EFFECTS OF THE FOOD STAMP PROGRAM ON FOOD CONSUMPTION IN THE SOUTHERN UNITED STATES

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The Food Stamp Program (FSP) began in 1939 on a limited basis. In 1961, President Kennedy created an experimental Food Stamp Program that became nationwide after enactment of the Food Stamp Act of 1964. The two main purposes of the FSP are to improve the nutritional status of low income families and to support farm income by increasing food demand. The cost of the FSP rose from $1.8 billion in 1972, to $6.9 billion in 1979. This dramatic increase has motivated a considerable research effort to evaluate the program. This research can be classified into three broad categories (that are not necessarily mutually exclusive). The first category concerns the impact of the FSP on the nutritional status of participants. Lane, and Scearce and Jensen have found some evidence that the program has a positive impact on the diet of participant households. The second category assesses how participation in the FSP affects family expenditures. In this context, West and Price, Neenan and Davis, and West have investigated the impact of the program on household total food expenditures. The third category of research concerns the impact of the FSP on the nation's economy. Nelson and Perrin have estimated that the nation's economy gained $2.3 billion in business receipts in 1976 because of an increase in final demand of $5.3 billion in bonus food stamps.[1]

This paper focuses on the second category of research. It examines the influence of participation in the FSP on the food consumption of low income households in the Southern region of the United States. It also investigates the impact of selected sociodemographic factors (housing, tenure, age, family size, race, etc.) on food expenditures for low income households. The choice of the Southern region is partly motivated by the relatively high poverty count in the South (Kletke), and by the empirical evidence that suggests that food consumption behavior in the South differs from consumption behavior in the rest of the country (Buse and Salathe).

Our approach departs from previous research in several ways. First, our analysis is more detailed in that it covers the expenditure pattern of 15 food commodities. Indeed, in order to investigate how the FSP affects food consumption behavior, it is useful to analyze this impact on selected food items. Second, particular attention is given to interaction variables in the specification of our model, providing some new evidence on the consumption behavior of low income households. For example, it is found that the influence of the FSP on household food purchases appears to vary with the location, race, and education of the households participating in the program.

THE MODEL

Consumption theory can provide some basis for the specification of a model of consumption behavior. The theoretical implications of participation in the FSP in terms of total food expenditures have been presented by Mittelhammer and West, and Sullivan. Although the increase in total food demand under the FSP depends on household preferences, they argue that the FSP tends to stimulate the demand for food beyond that arising strictly from an income transfer, particularly among families with very low income. In other words, consumption theory suggests that the marginal impact of the food stamp transfer on total food expenditures is likely to appear greater than the marginal impact of income on food expenditures. The reason is that the FSP acts as an in-kind income supplement, the income transfer being based on income level and family size. The empirical evidence tends to support these theoretical arguments: Hymans and Shapiro, West and Price, and Neenan and Davis estimated that the marginal impact of the food stamp bonus on total food expenditures is positive and substantially larger than the marginal impact of income on total food for low income households.

A question that has been asked about the im-

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[1] Households eligible for the FSP obtain coupons that are used in retail food outlets; coupon allotments depend on household size. Before January, 1979, households had to purchase coupons, the purchase price varying with income. Bonus stamps represent the difference between the coupon allotment value and the purchase requirement. The 1977 Food and Agriculture Act modified the program by eliminating purchase requirements: beginning January, 1979, eligible families no longer have to purchase food stamp certificates.

pact of the Food Stamp Program is "What food item expenditures are increased when a family participates in the FSP?" Some reports persist that food stamp families purchase luxury food items with their stamps. In order to answer this question, one must empirically examine the effects of food stamp participation on the expenditures for specific food items. Following the tradition of previous research (Neenan and Davis; West and Price), the general form of the expenditures relationship is then expressed as

$$(1) \qquad Y_i = f_i\,(\mathrm{INC, BON, S})$$

where Y_i is the household expenditures on the i^{th} food item, INC is total family income, BON is the bonus value of food stamp supplement, and S is a set of socioeconomic variables that have some influence on household food preferences. This specification of the Engel relationship (1) is appropriate for analysis of cross-section data in which prices can be considered as fixed.

