IMPACTS OF HOUSEHOLD COMPOSITION ON CONVENIENCE AND NONCONVENIENCE FOOD EXPENDITURES IN THE SOUTH

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The importance of the role played by household size and the age-sex characteristics of household membership in consumer expenditure and demand studies has been discussed by Barton, Blokland, Buse and Salathe, McClements (1977), Muellbauer (1974, 1980), Prais and Houthakker, and Price. This information aids in the specification and estimation of Engel functions, demand functions, and demand systems. Such information is also needed in the study of poverty problems (Atkinson) and in the design and implementation of domestic food and income maintenance programs (Chavas and Yeung, p. 132).

Through the use of equivalence scales, this paper focuses on the impacts of household composition on convenience and nonconvenience food expenditures. Although approximately 45 percent of the U.S. food dollar was spent on convenience foods in the past several years, information concerning factors affecting household expenditures on convenience foods is currently incomplete. The specific objectives of this paper are (1) to present, using Buse and Salathe's model, empirical estimates for equivalence scales and hypothesis test results about the effects that household size and membership composition have on expenditures for three groups of convenience foods, for nonconvenience foods and for total foods by households located in the southern region of the United States, and (2) to present a few life cycle expenditure-change profiles to illustrate the magnitude of impact that a change in household composition may have for different sociodemographic scenarios.

DEFINITIONS OF CONVENIENCE AND NONCONVENIENCE FOODS

Convenience foods are defined by Traub and Odland as fully prepared or partially prepared food items where some or all of the preparation time, culinary skills, or energy inputs are provided by the food processor-distributor rather than in the homemaker's kitchen. This definition encompasses a broad range of heterogeneous foods. To circumvent possible shortcomings of this definition, convenience foods were disaggregated into three classes, namely, basic convenience, complex convenience, and manufactured convenience foods. The basic convenience food class consists of such items as canned and frozen fruits, vegetables, and juices; shelled nuts; frozen fresh fillets; and yogurt. The important characteristic of the basic convenience food items is that processing is performed for preservation purposes rather than providing a time or energy savings to the homemaker. These items generally consist of a single or limited number of ingredients and require little or no culinary expertise. The complex convenience class consists of food items that the layman normally thinks of as a convenience food; that is, it consists of items such as frozen and canned entrees, frozen desserts, pudding mixes, canned soups, ready-to-eat cookies, cakes, breads, and rolls. The complex convenience items generally embody multiple ingredients, provide high levels of time savings and/or energy inputs, and have culinary expertise built in. The manufactured convenience food class consists of items with no home-prepared counterparts. This group contains most of the carbonated and alcoholic beverages, breakfast toaster pastries, saltines, dry cereals, and so forth.

Food items not satisfying the properties of the three convenience food classes defined above were considered to be nonconvenience foods. The nonconvenience food class contains such items as fresh vegetables, meat, poultry, and other unprocessed food items; ingredient food items such as sugar and flour; and home-produced, home-canned, home-frozen, or home-preserved food items.[1]

EQUIVALENCE SCALE MODELS

Equivalence scales are index-type measures of deflators designed to show the impact that individual household members of a different sex, age, and household status have on the household's expenditure and consumption behavior. Household equivalence scales provide measures of the number of standard consumers in each household and are obtained by aggregating over the relevant adult equivalence scales. Adult

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[1] To evaluate the feasibility of the above classification scheme, groups of home economists and undergraduate students were given the aforementioned definitions and asked to classify randomly selected food items according to their relevant food group. While home economists typically have more extensive experience in food preparation than undergraduate students, the actual classification of the various food items by the two distinct groups closely matched the original classifications.

equivalence scales indicate the needs and standardized weights that an individual member of a given age and sex contributes to the household's expenditure and consumption behavior relative to a standard member's impact. As such, the adult scale shows by how much the household size, as measured by the household scale, will change should a member of a given age and sex be added to or deleted from that household.

