AN INTERTEMPORAL ANALYSIS OF CHANGES IN U.S. FOOD PURCHASING BEHAVIOR

By

Chung Liang Huang and Robert Raunikar
Assistant Professor and Professor
Agricultural Economics, respectively
University of Georgia
Georgia Experiment Station
Experiment, Georgia 30212

The importance of changes in taste and preferences as related to income elasticities for food are discussed.

Introduction

Significant changes in U.S. household food purchasing behavior during the past decades were caused not only by economic conditions, but also by demographic shifts, tastes, and preferences. The steadily declining birth rate since 1950 has decreased average household size and has changed the age distribution of the population. Other important changes in socioeconomic characteristics of the U.S. population observed during the past decades are the increases in female participation in the labor force and increases in the number of working wives. While changes in taste and preference are difficult to quantify, previous research (1) suggests that taste and preference are highly variable, indicating that quality of commodities, habits of consumers, effects of advertising, and various other factors have significantly influenced taste and preference. Thus, the nature of demand for a variety of food products has changed. These changes are partially reflected in the changes of food expenditure patterns (2, 3, 4 and 6) and may dictate resource reallocation within the food processing industry.

Analyses of household food purchasing behavior are imperative both in predicting future growth of various sectors of the food processing industry and in formulating policies for farm production and income. Successful prediction on food demand and policy predication require accurate estimates of demand parameters as well as an understanding of the nature of demand for various food products. Much recent research has been focused on quantifying household food expenditure relationships (5 and 7). Few studies have examined changes in the nature of demand for food products over time (1).

Objectives

The objective of this study is to provide an intertemporal analysis in changes of household food expenditure patterns and to investigate changes in the nature of demand for food based on results of two recent surveys -- the

Bureau of Labor Statistics 1972-73 Consumer Expenditure Dairy Survey (CEDS) and the U.S. Department of Agriculture 1977-78 Nationwide Food Consumption Survey (NFCS).

Methodology

Harmston and Hino (1) suggest that by comparison and examination of the resultant income elasticities from cross-sectional studies between two time periods, changes in the nature of demand for individual food products can be inferred. Traditionally, the nature of demand is defined by the sign and magnitude of the income elasticity. For example, if the income elasticity of a particular commodity is negative, the commodity is defined as an inferior good. If the income elasticity is positive, the commodity is a superior good. Moreover, a commodity is classified as a necessity, if income elasticity is less than unity, and a luxury if income elasticity is greater than unity.

For the purpose of this analysis, additional classifications are developed to provide a more detailed description of the nature of demand for food when intertemporal comparisons on signs and magnitudes of income elasticities are made. This study adopts a classification system that defines the nature of demand for food into five categories. Specifically, a superior food product is classified as preferred if the income elasticity is positive and increases in magnitude over the time periods studied. A superior good is defined as nonpreferred if the income elasticity is positive but decreases in magnitude. Food products with negative income elasticities are designated as inferior goods. Finally, changes in the signs of income elasticities from positive to negative and from negative to positive between the time periods define the changing nature of food products as being inferior and superior, respectively.

The proposed analysis is based on estimates of income elasticities of various food products reported in two recent USDA documents (5 and 7). Both studies use the same empirical model and statistical procedure in estimations of food expenditure relationships. Smallwood and Blaylock (7) suggest that the elasticity measures reported in their study are comparable to those reported by Salathe (5), and that the major differences between the two studies are in the timeliness of the data and the type of survey in which the data were collected. Specifically, Smallwood and Blaylock (7) use the 1977-78 NFCS while Salathe (5) uses the 1972-73 CEDS to estimate income elasticities of various food products.

Income elasticities for 109 food commodities were reported in Salathe's study (5). In contrast, income elasticities for 24 major food groups and 77 subgroups were reported in Smallwood and Blaylock's study (7). Therefore, for the purpose of this study, some regrouping of food commodities is necessary so that valid comparisons can be made between the results of the two studies. In cases where regrouping of food commodities are made to provide a comparable basis, the income elasticities are recalculated using available information reported in the studies. As a result, 27 food commodity groups are selected for further analysis in this study.

Results

Between the 1972-73 CEDS and the 1977-78 NFCS, average household income increased from $202.85 per week to $273.04 per week, while average household size decreased from 3.01 persons to 2.95 persons. Average household food expenditures for various selected food groups and their budget shares in food-at-home expenditures are presented in Table 1. Average total food expen-

TABLE 1. Weekly household food expenditures, 1972-73 CEDS and 1977-78 NFCS.

