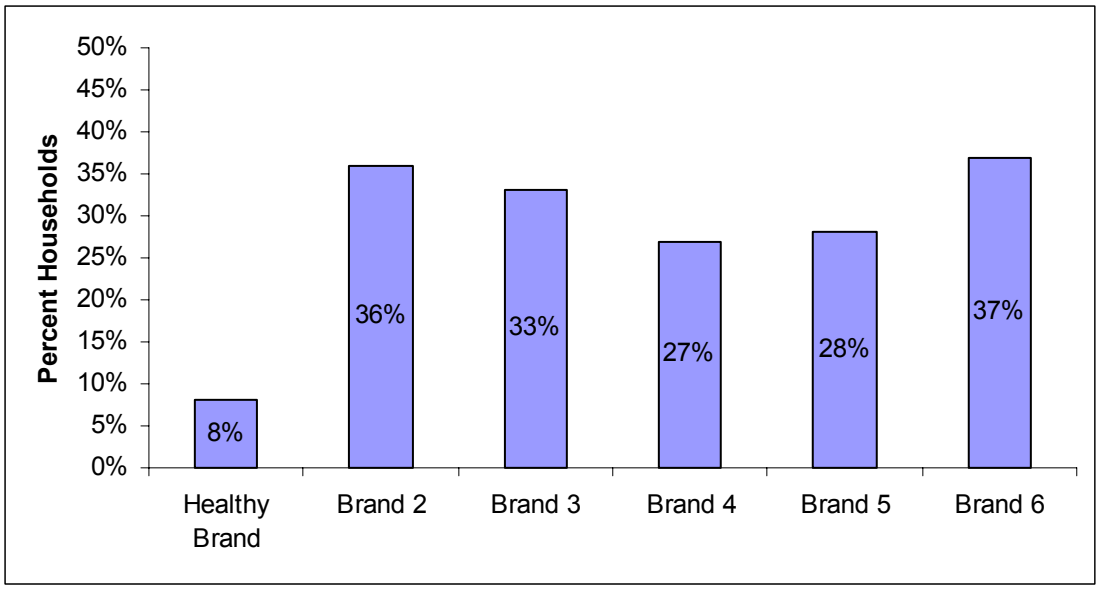

Figure 1. Percent of the Households that Purchased any of the Six Brands, 1999

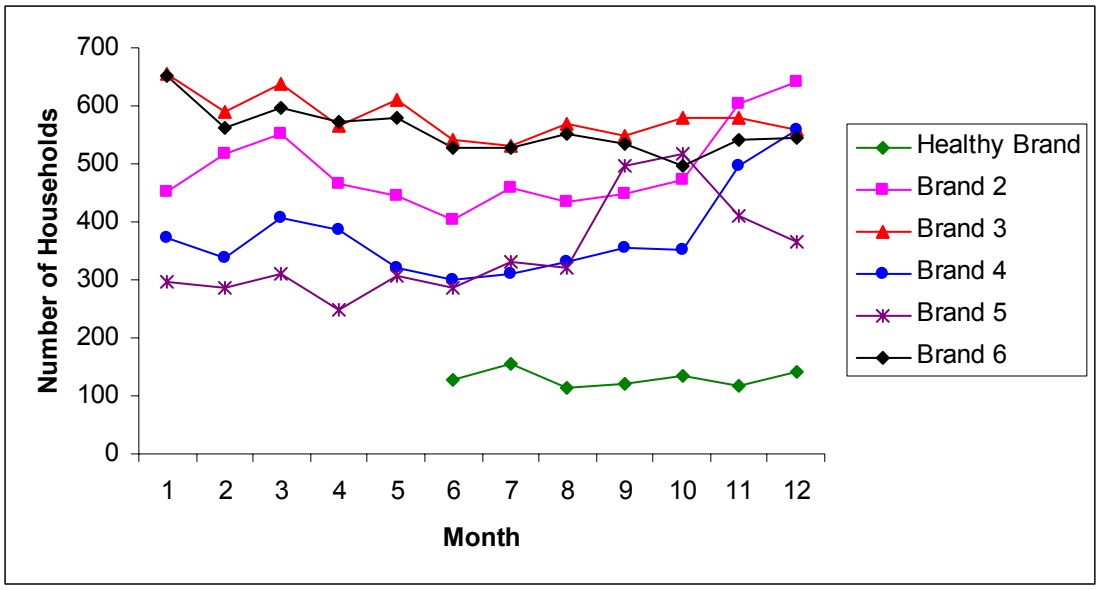

Figure 2. Number of Households Purchasing Selected Brands per Month, 1999