A number of models and procedures have been used to obtain empirical estimates of equivalence scales (Barton; Blokland; Buse and Salathe; McClements (1979); Muellbauer (1980); Prais and Houthakker; and Price). The Prais-Houthakker model, in which consumption good expenditures per household equivalent are a function of the household's standardized income or total expenditures, has been used frequently in the past. As pointed out by Blokland, Buse and Salathe, and Muellbauer (1980), this model has a number of deficiencies, some of which are (1) the age-sex class membership specifications yield equivalence scales that are stepwise discrete (Blokland, p. 16); (2) socio-demographic factors, which may be important explanatory variables, are excluded (Buse and Salathe, p. 46); and (3) an identification problem occurs because not all of the specific commodity group expenditure and total expenditure scale parameters can be estimated simultaneously (Blokland, pp. 13–14), (Muellbauer 1980, p. 154).

Table 1. Buse and Salathe's Adult Scale Functions for the j[th] Male or Female Household Member

Equation Number	Adult Scale Function $E(a_j,a_j)$	Age Class	Age Range
Male Adult Scales $E(a_j,1)$			
(1)	$= \varepsilon + \delta a_j - [.1\delta + .0075(\varepsilon-1)]\,a_j^2 + [.0025\delta + .00025(\varepsilon-1)]\,a_j^3$	1 childhood	$0 \leq a_j < 20$
(2)	$= 1$	2 adult	$20 \leq a_j \leq 55$
(3)	$= 1 - .0075(1-\mu)(a_j - 55)^2 + .00025(1-\mu)(a_j - 55)^3$	3 older adult	$55 \leq a_j \leq 75$
(4)	$= \mu$	4 elderly	$a_j \geq 75$
Female Adult Scales $E(a_j,2)$			
(5)	$= \varepsilon + \zeta a_j - [.1\zeta + .0075(\varepsilon-\gamma)]a_j^2 + [.0025\zeta + .00025(\varepsilon-\gamma)]a_j^3$	5 childhood	$0 \leq a_j < 20$
(6)	$= \gamma$	6 adult	$20 \leq a_j \leq 55$
(7)	$= \gamma - .0075(\gamma-\nu)(a_j - 55)^2 + .00025(\gamma-\nu)(a_j - 55)^3$	7 older adult	$55 \leq a_j \leq 75$
(8)	$= \nu$	8 elderly	$a_j \geq 75$

Source: The authors.

BUSE-SALATHE ADULT SCALES

The Buse-Salathe model may be considered an extension of Blokland's scale specifications (Blokland, pp. 32–42 and pp. 52–55). Blokland uses two general age classes to approximate the adult scales for each sex by a continuous-type spline function where parameterization is in terms of the ordinate values (equivalence scales) at the interior knots or join points and at the end points (Poirier). Blokland presumes that the adult scales are expressed as a cubic function of age over the childhood period, from birth to 20 years, and as a constant from 20 years of age and over. Buse and Salathe extend Blokland's specifications by adding two age classes to allow for possible differences in the adult scales, that is, between the adult (20 to 55 years) and the older adult (55 to 75 years) or elderly years (age 75 or greater). Use of the continuous piecewise-type function imposes gradualness in the equivalence scales between adjacent age classes.

Highlights of the functional equations and adult scale parameters for each sex in Buse and Salathe's model are presented in Table 1. Equations (1) through (4) provide the life cycle scale values for a male, whereas equations (5) through (8) yield the female scale values. These equations result from the prior restrictions, which are (1) adult scales are the same for a male or female at birth, age 0, and are given by the parameter ϵ, obtained when $a_j = 0$ in equations (1) and (5); (2) the first and second derivatives of the scale functions with respect to age exist for the childhood and older adult ages, equations (1), (3), (5) and (7), but equal zero for the adult and elderly years, equations (2), (4), (6) and (8); (3) the standard consuming household member is an adult male who is assigned a scale value of 1, equation (2); (4) the scale for an adult female is given by the parameter γ, equation (6); and (5) scales for elderly males and elderly females are given by the parameters μ and ν respectively, equations (4) and (8).