Product category	1972-73 CEDS[a] Average food expenditures	1972-73 CEDS[a] % of at-home expenditures	1977-78 NFCS Average food expenditures	1977-78 NFCS % of at-home expenditures
	Dollars	Percent	Dollars	Percent
TOTAL FOOD	32.24		56.26	
FOOD-AWAY-FROM-HOME	8.62		14.58	
FOOD-AT-HOME	23.62	100.00[b]	41.68	100.00[b]
Flour and prepared mixes	0.22	0.93	0.38[c]	0.90
Bread	0.81[c]	3.42	1.15	2.77
Beef and veal	3.34	14.14	5.84[c]	14.01
Pork	2.13	9.02	3.36	8.05
Lamb, mutton and goat	0.11	0.47	0.13	0.31
Poultry	1.01	4.28	1.83	4.38
Fish and shellfish	0.66	2.79	1.17	2.80
Luncheon meats	0.63	2.67	1.44	3.46
Eggs	0.57	2.41	0.84	2.01
Fresh milk and cream	1.96[c]	8.30	2.98[c]	7.14
Cheese	0.64	2.71	1.50	3.61
Fresh fruits	0.88	3.73	1.60	3.85
Canned and dried fruits	0.30	1.27	0.39[c]	0.92
Frozen vegetables	0.21	0.89	0.34	0.82
Frozen fruit juices	0.19	0.80	0.42	1.01
Fresh potatoes	0.21	0.89	0.41	0.98
Fresh tomatoes	0.16	0.68	0.29	0.69
Canned and dried vegets.	0.59	2.50	1.09[c]	2.63
Table fats	0.33[c]	1.40	0.61	1.46
Other fats, oils and salad dressings	0.31	1.31	0.75[c]	1.78
Sugars	0.18	0.76	0.35	0.85
Soft drinks	1.02[c]	4.32	1.17	2.82
Coffee	0.51[c]	2.16	1.51	3.63
Baby foods	0.13	0.55	0.06	0.14

SOURCE: (5) and (7).

[a]The data are based on the results of the first survey period.

[b]Totals may not sum due to omission of other food expenditure items.

[c]Food commodities were regrouped to provide a comparable basis.

ditures by households increased 74.5% from $32.24 per week to $56.26 per week between the 1972-73 CEDS and the 1977-78 NFCS. At-home food expenditures accounted for 75.2% of the increase in total food expenditures while away-from-home food expenditures accounted for 24.8%.

Little change is observed in the relative importance among at-home food expenditure categories. Beef and veal are the most important food items purchased by U.S. households, accounting for 14.14% and 14.01% of at-home food expenditures in the 1972-73 CEDS and the 1977-78 NFCS, respectively. Household at-home food expenditures for pork, and fresh milk and cream ranked second and third, respectively, in both surveys. Perhaps, the most significant changes observed between the 1972-73 and 1977-78 surveys were the changes in relative importance of soft drinks and coffee in food-at-home expenditures. Food expenditures for soft drinks accounting for 4.32% of at-home food expenditures and ranked fourth in 1972-78, but ranked ninth in the 1977-78 survey. In contrast, expenditures for coffee which ranked twelfth in the 1972-73 CEDS gained in relative importance to sixth among selected at-home food expenditures in the 1977-78 NFCS.

Table 1 shows increases in average household food expenditures for all food items during the 1972-73 and 1977-78 period. However, during the same period, the U.S. economy has been characterized by salient inflation, particularly by rapid increases in food prices. Between the period 1972-73 and 1977-78, the Consumer Price Index (CPI) for all food items increased by 52.4% while the CPI for all items, food and nonfood, increased by 45.8% (8), suggesting that household real income decreased from $202.85 per week in 1972-73 to $187.24 per week in 1977-78. Furthermore, substantial variation among the CPI for different food items was observed. During the same period, increases in the CPI for food items ranged from 21.2% for eggs to 163.7% for beverage products. Thus, in addition to a decrease in average real household income, the relative price level of various food products also changed between the two survey periods.

Changes in the budget share of selected at-home food expenditures and their changes in real food expenditures between the 1972-73 CEDS and the 1977-78 NFCS are presented in Table 2. Among the 24 selected at-home food products, 13 food products show an increase in both budget share and real expenditures in the 1977-78 NFCS. Food expenditures for coffee shows the largest increase in at-home food expenditure share. Among the 11 food items that indicate a decrease in at-home food expenditure share, 6 foods showed an increase in real expenditures while 5 showed a decrease. The largest decrease in budget share is found in household food expenditures for soft drinks. Increases in real expenditures are found to be largest for beef and veal, followed by poultry, luncheon meats, and pork.

