Staff Paper P94-17 July 1994

STAFF PAPER SERIES

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DEPARTMENT OF AGRICULTURAL AND APPLIED ECONOMICS

COLLEGE OF AGRICULTURE

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June 1994

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ABSTRACT

This study uses nonparametric techniques to analyze the stability of demand for 19 major food categories among various demographic groups in the United States. Households are divided into population groups by income, the head's age, and the spouse's education level. The data used are from the 1980-1990 Diary portion of the Bureau of Labor Statistics annual Consumer Expenditures Surveys. The programming model developed by Sakong and Hayes is used to test for and measure taste changes. Substantial differences in preference trends between population groups are found for many of the food commodities.

Taste Changes in the Demand for Food

by Demographic Groups in the United States:

A Nonparametric Empirical Analysis[1]

Rafael Cortez and Ben Senauer

Food consumption patterns in the United States have been changing dramatically. Differentiating between the impact of price and income changes on food demand and the effects of preference shifts is important. A substantial body of literature now exists which focuses on the stability of food preferences, particularly for meat and poultry.[2] Various research studies have utilized either parametric or nonparametric techniques to test for taste changes. Virtually all the previous empirical studies have relied on aggregate, time-series data, usually national per capita consumption (disappearance) series. Therefore, the empirical results relate to the average behavior of the entire population. However, a great deal remains unknown if our analyses examine only the average behavior of the entire population reflected in aggregate data. There are major differences in the food consumption patterns of different demographic groups in the United States. Moreover, the diets of various segments of the population are changing in very different ways (Senauer, Asp, and Kinsey).

This analysis applies the recent nonparametric technique developed by Sakong and Hayes to disaggregated data to detect and measure taste change for 19 food categories by specific demographic groups. Sakong and Hayes refer to their model as a "test for preference stability." It is related to the earlier models of Chavas and Cox (1990) and also

Alston and Chalfant (1992). Sakong and Hayes' model simultaneously solves for the change in tastes that minimizes the expenditure elasticities and the degree of taste change itself. A central feature of their test is its restriction of the compensated consumption bundles.

The data used in this study are from the Diary portion of the Bureau of Labor Statistics Consumer Expenditure Survey (CES) and the Consumer Price Indexes (CPI). The analysis is based on the annual CES surveys for 1980-1990 covering eleven years. Consumer units (households) are classified into demographic groups by income, age of the household head, and education level of the spouse. These variables were used to create segments of the population whose food consumption patterns are similar. A household's expenditures for the 19 food categories were converted to an adult equivalents basis and matched with CPI price data by month and year to derive an implicit quantity index for each food. The household data for a specific demographic segment were then averaged together by quarter. The resulting data set used in the nonparametric analysis contained 44 observations (11 years with 4 quarters) for the 19 food categories for each demographic group.

THEORETICAL BACKGROUND

The Sakong and Hayes model, "a test for preference stability," minimizes the degree of taste change subject to nonnegativity of expenditure elasticities, adding-up, convexity, and bounds on the elasticities. The programming model (Sakong and Hayes, p. 273) to be solved is:

Minimize b' TC

TC , ϕ

Subject to :

(1)
$$\sum_{i=1}^{n} p_{it}x_{it} - \sum_{i=1}^{n} p_{it}x_{is}$$

$$\leq \sum_{i=1}^{n}\sum_{j=2}^{t} a_j \frac{p_{it}x_{ij}}{M_j}\varepsilon^j_{iM} - \sum_{i=1}^{n}\sum_{j=2}^{s} a_j \frac{p_{it}x_{ij}}{M_j}\varepsilon^j_{iM} + \sum_{i=1}^{n}\sum_{j=2}^{t} p_{it}tc_{ij} - \sum_{i=1}^{n}\sum_{j=2}^{s} p_{it}tc_{ij}$$

For all t and s

(2)
$$\sum_{i=1}^{n} w_i^t \varepsilon^t_{iM} = 1$$

For all t

(3)
$$\varepsilon^t_{iM} \geq 0$$

For all i and t

(4)
$$\varepsilon^L \leq \phi \leq \varepsilon^U$$

Where b is an arbitrary vector whose elements are constant and make the problem bounded; ϕ is a vector whose elements denote the expenditure elasticities of commodity i at period j; $TC' = (tc_{12},..., tc_{n2},...,tc_{1T},...,tc_{nT})$ is a vector of taste changes and tc_{ij} denotes the taste change of good i at time j; p_{it} and x_{it} are the observed price and demanded quantity of commodity i at period t; w_i^t and ε_{iM}^t denote the expenditure share and the food expenditure elasticity of commodity i at time t respectively; M is total food expenditures; a_j is a composite value as shown by Sakong and Hayes (p. 271); ε^L and ε^U are vectors of lower and upper bounds respectively of the estimated expenditure elasticities. The model solves simultaneously for the taste change and expenditure elasticities that minimize taste change subject to the convexity condition (1), adding-up (2), non-negativity conditions (3), and the elasticity bounds (4).

The model estimates the size of the adjustment in quantity data (either positive or negative) necessary to eliminate the Generalized Axiom of Revealed Preference (GARP) violations (i.e., rationalize the data) satisfying the restrictions imposed on the expenditure elasticities. The adjustment in quantity data is shown by the vector TC'. A positive value of tc_{it} indicates a shift of preferences in favor of the good, a negative value of tc_{it} shows a change of tastes against the good i at time t.

In our analysis, food is assumed to be a weakly separable group, which is why M is total food expenditures rather than income or total consumption expenditures. This study treats the average demand of a specific demographic group as if it were generated by a representative consumer maximizing a utility function. Previous studies have made this assumption with aggregate date. Sakong and Hayes imposed a constraint on the variation of the expenditure elasticities over time in their Model C. This analysis does not and, therefore, uses their Model B. As Sakong and Hayes (p. 274) note, the "actual" taste change could be computed if the "true" elasticities were known.