Scale values for the adult and elderly members of each sex came directly from the prior restrictions. The relations between the prior restrictions and scales for the childhood and older adult years, equations (1), (5), (3), and (7), however, are not as obvious. These equations are obtained by solving and evaluating the cubic expressions, derivatives, and other conditions given the age-sex class specifications (Blokland, pp. 34–55; Poirier). This procedure yields gradualness at the join points of 20 and 55 years of age and generates a continuous piecewise scale function over the life cycle. The weights of .1, .0075, .0025 and .00025 in equations (1), (3), (5), and (7) are unique to Buse and Salathe's model. They result from the selection of 20 years of age as the join point between the childhood and adult age classes. These weights arise when the parameters associated with the second- and third-degree terms in the cubic expressions are reduced by solving for them in terms of the other parameters (Blokland, pp. 52–54). That is, the weighting factors and parameters δ and ζ in equations (1) and (5) arise from the age-class specifications and cubic expressions used to approximate the male and female adult scale values over the childhood years (Buse and Salathe, p. 462).

BUSE-SALATHE HOUSEHOLD EQUIVALENCE SCALES

Since the adult scale parameters contained in equations (1) through (8) of Table 1 were not estimated directly, the adult scale functions arising from Buse and Salathe's specifications have to be treated as maintained hypotheses. The data available to us applied only to the overall household unit, and therefore the adult scale parameters had to be estimated indirectly as components of household equivalence scales. Household equivalence scales, which indicate the standard number of consuming members within a household, were approximated for the i^{th} food group by a linear combination of the adult scales as follows:

$$(1) \qquad KH_i = P + \gamma_i Q + \epsilon_i R + \delta_i S + \zeta_i T + \mu_i U + \nu_i V$$

where KH_i is the household equivalence scale and γ_i; ϵ_i, δ_i, ζ_i, μ_i, and ν_i are the unknown adult parameters. The variables P, Q, R, S, T, U, and V are weighted sums generated for each household in the sample where the weights for each household member depend upon the age class and other properties given in the adult scale equations of Table 1. For example, if the household has a male member who belongs to the childhood, adult, or older adult age class, then the variable P will be greater than zero. Should this male member belong to the older adult class (of age 56 to 74), both variables P and U would be positive. The variables P, S, and U depend upon different-aged male members only; variables Q, T, and V on females only; and variable R is positive when there is a male and/or female child within the household.

DATA AND ESTIMATION PROCEDURES

Data utilized in the study came from the Nationwide Food Consumption Survey (NFCS) in which households were surveyed over the spring, summer, fall, and winter quarters of 1977–78. After classification, the total 4,111 food items covered in the NFCS consisted of 35.3 percent nonconvenience foods, 32.6 percent basic convenience, 24.7 percent complex convenience, and 4.6 percent manufactured convenience food items. The total number of observations used to estimate the household effects was less than the total number of NFCS observations because a household was deleted if data for any of the explanatory variables were missing. For example, 4,399 of the households in the southern region of the United States reported the actual age and sex for each household member, the information required to compute the weighted sum variables, P, Q, R, S, T, U, and V in the household scale equation (1). A number of these southern households did not provide information about their socio-demographic attributes and therefore the usable sample consisted of 2,967 households. While this procedure can generate sample selection bias, it does not appear to be a problem because frequencies found for the usable sample were quite similar to the frequencies found for the cells in the overall sample of southern households.

The equivalence scale parameters were estimated for the i^{th} food group by incorporating them in the following Engel curves:

$$(2) \qquad E_i = f(ES, ED, PF, U, X, Y, KH_i, U \cdot KH_i, X \cdot KH_i, Y \cdot KH_i, KH_i^2, U \cdot KH_i^2, X \cdot KH_i^2, Y \cdot KH_i^2).$$

The variables are E_i, the household's weekly food expenditure on i^{th} good, as measured by money value of food used at home; ES, employment status of the female household head; ED, educational status of the female household head; PF, usual preparer of food in the household; X, race of the household survey respondent; U, residential location; Y, annual income of the household; and KH_i, the household equivalence scale defined by equation (1). The variables ES, ED, and PF were included as intercept shifters, whereas, U, X, and Y were specified as intercept and slope shifters interacting with KH_i and KH_i^2. All of the explanatory variables in equation (2) other than KH_i were introduced as dummy variables. To represent Y, three income classes were used when households with annual incomes of \$10,000 to \$19,999 were treated as the standard class.