The results of Table 2 suggest that real household food expenditures tend to trend upward even during a period of time when relatively high inflation in food prices is prevalent and real income has decreased. The results also suggest that food expenditures may be more sensitive to changes in relative prices than changes in income, primarily due to many close substitutes available among food products.

The classifications of the nature of demand for food based on signs and magnitudes of the income elasticities are presented in Table 3. Of the 27 food product groups or subgroups examined in this study, 21 food products were superior

TABLE 2. Changes in budget share and real food expenditures in 1977-78 NFCS as compared with 1972-73 CEDS

Product category	Change in budget share	Change in real expenditures[a]
	Percent	Dollars
PRODUCTS THAT GAIN IN BUDGET SHARE AND REAL EXPENDITURES		
Poultry	0.01	0.46
Fish and shellfish	0.01	0.02
Luncheon meats	0.79	0.44
Cheese	0.90	0.38
Fresh fruits	0.12	0.20
Frozen fruit juices	0.21	0.07
Fresh potatoes	0.09	0.07
Fresh tomatoes	0.01	0.04
Canned and dried vegetables[b]	0.13	0.10
Table fats[b]	0.06	0.04
Other fats, oils and salad dressings[b]	0.47	0.15
Sugars[b]	0.09	0.00
Coffee[b]	1.47	0.06
PRODUCTS WITH LOSS IN BUDGET SHARE BUT GAIN IN REAL EXPENDITURES		
Flour and prepared mixes[b]	-0.03	0.02
Beef and veal[b]	-0.13	1.11
Pork	-0.97	0.43
Eggs	-0.40	0.12
Fresh milk and cream[b]	-1.16	0.07
Frozen vegetables	-0.07	0.00
PRODUCTS WITH LOSS IN BUDGET SHARE AND REAL EXPENDITURES		
Bread[b]	-0.66	-0.08
Lamb, mutton and goat	-0.16	-0.01
Canned and dried fruits[b]	-0.35	-0.05
Soft drinks[b]	-1.50	-0.58
Baby foods	-0.41	-0.09

SOURCE: Table 1.

[a]CPI for different food commodity groups obtained from (8) were used to deflate the 1977-78 NFCS average food expenditures, 1972-73 CPI = 100.

[b]Food commodities were regrouped to provide a comparable basis.

TABLE 3. Classifications of the nature of demand for food by income elasticities, 1972-73 CEDS and 1977-78 NFCS

Classification and product category	Income elasticities 1972-73[a]	1977-78
PREFERRED SUPERIOR		
Fresh milk and cream	0.031[b]	0.074[b]
Frozen vegetables	0.429	0.435
Table fats	0.147[b]	0.160
Coffee	0.018[b]	0.144
NONPREFERRED SUPERIOR		
TOTAL FOOD	0.365	0.320
FOOD-AWAY-FROM-HOME	0.869	0.814
FOOD-AT-HOME	0.181	0.147[b]
Beef and veal	0.363	0.237[b]
Lamb, mutton and goat	0.658	0.622
Poultry	0.093	0.066
Fish and shellfish	0.357	0.328
Cheese	0.387	0.321
Fresh fruits	0.273	0.241[b]
Canned and dried fruits	0.241	0.171[b]
Frozen fruit juices	0.571	0.432
Fresh tomatoes	0.286[b]	0.096
Soft drinks	0.211[b]	0.189
CHANGING NATURE TO INFERIOR		
Pork	0.065	-0.005
Luncheon meats	0.195	-0.067[b]
Canned and dried vegetables	0.033	-0.032[b]
Other fats, oils and salad dressings	0.038	-0.007[b]
CHANGING NATURE TO SUPERIOR		
Bread	-0.011[b]	0.020
INFERIOR		
Flour and prepared mixes	-0.170	-0.082[b]
Eggs	-0.052	-0.063
Fresh potatoes	-0.070	-0.150
Sugars	-0.196	-0.157
Baby foods	-0.421	-0.358

SOURCE: (5) and (7). [a]The numbers are for the first survey period. [b]Income elasticities were recalculated based on regrouping of food commodities.

goods in the 1972-73 CEDS and 18 were superior goods in the 1977-78 NFCS. Among the superior goods, only 4 food products were preferred. Furthermore, between the period of the two surveys, 4 superior goods became inferiors and one inferior good became superior.