As Sakong and Hayes (p. 270) point out, the term "violation of stable preferences" is perhaps more accurate than "taste change," because one can not be certain that the violations found are not the result of "poor data or violations of other assumptions." However, if the adjustments in commodity demand necessary to rationalize the data are relatively large, attributing the violations solely to measurement error or other factors, rather than a shift in preferences, would seem less plausible. Furthermore, with the Sakong and Hayes model, each time period is treated independently so the emergence of a trend in tastes in favor of or away from a food indicates the preference violations are not random, but consistent over time.

To determine the bounds for the expenditure elasticities (ε^L and ε^U) an Almost Ideal Demand System for the 19 food commodities was estimated using the household-level CES data and the CPI data for prices. Zellner's iterative seemingly unrelated regression model was utilized and the general restrictions derived from consumer maximization were imposed. The sample included all households in the CES with non-zero expenditures for each of the 19 food categories.

The lower and upper bounds for the elasticities are shown in Table 1. These elasticities are with respect to total food expenditures and, therefore, larger than income elasticities. The lower and upper bounds were set equal to 0.5 and 1.5 times the mean value of the expenditure elasticity of the commodity i rounded-off to the nearest 50 hundredths (.05). These bounds on the expenditure elasticities are expected to reduce the errors from potential model misspecification. The bounds appear reasonable since they contain the confidence intervals at the 95 level of all the expenditure elasticities computed by earlier studies that used similar CES data but different models and estimation procedures (Kokoski; Falconi; and Young).

As pointed out earlier by Landsburg; Varian; Chalfant and Alston (1991a and b); and Sakong and Hayes, when income growth is large compared to relative price variation, one is unlikely to find violations of the revealed preference axioms. This is because each bundle of commodities will always be preferred to the bundles chosen in the previous period. Therefore, we have a situation in which data points are not comparable. In order to reduce the incomparability of data points that arise from the increase of expenditures over time, we translated current prices into constant values. The result is that the test of stability of preferences used quantity indices and real composite prices for all food commodities. This adjustment makes it less likely to find incomparable data points that may lead to a failure to detect violations of stable preferences, when in fact they do exist.

DATA

The annual Consumer Expenditure Surveys provide a continuous flow of data on the purchases of American consumer units, which in most cases are households. The Diary survey covers small frequently purchased items, including detailed food expenditures. Expenditures are collected for two one-week periods and the data collection is spread over twelve months. The weighting procedure recommended by the BLS was used which translates the sample consumer units (CUs) into the universe of CUs in the U.S. population. Weights are assigned to each CU by the BLS. The weight given to a CU is basically the inverse of its probability of selection into the sample (U.S. Dept. of Labor, 1991).

The CES expenditure data were adjusted for differences in household size and composition (i.e., the number, and age and gender of household members) using adult equivalent scales. The adult equivalent scales derived by Tedford, Capps and Havlicek were used to convert household expenditures to a per capita adult equivalent basis.

The CES does not provide quantities or prices. The source of price data was the BLS's CPI for the selected food categories (U.S. Dept. of Labor, 1992). The expenditure and price series are compatible because the CPI series are constructed on the basis of expenditure weights from the CES. The CPI and a detailed list of food prices during the base period were used to derive monthly composite prices for each of the 19 food categories. The seasonally unadjusted, U.S. average Consumer Price Indexes for all urban consumers with a 1982-84 base were used. For this reason, only urban households were extracted from the CES to match with the CPI. This analysis, therefore, relates to the 85 percent of the U.S. population which is urban. The CES records each household for a particular month of the year. It was assumed that all households in a particular month face the same prices. An estimated quantity for each food category was obtained by dividing current expenditures by the corresponding composite price developed.

Using the share proportion (w_0^j) and prices (p_0^j) at base period 0 (1982-1984) for good j in each category i, (P_0^i) the composite price for category i at the base period was computed as follows:

$$P_0^i = \sum_{j=1}^{n} w_0^j \cdot p_0^j$$

Since $CPI_t^i = (P_t^i / P_0^i) \times 100$, solving for the composite price for category i at time t, we obtained:

$$(5)\quad P_t^i = P_0^i \cdot \left(\frac{CPI_t^i}{100}\right)$$

The estimated quantity (Q_t^i) for category i at time t was estimated as:

$$Q_t^i = \frac{E_t^i}{P_t^i}$$

where E_t^i is the expenditure on category i at period t.

The constructed composite price series reflect a rescaled index of the Consumer Price Index data. In the case of most food aggregates such as cereals, meats, diary products and fresh fruits and vegetables an extended list of prices per pound for specific food items in the base period was used to construct their respective composite prices. Therefore, the quantity index can be viewed as a reasonable approximation of the quantity measured in pounds.

However, the BLS does not provide a list of prices for items within miscellaneous foods and food away from home. In these cases, the price indices were simply rescaled with a base of 1.00, rather than 100. Similarly, the available list of prices for items within processed fruits and vegetables is quite limited. For all these food categories it is clear that the composite price indices are not a close estimate of average prices, and therefore the constructed quantities should only be interpreted as implicit quantity indices.

The variables used to create the demographic groups from the CES household data were income, age of the household reference person and education level of the spouse. The reference person is the person considered by other members of the CU to be the household head (usually the husband, if present). These variables were chosen because they have been shown in previous studies to have an important effect on food consumption (Smallwood; Smallwood and Blaylock, 1987 and 1992; Senauer, Asp and Kinsey). Each of these variables was divided into two categories. Households were classified into two income groups by a multiple of the poverty level. The first group contained households with incomes less than or equal to twice the poverty level related to that size household. The second group had incomes above that level.

The two age-related categories were: households whose reference person (head) was younger than 45 years old and those whose reference person was 45 or older. Education of the spouse (of the reference person if no spouse was present) was used to classify households into those with spouses that had a high school education or less and those with more education. When combined, these three variables create up to six demographic groups. For example, one group is all households with income more than twice the poverty level, heads age 45 and over, and spouses with more than a high school education.

The specific break points for these variables were chosen based on the results of previous studies and to divide the sample into roughly equal halves. Otherwise, when cross-classified by several variables a particular demographic group could have ended up with a very small sample in a particular period. The education level of the spouse and of the household head were highly correlated (0.92). Similarly the correlation coefficient between age of the spouse and age of the head was very high (0.85). Therefore, choosing age or education either of the household head or of the spouse should not significantly alter the division of households into population groups by age and education level.