The household equivalence scale variable KH_i and its squared value KH_i^2 were included in the Engel curves to account for possible economies of household size (Buse and Salathe; Price). Inclusion of these variables and their interaction with the socio-demographic variables required use of a nonlinear estimation method. That is, upon estimation the scale parameters γ, ϵ, δ, ζ, μ, and ν are constrained to be equal in both the KH_i and KH_i^2 terms of equation (2). A nonlinear regression algorithm using Marquardt's compromise method was used in this study (Draper and Smith).

EMPIRICAL SCALE ESTIMATES AND HYPOTHESIS TEST RESULTS

Scale parameter estimates for the southern household's expenditures on total foods, nonconvenience foods, and the three convenience food groups are given in Table 2. In general, the results support prior expectations that household size and membership characteristics are important variables in explaining variations in households' expenditures on the different types of food groups.

As defined earlier, addition of an adult male will increase the household equivalence scale by one unit. Addition or deletion of a member who is not an adult male, however, is expected to change the equivalence scale by a value different from one. The effect of a newborn male or female child is given by the parameter ϵ. The parameters γ, μ, and ν measure the change in household equivalents for an adult female, an elderly male (age $\geq$ 75 years), or an elderly female (age $\geq$ 75 years), respectively. The parameters δ and ζ have

Table 2. Estimated Scale Parameters and Standard Errors For Total Foods, Nonconvenience Foods, Basic Convenience, Complex Convenience and Manufactured Convenience Foods For Households in the South

Parameters	Total Foods	Nonconvenience Foods	Convenience Food Groups		
			Basic	Complex	Manufactured
ϵ	.2638[a] (.1093)	.0067 (.1313)	.6193[a] (.1763)	.7081[a] (.1595)	.2390 (.2793)
γ	.7454[a] (.0686)	.7392[a] (.0814)	.7966[a] (.1104)	.6282[a] (.0929)	.7704[a] (.1713)
μ	.8487[a] (.1079)	1.0787[a] (.1369)	.7848[a] (.1790)	.4252[a] (.1301)	.5201 (.2653)
ν	.5967[a] (.1029)	.5847[a] (.1227)	.8000[a] (.1737)	.5516[a] (.1344)	.2679 (.2758)
δ	.0124 (.0360)	.0633 (.0438)	-.0881 (.0551)	-.0961 (.0500)	.1745 (.0871)
ζ	.0321 (.0374)	.0653 (.0447)	-.0478 (.0543)	-.0064 (.0540)	.0997 (.0964)
R^2	.4378	.3343	.2284	.3044	.1868

Source: Computations by authors.

Note: The numbers contained in parentheses are asymptotic standard errors of the respective parameter estimates.

[a] indicates that test of null hypothesis ϵ, γ, μ or $\nu = 1$ was rejected at the .05 probability level.

an indirect effect because they are coefficients associated with the cubic expressions used in the specifications for the childhood years. Should statistical tests find that they are not significantly different from zero, it means that the scale functions could have been specified as a strict monotonic function of age. If μ is not significantly different from one, it means that equations (3) and (4) in Table 1 collapse to equation (2). This would be equivalent to Blokland's specifications.