The analysis reveals that there is a tendency toward a decreasing of preference in demand for food as might be expected. In addition, the results suggest that demand for food is primarily nonpreferred superior in nature, indicating household food expenditures in response to income changes have been decreasing over time for most food products.

Four commodity groups--fresh milk and cream, frozen vegetables, table fats and coffee--have shown slightly higher income elasticities from the results of the 1977-78 NFCS than from the 1972-73 CEDS. Possible explanations for the observed changes may be related partially to the improvement in the quality of food products and to the greater awareness of dietary considerations of the consumers. For example, changes in consumers' preference toward fresh whole milk and low fat milk have been evident in a steady decrease and increase in per capita consumption of whole milk and low fat milk, respectively, during the past decades. The increasing popularity of low fat milk among American consumers could be the underlying factor that characterizes fresh milk and cream as a preferred superior good. Similarly, the shifts of consumers' attitude toward frozen vegetables (convenience), margarine (dietary consideration) and instant coffee (may be for both convenience and decaffeinated reasons) might be responsible for these products of being preferred superior goods. Additionally, extensive advertising campaigns for some of the products in this group also could have caused changes in consumers' attitude toward "more preference" for these food products.

Four commodity groups--pork, luncheon meats, canned and dried vegetables, and other fats, oils and salad dressings--changed from superior to inferior goods. These products in general had relatively low income elasticities and the changes were consistent with the observation that there existed a tendency toward "less preference" for food. The existence of good quality and strong substitutes such as poultry products and frozen vegetables are possible explanations in the case of pork, and canned and dried vegetables.

The nature of demand for bread changing form an inferior to a superior good is somewhat at variance with the idea that bread is traditionally considered to be an inferior good. This change in the nature of demand for bread may be hypothesized to be caused by the promotion of nutrient fortification and the increasing varieties of whole wheat bread for which the quality of bread is improved considerably in the eyes of nutrition conscious consumers. Five food product groups that were classified as inferior goods from the results of the 1972-73 study remained as inferior goods in the 1977-78 study.

Conclusions and Implications

Although the results of two recent national surveys of U.S. households indicate that average food expenditures tend to increase over time periods, the results of this analysis suggest that the nature of demand for food, in general, is nonpreferred superior. Thus, the proportional increase in food expenditures relative to increase in income decreases as U.S. households become more affluent. This tendency toward a decreasing of preference in demand for food is found in a majority of food products examined in the study.

A number of factors that may influence taste and preference are hypothesized as possible explanations for the observed changes in the nature of demand for some food commodities. Continuing changes in taste and preference over a certain period of time caused by changes in relative qualities of commodities, the availability of strong substitutes and other factors may result in a superior good becoming inferior, or vice versa.

The study based on the results of two reports, not very comparable in the type of data collected, illustrates the nature of an analysis that would be of value to the food industry in the development of plans for the future. The importance of changes in taste and preference reflected in income elasticities is evident from the results of this analysis. An understanding in the nature of demand for food will ensure better prediction and planning for future growth of the food industry. Predicting the growth of the demand for food appears to require considerable basic information, concerning how the consumers' attitude can be changed in favor of some food products and is beyond the results presented in this analysis.

REFERENCES

1. Harmston, F. K. and H. Hino. "An Intertemporal Analysis of the Nature of Demand for Food Products." Amer. J. Agr. Econ. 52(1970):381-86.

2. Gallo, A. E. and W. T. Boehm. "Changes in Food Expenditures by Income Group." Nat. F. Rev., USDA, ESCS, NFR-6, Winter 1979, pp. 12-15.

3. Lebovit, C. B. and A. E. Gallo. "Changing U.S. Food Spending Patterns." Nat. F. Rev., USDA, ESCS, NFR-6, Winter 1979, pp. 17.

4. Lebovit, C. B. "The Impact of Some Demographic Changes on U.S. Food Consumption: 1965-75 and 1975-90." Nat. F. Sit., USDA, ERS, NFS-156, May 1976, pp. 25-29.

5. Salathe, L. E. Household Expenditure Patterns in the United States. USDA, ESCS, Tech. Bul. No. 1603, April 1979.

6. _____. "Demographics and Food Consumption." Nat. F. Rev., USDA, ESCS, NFR-8, Fall 1979, pp. 31-34.

7. Smallwood, D. and J. Blaylock. Impact of Household Size and Income on Food Spending Patterns. USDA, ESS, Tech. Bul. No. 1650, May 1981.

8. USDA, ESS. Food Consumption, Prices and Expenditures. Statis. Bul. No. 656, February 1981, p. 78.