Once classified into the selected demographic groups the household observations were aggregated by quarter. The resulting data set used in the nonparametric analysis had 44 observations (4 quarters for 11 years) for the 19 food categories for each demographic group. The data cover from the first quarter of 1980 to the fourth quarter of 1990. The quarterly data represent the averages for a population group within each period and can be viewed as reflecting the behavior of a "representative consumer" within a particular demographic segment of the population. The CES is not a panel data set composed of the same sample of households over time. This analysis traces the taste changes over time of households defined by a particular set of demographic characteristics. Households in the population shift between groups as their income, the head's age or spouse's education change.

The application of the Sakong and Hayes model created an optimization problem involving a very large number of constraints; 2,527 restrictions were imposed for a solution. The most recent version of the GAMS computer software, GAMS 386 version 2.25, was used to solve this large linear programming problem.

EMPIRICAL RESULTS

Table 2 shows the cumulative taste changes for the period 1980-1990 covered by this analysis. No taste changes were found for any of the demographic groups for the food groups not shown: cereals, bakery goods, other meats, fresh milk, processed vegetables, and miscellaneous foods. For most of the commodities in Table 2, the implicit quantity index can reasonably be interpreted as pounds per adult equivalent per week. Food away from home (FAFH), and the others discussed earlier, are obvious exceptions.

Group 1 is based on the entire sample of all urban consumer units. The results reflect the aggregate behavior of the U.S. urban population. Previous studies based on time-series data have not been able to go beyond studying such aggregate behavior. The longitudinal data base provided by the CES allows us to analyze the disaggregate behavior of specific demographic groups. Groups 2 and 3 are classified by income level. Groups 4-11 are based on a three-way cross-classification using household income, the head's age, and the spouse's education. Each group is fully described in the notes for Table 2.

The taste changes are negative for every group for beef; preferences shifted away from beef. However, the aggregate shift of -0.313 masks some very large differences in behavior among demographic segments. The shift for Group 7, households with lower incomes, older heads and more educated spouses, was only -0.135; whereas it was -1.305 for Group 11, households with higher incomes, older heads and more educated spouses, almost a ten-fold difference. The aggregate population response of Group 1 was a shift of 0.151 in favor of pork. In terms of the disaggregate results, the largest positive shift was by Group 4. The preferences of a few of the demographic groups shifted away from pork, though, with the largest negative move by Group 7.

The Sakong and Hayes model for the period 1980-90 actually detected a negative taste change for poultry for the aggregate population, albeit very small. The actual consumption of poultry increased between 1980 and 1990. This means that factors such as price and income effects had a positive impact on demand and more than offset the negative taste change. Households with lower incomes, younger heads and less educated spouses (Group 4) had the largest negative shift of -0.152. The same income and age group, but with more educated spouses (Group 5) showed a preference shift of 0.401 towards poultry, though. The only negative shift for fish and seafood was by Group 4, and it was very small. The largest positive shift for fish was by Group 11, 0.520, which was almost four times larger than the aggregate shift of 0.137 for Group 1. The aggregate shift was away from eggs, -0.126 for Group 1, but three groups of households that were defined to have incomes less than twice the poverty level, showed taste changes towards eggs (Groups 2, 5 and 7).

The aggregate Group 1 showed no change in tastes for dairy products. Most of the disaggregated groups did, with negative shifts by Groups 3 and 5. The largest preference shifts towards dairy products were by Groups 10 and 11, with higher incomes and older heads. Surprisingly, the tastes of all eleven groups moved away from fresh fruits. The shift of Group 7 was ten fold greater than that of the aggregate population, Group 1. Although the preferences of households with higher incomes, older heads, and more educated spouses (Group 11) moved away from fresh fruits, they showed the strongest shift towards fresh vegetables. Behind the small negative change for the aggregate Group 1 for processed fruits, there were also considerable differences in the behavior of disaggregate groups. The largest difference was between Groups 6 and 10, which both had older heads and less educated spouses, but the former had lower and the latter higher incomes.

Group 10's preferences shifted away and Group 11's towards sweets. Both groups had higher incomes with an older head, but the former had a less and the latter a more educated spouse. The aggregate Group 1, and all but two of the disaggregated groups, showed no taste change for nonalcoholic beverages. Behind the very small negative taste change of -0.007 for fats and oils by Group 1, the greatest difference in disaggregate behavior was between Groups 7 and 11. Both had older heads and more educated spouses, but the former had lower and the latter higher incomes. For food away from home (FAFH), the aggregate Group 1 and all but two of the disaggregated groups showed no taste changes. Higher income households (Group 3) and Group 8 with higher incomes, younger heads and less educated spouses had positive preference shifts towards FAFH.

The taste changes shown in Table 2 can be put into perspective in terms of their relative magnitudes by comparing them to the observed change in consumption between 1980 and 1990 and also by calculating the change in tastes as a proportion of the actual level of consumption. Beef might be a good category to examine more closely since it is the commodity that has been the focus of many of the previous studies of the structural stability of demand. The quantity index for beef for the aggregate group of all urban households (Group 1) averaged 0.929 in 1980 and 0.661 in 1990. The four quarters of 1980 and of 1990 were averaged together to smooth out the quarter-to-quarter variation. These figures may be interpreted as representing pounds per adult equivalent per week. The Group 1 taste change of -0.313 was 33.7 percent of 1980 consumption. The observed change in consumption between 1980 and 1990 was -0.268, which is less than the negative preference shift. This means that other factors, such as price and income effects, had a positive impact on consumption that partially offset the taste change away from beef.