Given the above interpretations, null hypotheses that each parameter ϵ, γ, μ, and ν equals 1, and that δ and ζ equal zero were tested against the alternative of nonequality. Table 2 indicates that the magnitude of the estimates and their significance varied in different ways over the food groups and over the age-sex classes. None of the estimates of the terms δ and ζ were found to be significantly different from zero in the South. As expected, children at birth had an impact significantly lower than an adult male for each food group other than complex convenience foods. The smallest difference in estimated value of scale parameters across food groups occurred for adult females (γ) ranging from 62.8 to 79.6 for the complex and basic convenience food groups, respectively. Since μ was significantly less than 1 only for complex convenience foods, it suggests that male age differences beyond 20 years of age are not important for the nonconvenience, basic convenience, or manufactured convenience food groups. On the other hand, estimates for ν suggest that age differences for females 20 years and older are important. The elderly females imputed scales for total foods, nonconvenience, and complex convenience foods are significantly less than one, but more than twice as large as their scale value of .2679 for manufactured convenience foods. These results and the general contents of Table 2 suggest that disaggregation of total foods into the four nonconvenience and convenience food groups yields quite dissimilar life cycle patterns of equivalence scales.

EMPIRICAL RESULTS FOR SOCIODEMOGRAPHIC VARIATES

Empirical estimates for the sociodemographic variates, included to account for taste and other noneconomic factor differences, are presented in Table 3. Some of the significant findings found to provide useful explanations are as follows: Except for basic convenience foods, households in which the usual preparer of foods was the male head or male head and someone else, MP2, or male and female head, MP3, spent significantly more than households in which the usual preparer of food was someone else. Statistical test results for U2, U2·KH and U2·KH^2 indicate that nonmetropolitan households spent more on total foods and nonconvenience foods than their suburban counterparts in the South. Household income differences were also found to be significant both as intercept and as slope shifters. Low-income households, Y1, spent significantly less on all foods and nonconvenience foods than the intermediate-income households (annual income of $10,000 to $19,999). On the other hand, high-income households, Y2, spent more on manufactured convenience foods than was spent by intermediate-income households. Households in which the survey respondent was nonwhite and nonblack spent much more on complex convenience foods than households in which the respondent was white.

The coefficient associated with the household equivalence scale variable, KH_i, was positive and statistically significant for every food group. The coefficients associated with the squared scale variable KH_i^2, however, were found to be negative, and their absolute value at least twice their standard error only for the complex convenience and manufactured convenience food groups. This result suggests, consistent with Price, and Buse and Salathe's arguments, that a household member's impact on expenditures for complex and manufactured convenience food items depends upon the household's size.

COMPOSITE HYPOTHESES TEST RESULTS

Since the parameter estimates indicate that household composition has a significant effect on expenditures for the different convenience and nonconvenience food groups, a number of composite hypotheses about the age and sex characteristics were formulated and tested. The procedure utilized was to impose restrictions consistent with the postulated hypothesis and to use the F distribution. Results are presented in Table 4. Test of hypothesis (1) found both age and sex to be important factors in influencing expenditures on each of the food groups. This finding indicates that the equivalence scale functions did not collapse to a household size specification. Results for hypothesis (2) indicate that sex differences were important in explaining expenditure behavior for total foods, nonconvenience foods, and complex convenience foods.

Table 3. Estimated Parameters and Standard Errors for Sociodemographic Variables for Total Foods, Nonconvenience Foods, Basic Convenience, Complex Convenience and Manufactured Foods in the South