The taste change of -1.305 for beef by Group 11 (households with lower incomes, older heads and more educated spouses), was more than their 1980 consumption level of

1.287. Observed consumption for that group in 1990 was 0.833, thus the actual decrease in consumption between 1980 and 1990 was only -0.454. Changes in prices and income offset most of the negative shift in preferences. Fish is another commodity for which the taste change between 1980-90 was large relative to the level of consumption in 1980. The preference shift towards fish of 0.137 for all urban households (Group 1) was equal to 77.0 percent of 1980 consumption. Fish consumption actually declined by 0.0014 between 1980 and 1990. In particular, fish prices rose substantially over this period, which more than offset the positive taste change. The magnitude of the taste changes in relation to observed consumption and its change between 1980 and 1990 is considerably smaller for most of the other food categories.

If there is a case to be made that the implicit quantity index numbers can reasonably be interpreted as measuring pounds per adult equivalent per week, for the categories with better price data, one should be able to relate them to other food consumption data. Annualizing the beef quantity figure for 1980 for Group 1 (all urban households) yields 48.3 pounds per adult equivalent per year. Beef consumption in 1980 was 76.4 pounds per capita according to USDA's time-series food disappearance data, measured as a retail cut equivalent (Putnam and Allshouse, p. 32). The USDA figures are derived on an estimated supply and utilization basis.

The USDA number includes beef going into both the at-home and away-from-home markets, whereas our figure derived from the CES data reflects only beef purchased for consumption at home. Food away from home expenditures in 1980 accounted for 32.3 percent of total spending for food and food at home expenditures 67.7 percent (Putnam and

Allshouse, p. 138). If this at-home proportion is applied to the USDA beef figure, the 1980 at-home market estimate is 51.7 pounds. This USDA-based figure and our CES estimate of 48.3 pounds are reassuringly close. There are many factors that might explain the small difference. Recall that our quantity is per adult equivalent and USDA's per capita; USDA's estimate of total pounds is simply divided by the U.S. population.

Figures 1 through 4 dramatically show the substantial differences in cumulative taste changes for various food categories among some of the demographic groups. In Figures 1 and 2 the population segments are classified only by income level. The preference shift away from beef in Figure 1 was much larger among higher income consumers than those with lower incomes. The former group also had a small shift towards pork and a negligible one towards poultry, whereas the latter's tastes shifted away from poultry. In Figure 2, the preferences of lower income households shifted away from fresh vegetables and did not change for food away from home (FAFH). Those of higher income consumer units moved in favor of fresh vegetables and FAFH.

The demographic groups in Figures 3 and 4 are cross-classified by income, head's age, and spouse's education. Older, better educated, higher income households shifted far more strongly away from beef and towards fish than younger, less educated, lower income consumer units. The latter shifted towards pork; the former did not. In Figure 4, the younger demographic group's tastes moved away from fresh vegetables; whereas the older group's shifted towards dairy products, fresh vegetables, and sweets, but against fresh fruits and oils.

Figures 5 through 7 are similar to the ones presented in Sakong and Hayes. They show the path of taste changes over time, in our case across the 44 quarters from 1980-1990. Figure 5, for all urban households, shows a shift in favor of pork early in the period with somewhat of a change back later. The shift towards pork may have been in response to its improved quality, especially leanness (reduced fat). Most of the change against beef also occurred early in the 1980s. The shift towards fish began about mid-decade. There was a slight shift against poultry, which was basically reversed by the end of the decade.

The time paths in Figures 6 and 7 are very different from Figure 5 and from each other. The younger, less educated, lower income households in Figure 6 shifted towards pork very early in the 1980s. The older, more educated, higher income consumers in Figure 7 shifted away from beef until about mid-decade when preferences stabilized at the new lower level. Other major differences are also apparent in comparing Figures 5, 6 and 7.

CONCLUSIONS

This study has shown that the magnitude, and even direction in many cases, of taste changes for several major food categories vary substantially among demographic groups in the U.S. population. This information has considerable practical significance for the food industry. This industry is increasingly consumer-driven. The companies and products which are most successful are focused on meeting the needs and wants of consumers. It is important for policy and marketing purposes to know whether an observed change in food consumption is being affected by economic factors, prices and income changes, or by preference shifts. As seen in this study, they may be working in opposite directions and partially off-setting one another. If price increases are the major factor behind a decrease in consumption, efforts should focus on reducing production costs, and hence prices. If taste changes are the major factor, adjustments in product quality attributes and the marketing strategy should be stressed.

A knowledge of preference trends for various population groups is particularly valuable because of the increasing emphasis on market segmentation and targeted marketing. Many food products are developed for and marketed to particular market niches or segments, defined by demographic characteristics. Mass marketing is being supplanted by targeted marketing. Food producers, processors, and marketers need to know not just the preference trends of the aggregate population but how tastes and preferences are changing among demographic groups. For example, since the preferences of households with lower incomes moved only slightly against beef, emphasis could be given to holding down prices and the better marketing of traditional products to this group. However, the strong taste change away from beef by higher income households indicates the need for a promotion and marketing strategy designed to alter their perception of beef and the development of new products that contain the characteristics desired by these consumers.

FOOTNOTES

[1]The authors wish to thank Dr. James Chalfant, who provided his computing language regarding the test for preference stability, and Dr. Alexander Meeraus who provided the GAMS 386 version 2.25 software on a free trial basis.

[2]A list of some of the literature in this area, which is by no means comprehensive, includes: Alston and Chalfant (1988 and 1991a); Chavas; Chavas and Cox (1988); Choi and Sosin; Eales; Eales and Unnevehr; Moschini and Meilke (1984 and 1989); and Sakong and Hayes.

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Table 1. Lower and upper bounds for food expenditure elasticities.

Food Commodity	Bounds	
	Lower	Upper
Cereals	0.30	0.90
Bakery products	0.30	1.00
Beef	0.65	1.80
Pork	0.50	1.50
Other meats	0.50	1.50
Poultry	0.50	1.50
Fish and seafood	0.60	1.60
Eggs	0.30	0.75
Fresh milk	0.30	0.75
Dairy products	0.40	1.20
Fresh fruits	0.40	1.20
Fresh vegetables	0.50	1.10
Processed fruits	0.50	1.10
Processed vegetables	0.50	1.20
Sugar and sweets	0.40	1.10
Non alcoholic beverages	0.40	1.00
Fats and oils	0.50	1.00
Miscellaneous foods	0.50	1.20
FAFH	1.20	2.40

Table 2. Cumulative taste changes by commodity for selected population groups: 1980-1990.[1] (Quantity index, i.e., pounds per adult equivalent per week.)

Population Group[2]	Beef	Pork	Poultry	Fish and Seafood	Eggs
Group 1	-0.313	0.151	-0.014	0.137	-0.126
Group 2	-0.115	-0.029	-0.222	0.165	0.011
Group 3	-0.644	0.156	0.046	0.207	-0.097
Group 4	-0.299	0.675	-0.152	-0.027	-0.122
Group 5	-0.454	0.222	0.401	0.123	0.039
Group 6	-0.169	0.236	0.011	0.209	-0.495
Group 7	-0.135	-0.368	0.261	0.127	0.490
Group 8	-0.831	0.285	-0.015	0.164	-0.022
Group 9	-0.492	0.106	-0.266	0.191	-0.176
Group 10	-0.526	-0.115	-0.001	0.232	-0.396
Group 11	-1.305	-0.050	0.263	0.520	-0.034

Table 2. Continued.

Population group	Dairy prod.	Fresh fruits	Fresh vegetables	Proc. fruits
Group 1	0	-0.114	-0.035	-0.014
Group 2	0	-0.091	-0.306	-0.062
Group 3	-0.010	-0.269	0.254	0.144
Group 4	0	-0.084	-0.319	0.158
Group 5	-0.040	-0.305	-0.262	-0.159
Group 6	0.048	-0.175	0.153	-0.422
Group 7	0.019	-1.179	-0.151	0.063
Group 8	0.005	-0.347	0.278	0.205
Group 9	0.008	-0.010	-0.070	0.175
Group 10	0.216	-0.100	-0.121	0.487
Group 11	0.285	-0.629	0.605	0.174

Table 2. Continued.

Population group	Sweets	Beverages	Oils	FAFH
Group 1	0.098	0	-0.007	0
Group 2	0.117	0	-0.003	0
Group 3	0.173	0	-0.111	0.275
Group 4	-0.085	0	0	0
Group 5	0.396	0	-0.022	0
Group 6	0	0	-0.046	0
Group 7	0.184	0	0.204	0
Group 8	0	-0.028	-0.108	0.538
Group 9	0.469	0	0	0
Group 10	-0.071	-0.141	0.011	0
Group 11	0.723	0	-0.376	0

[1]A food commodity was not listed when no taste change was detected for any population group.

[2]The population groups are:

Group 1 = All urban households.
Group 2 = Households with lower incomes.
Group 3 = Households with higher incomes.
Group 4 = Households with lower incomes, younger household heads and less educated spouses.
Group 5 = Households with lower incomes, younger household heads and more educated spouses.
Group 6 = Households with lower incomes, older household heads and less educated spouses.
Group 7 = Households with lower incomes, older household heads and more educated spouses.
Group 8 = Households with higher incomes, younger household heads and less educated spouses.
Group 9 = Households with higher incomes, younger household heads and more educated spouses.
Group 10 = Households with higher incomes, older household heads and less educated spouses.
Group 11 = Households with higher incomes, older household heads and more educated spouses.

Figure 1. Cumulative taste changes in meats: 1980-1990 by income class.

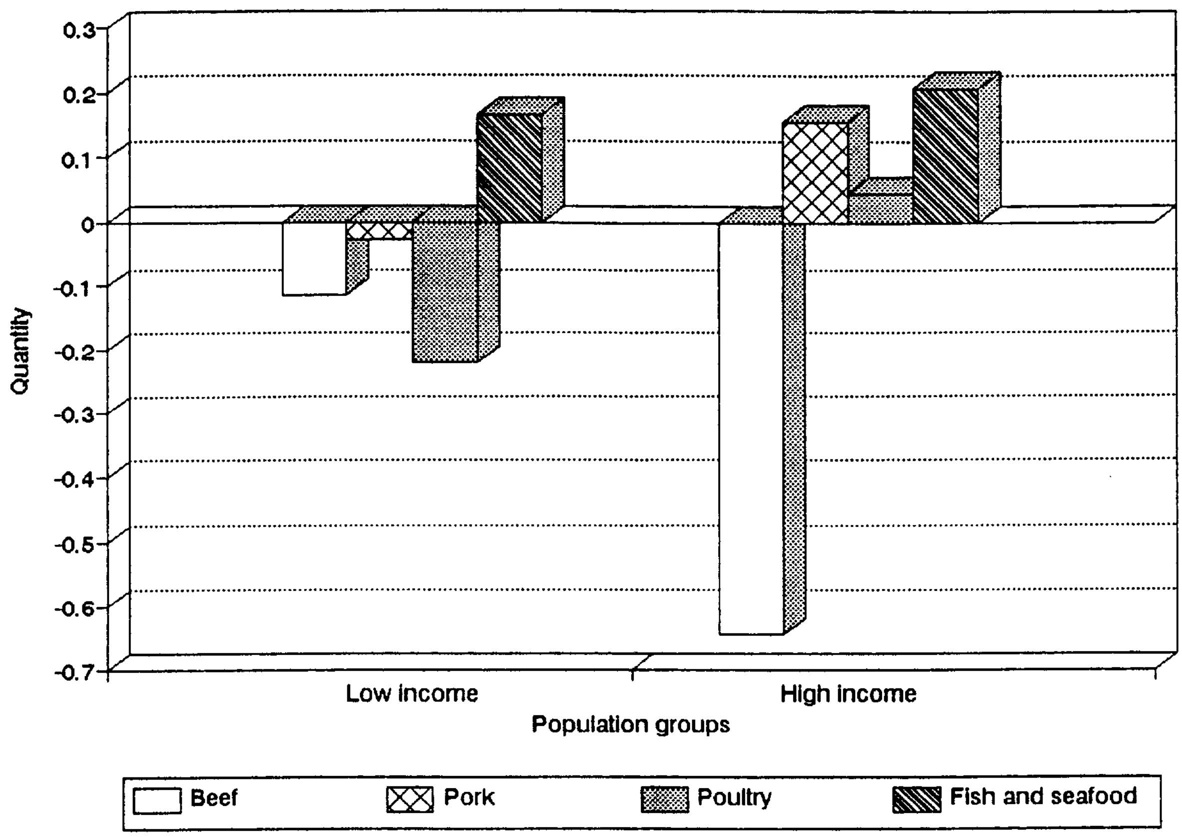

Figure 2. Cumulative taste changes in other foods: 1980-1990 by income class.