Variate or Variable[a]	Total Foods	Nonconvenience Foods	Convenience Food Groups: Basic	Convenience Food Groups: Complex	Convenience Food Groups: Manufactured
ES	.834 (.816)	.895 (.558)	.161 (.227)	-.307 (.231)	.044 (.140)
Ed	-.118 (.921)	.781 (.629)	-.885 (.257)[b]	.259 (.261)	-.267 (.159)
MP1	6.344 (3.474)	4.285 (2.372)	1.524 (.971)	.776 (.982)	-.405 (.603)
MP2	15.761 (4.880)[b]	6.599 (3.334)	1.427 (1.363)	4.281 (1.381)	3.246 (.845)[b]
MP3	9.630 (3.757)[b]	5.957 (2.566)[b]	1.922 (1.050)	1.476 (1.063)	.054 (.651)
U1	6.083 (3.938)	1.656 (2.750)	1.791 (1.189)	1.291 (.997)	.912 (.540)
U2	9.351 (3.420)[b]	6.478 (2.409)[b]	1.462 (1.028)	.943 (.852)	.339 (.450)
X1	-3.881 (3.267)	-1.215 (2.265)	-1.329 (.980)	-.835 (.845)	-.476 (.462)
X2	34.899 (19.711)	7.578 (14.098)	4.848 (5.334)	15.271 (5.004)[b]	.179 (3.142)
Y1	-8.430 (3.440)[b]	-7.740 (2.453)[b]	-.793 (1.010)	.014 (.851)	-.095 (.459)
Y2	-2.387 (5.799)	-5.121 (4.131)	-.596 (1.654)	.679 (1.417)	2.796 (.817)[b]
KH	15.504 (2.579)[b]	6.544 (1.830)[b]	2.683 (.740)[b]	4.650 (.703)[b]	1.520 (.342)[b]
U1 - KH	-3.189 (2.911)	-.003 (2.055)	-1.111 (.848)	-1.004 (.783)	-.666 (.375)
U2 - KH	-6.832 (2.460)[b]	-4.236 (1.749)[b]	-.820 (.714)	-1.291 (.649)	-.518 (.305)
X1 - KH	4.271 (2.32)	2.761 (1.635)	.849 (.670)	.289 (.628)	.311 (.305)
X2 - KH	-15.175 (10.007)	-1.243 (7.362)	-2.424 (2.566)	-8.224 (2.647)[b]	.205 (1.498)
Y1 - KH	4.578 (2.330)	4.814 (1.680)[b]	.448 (.663)	-.253 (.609)	-.178 (.290)
Y2 - KH	4.252 (3.578)	4.905 (2.605)	.732 (.989)	.034 (.916)	-1.298 (.476)[b]
KH^2	-.199 (.384)	.218 (.278)	-.009 (.108)	-.281 (.109)[b]	-.096 (.045)[b]
U1 - KH^2	.694 (.484)	.053 (.344)	.187 (.138)	.233 (.138)	.138 (.061)[b]
U2 - KH^2	.929 (.407)[b]	.613 (.293)[b]	.050 (.113)	.178 (.113)	.101 (.049)[b]
X1 - KH^2	-1.326 (.385)[b]	-.720 (.273)[b]	-.258 (.108)[b]	-.194 (.107)	-.125 (.051)[b]
X2 - KH^2	.903 (1.183)	-.143 (.890)	.068 (.289)	.771 (.331)[b]	-.137 (.164)
Y1 - KH^2	-.948 (.371)[b]	-.879 (.275)[b]	-.110 (.101)	-.036 (.100)	.014 (.041)
Y2 - KH^2	-.557 (.510)	-.733 (.379)	-.044 (.137)	-.018 (.137)	.175 (.067)[b]

Source: Computations by authors.
Note: The numbers contained in parentheses are asymptotic standard errors of the respective parameter estimates.
[a] F.H. means female head of household whereas M.H. means the male head. The dummy variables were defined as follows: ES = 1 if F.H. not employed outside of household; Ed = 1 if F.H. has high school education or less; MP1 = 1 if meal preparer is F.H. or F.H. and someone else; MP2 = 1 if meal preparer is M.H. or M.H. and someone else; MP3 = 1 if meal preparer is F.H. and M.H.; U1 = 1 if household residence in central city; U2 = 1 if residence in nonmetropolitan area; X1 = 1 if respondent was black; X2 = 1 if respondent was not black or not white; Y1 = 1 if household annual income < \$9,999; and Y2 = 1 if household annual income ≥ \$20,000.
[b] indicates that test of the null hypotheses that each of the parameters equals zero was rejected at the 5 percent level.