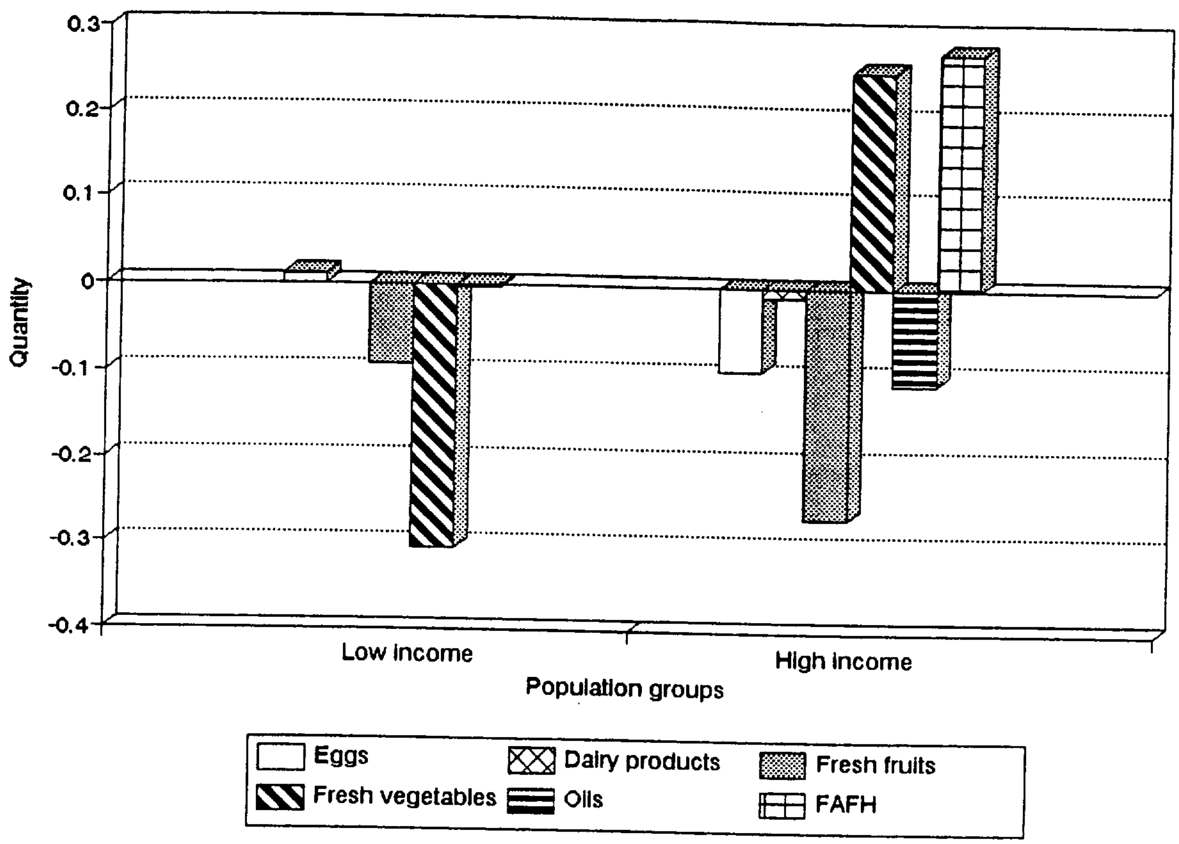

Figure 3. Cumulative taste changes in meats: 1980-1990 by income, age of household head and spouse's education.

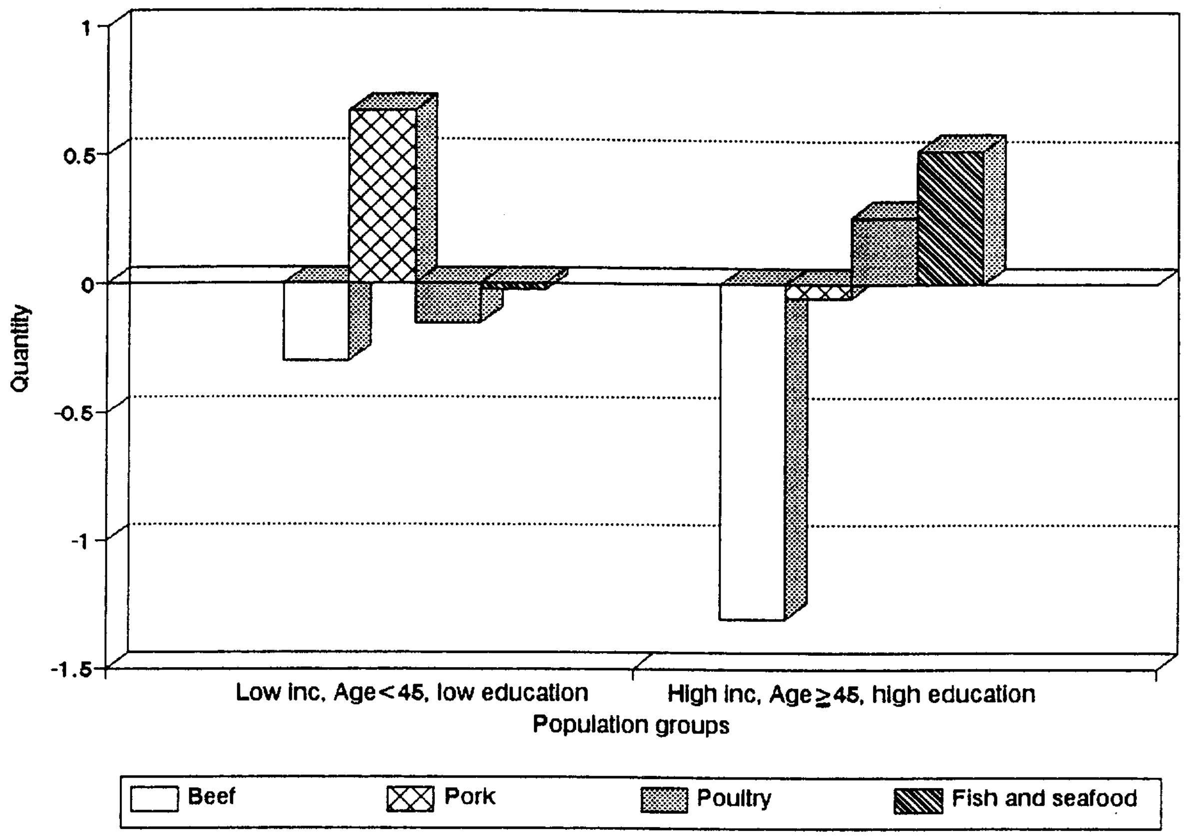

Figure 4. Cumulative taste changes in other foods: 1980-1990 by income, age of household head and spouse's education.

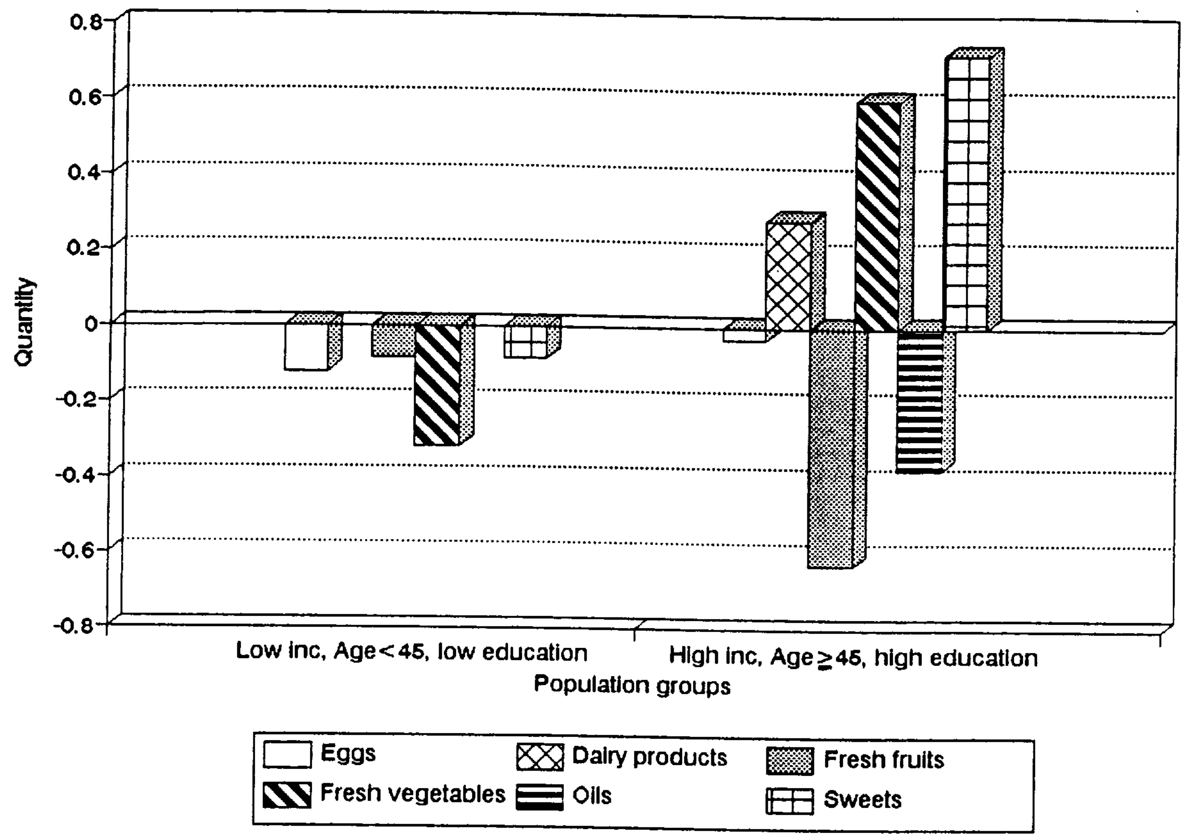

Figure 5. The path of taste changes for meats: All urban households.