Table 4. Summary Results of Statistical Tests on Composite Hypotheses About Age and/or Sex Effects of Southern Households on Total Food Expenditures and on Nonconvenience and the Convenience Food Group Expenditures

Composite Hypothesis Tested	Food Group for Which Hypothesis Was Rejected[a]
(1) Age and sex are not important	TF, N, B, C, M
(2) Sex is not important	TF, N, C
(2.a) Sex of adults is not important	TF, N, C
(2.b) Sex of elderly is not important	TF, N
(3) Age of males is not important	TF, N, B, C, M
(3.a) Male children are not important	TF, N, B, C, M
(3.b) Elderly males are not important	TF, C
(4) Age of females is not important	TF, N
(4.a) Female children are not important	TF, N
(4.b) Elderly females are not important	TF, M

[a] The food groups are designated by: TF - total food; N - nonconvenience foods, B - basic convenience foods, C - complex convenience foods and M - manufactured convenience foods. The .05 probability level of significance was used in testing the hypotheses.
Source: Computations by authors.

Differences in the sex of adults (2.a) yielded the same results, but differences in sex for the elderly years were important only for nonconvenience and total foods.

Hypotheses (3), (3.a), and (3.b) are about age differences of male household members and are a subset of hypothesis (1). These findings, along with the other test results, suggest that male age differences are important for basic convenience foods, similar to results found for hypothesis (1). However, it is differences, particularly between the childhood and adult years, that are important for each of the food groups. Differences in the male scales between the adult and elderly years are important only for all foods and complex convenience foods.

Tests of the remaining hypotheses indicate that age differences for female household members are primarily important for nonconvenience foods and the total food group. The greatest differences in scale values for females of different ages are between the childhood and adult years, similar to the findings for males.

EXAMPLE PROFILES OF LIFE CYCLE EXPENDITURES

Life cycle profiles of equivalence scales for each of the food groups can be obtained by using the parameter estimates given in Table 2 and appropriate equations given in Table 1. Such profiles indicate by how much the standard household size, KH_i, will change when a member of a given sex and age, from birth to death, is added (or deleted) from that household. Life cycle profiles indicating the expenditure changes for the different types of food groups that can be imputed to a household member of a given age and sex depend upon the equivalence scale profiles and parameter estimates obtained for the explanatory variables postulated in the Engel curves as given in Table 3. These profiles provide a simple comparison of the impact that differences in household composition and/or socio-demographic attributes of southern households have upon expenditures on the different types of nonconvenience and convenience food groups. Because of the statistical significance and magnitude of the differences found in these parameter estimates, such information should be useful to planners of sales promotion schemes, marketing policies, food distribution projects, and income-maintenance programs.

Graphs A and B in Figure 1 present plots of expenditure-change profiles for the nonconvenience and complex convenience food groups. These plots provide only one comparison from the large number of interesting and possible socio-demographic scenarios. This comparison shows expenditure changes attributed to members of households residing in central cities or in nonmetropolitan areas of the South. The other socio-demographic characteristics of these households are that the female household head was not employed

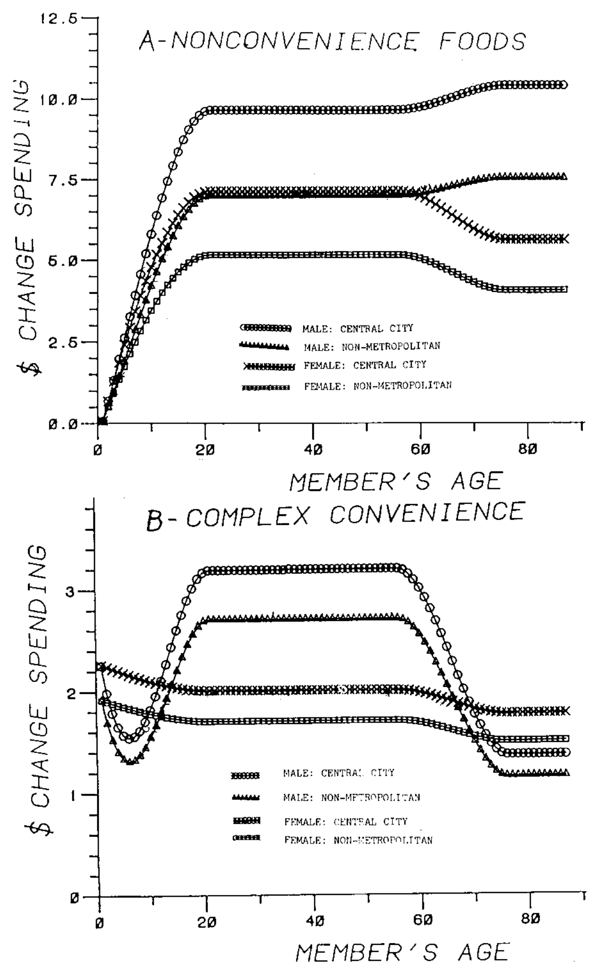

Figure 1. Expenditures on Nonconvenience and Complex Convenience Foods Imputed to Male and Female Household Members Residing in Central City or Non-metropolitan Areas of the South

outside of the household and had a high school education or less, the usual meal preparer is the female head or the female head and someone else, the survey respondent was white, and annual income of the household was $9,999 or less in 1977–78.

The average size of households in central cities was 1.9 persons (when measured by household equivalence scale it was 1.434 and 1.266 for nonconvenience and complex convenience foods, respectively). Their average weekly expenditures on nonconvenience and complex convenience foods were $15.83 and $4.83, respectively. The change in such expenditures imputed to an adult male were $9.61 and $3.18, a change of 60.7 and 65.8 percent in household expenditures on the respective food groups.

Households residing in nonmetropolitan areas were larger, with an average of 2.26 persons and average household scale values of 1.672 and 1.484 for nonconvenience and complex convenience foods, respectively. Weekly expenditures by these households were larger also, averaging $20.90 and $5.10 for the nonconvenience and complex convenience food groups. Addition of an adult male, however, did not increase the average expenditures on either food group as much as it did in the central city residences; the percentage increase was only 33.3 for nonconvenience foods and 52.7 for complex convenience foods.

The profile plots in graph A provide information about the relative differences in expenditure change on nonconvenience foods imputed to household members of different ages and sex who reside in central cities or in nonmetropolitan areas of the South. These plots bring together the information contained in the parameter estimates for the adult scales and socio-demographic variates. For example, the difference of $2.65 in weekly expenditure changes on nonconvenience foods, the difference imputed to adult males in central cities versus adult males in nonmetropolitan areas, results from the socio-demographic differences. Addition of an adult female to either type of household, however, will increase weekly expenditures by only 73.9 percent as much as the addition of an adult male (graph A). An adult female contributes $7.10 weekly to nonconvenience food expenditures when residing in a central city household, but only $5.14 when a resident of a nonmetropolitan area household. The increase in expenditures from $9.61 to $10.36 imputed to males between the adult and elderly years results from the parameter estimates of μ for nonconvenience foods.

Comparison of the plots in graph B reveals that differences in the age and sex of a member who is added to a household having different socio-demographic attributes will also yield different expenditure changes for complex convenience foods. An adult male in a central city household will add $3.18 to expenditures on complex convenience foods. Adult females residing in a nonmetropolitan household or in a central city household, however, add only 53 percent ($1.69) and 62 percent ($1.99) as much as the adult male. It is also interesting to note that the expenditure change for complex convenience foods imputed to females continuously fall as their age increases from birth to death, falling from $2.25 to $1.75 in central cities and from $1.90 to $1.48 in nonmetropolitan areas.

CONCLUDING REMARKS

Parameters for adult equivalence scales using the Buse-Salathe approach were estimated for expenditures on total foods, nonconvenience foods, and three classes of convenience foods in the South. Statistical tests conducted on the adult equivalence scale parameters were important in explaining household expenditure behavior. Consequently, the use of household size, as measured by number of members in lieu of household equivalents, would introduce specification bias to models of expenditure behavior. Moreover, the age and sex attributes of household members had different impacts on the various food expenditure patterns. In addition, information about the usual preparer of food, the geographic location of the household, and a number of other socio-demographic characteristics of the household are needed because they were also found to alter the magnitude of the food-group expenditure changes imputed to male and female household members of different ages.

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