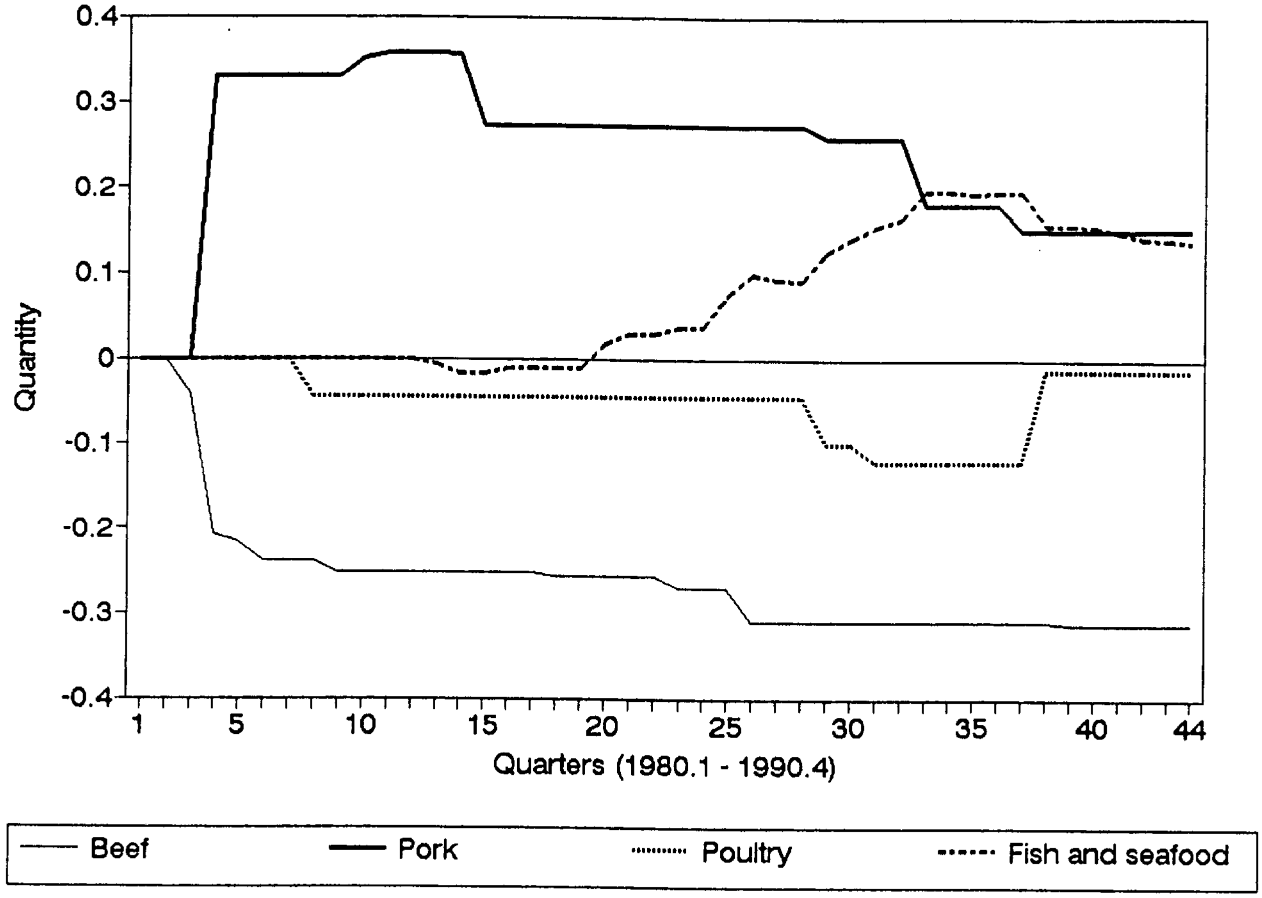

Figure 6. The path of taste changes for meats: Households with lower incomes, head younger than 45 and less educated spouse.

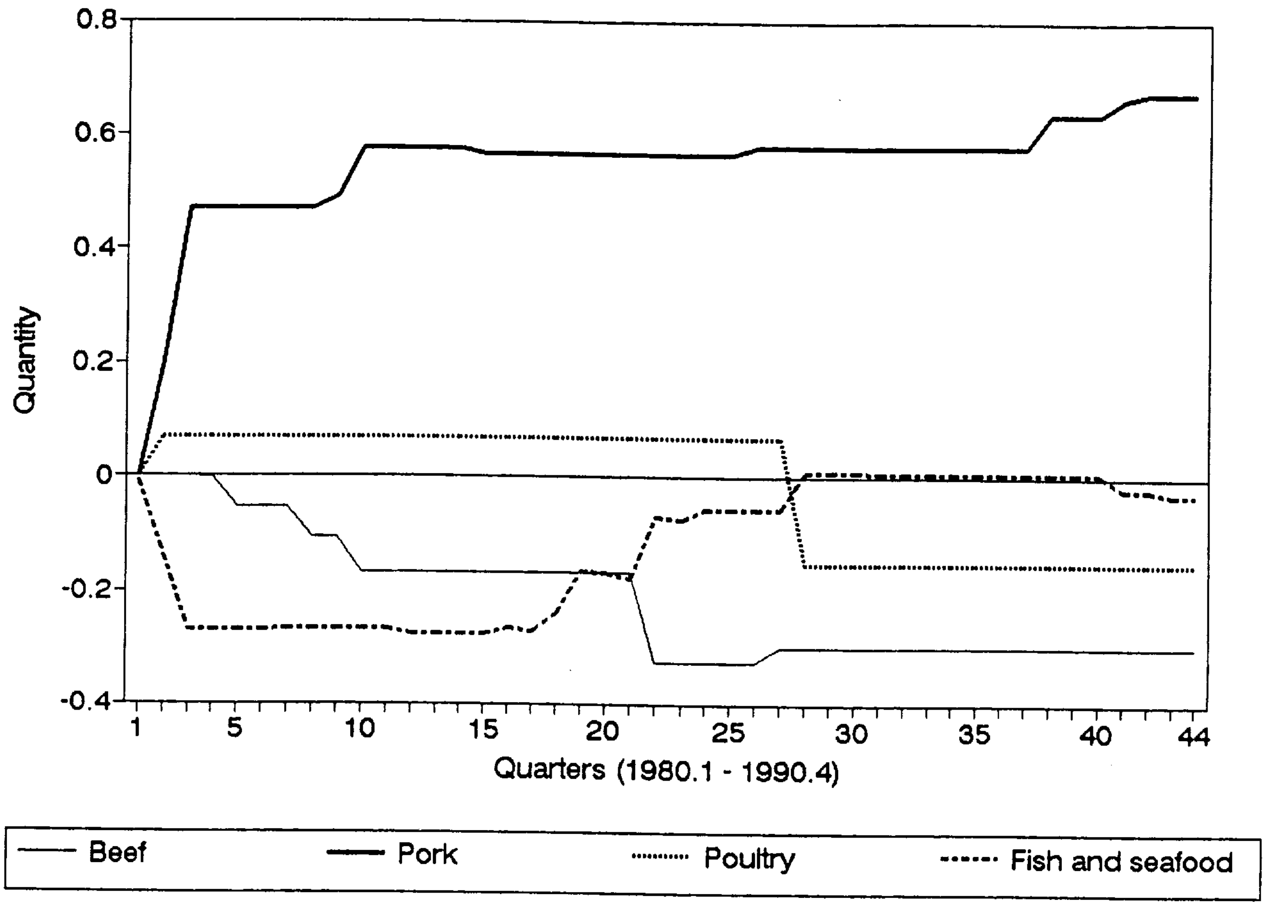

Figure 7. The path of taste changes for meats: Households with higher incomes, head 45 years old or older and more educated spouse.