Previous research (George and King; Hassan and Johnson) indicates that most food items are normal goods, implying an income elasticity between zero and one for most food commodities. Possible exceptions are items such as lard or evaporated milk that have been found to be inferior goods, exhibiting negative income elasticities.

Based on the permanent income hypothesis (Friedman), West and Price have found some evidence that households' assets may increase food purchase, particularly among households whose incomes follow seasonal patterns or who incur unusually large expenses. Since the home is frequently the largest asset owned by low income households, this effect may be partially captured by looking at home ownership; we may expect home owners to spend more (less) on food items with positive (negative) income elasticity than home renters.

Also, family size and composition clearly influence food expenditure patterns, because the nutritional needs of a household vary according to the number of family members, as well as the age structure of the family. In order to take into consideration the influence of family composition on consumption behavior, the use of equivalent scales has appealed to economists for many years (Prais and Houthakker; Price; Huang and Raunikar). However, the estimation of the equivalent scales presents empirical difficulties (Muellbauer). For this reason, a simpler approach is adopted in this paper. Indeed, as argued by Forsyth, there is no need to postulate the equivalent scales if the research is interested only in measuring the total effects of an additional household member on family expenditures. In this study, the household composition effects are accounted for by introducing in the model the number of family members who belong to different age categories. Five age categories have been selected: 0–15 years old; 15 to 25 years old; 25 to 45 years old; 45 to 65 years old; and greater than 65 years old.

Economic theory sheds little light on the specific sociodemographic characteristics that affect household food expenditures. Thus, the determination of the appropriate specification of the household's sociodemographic characteristics is difficult to motivate. Among the numerous variables that may have some influence on food consumption patterns, the following were added to the model: race, marital status, education, occupation, and employment status of the household head, as well as the location of the household. Indeed, previous research has shown that factors such as race or location appear to have a definite influence on food consumption (West and Price; Buse and Salathe; Neenan and Davis).

Thus, the model is specified as

$$(2) \qquad Y_i = f_i\,(\mathrm{INC, BON, N1, N2, N3, N4, N5, HT, RACE, MAR, EDU, OCC, IND1, IND3, LOC}) + e_i$$

where

Y_i = weekly household expenditures on the i^{th} commodity (cents),[2]
INC = total family income (cents/week),
BON = bonus stamp value (cents/week),
N1 = number of family members less than 15 years old,
N2 = number of family members between 15 and 25 years old,
N3 = number of family members between 25 and 45 years old,
N4 = number of family members between 45 and 65 years old,
N5 = number of family members more than 65 years old,
HT = dummy variable for housing tenure (= 1 for homeowner, 0 for house renter) accounting for the influence of family assets,
RACE = dummy variable for race (= 1 for black, 0 for other than black),
MAR = dummy variable for marital status (= 0 if the household head is married, 1 otherwise)
EDU = dummy variable for education (= 1 if the household head has a college education, 0 otherwise),
OCC = dummy variable for occupation (= 1 if household head is self-employed, salaried professional or technical worker, manager or administrator; 0 otherwise),

[2] Fifteen food items are included: cereals and bakery products, beef and veal, pork, other meats, poultry, fish and shellfish, eggs, dairy products, fruits, vegetables, sugar and sweets, fat and oil, non-alcoholic beverages, miscellaneous prepared food, and alcoholic beverages.

IND1 = dummy variable for the industry of the household head (= 1 if the household head works in agriculture, forestry, fishing, or mining; 0 otherwise),

IND3 = dummy variable (= 1 if the household head works in trade, service, or public administration; 0 otherwise),[3]

LOC = dummy variable for location (= 0 if the household is located in a SMSA, 1 otherwise),[4]

e_i = error term.

In this study, a linear relationship was initially hypothesized.[5] However, previous research suggests that a number of nonlinearities may exist in the expenditure relationship (2). Indeed, Buse and Salathe have found evidence that family size, income, race, and education affect the marginal propensity to spend on food. Thus, considering the impact of both income and bonus stamps on food expenditures, the variables FS.INC (where FS = N1 + N2 + N3 + N4 + N5 = family size), INC^2, INC.RACE, INC.EDU, FS.BON, INC.BON, BON.RACE, and BON.EDU are introduced in the model to account for such interactions. Further evidence of the interactions existing between bonus and income, and between bonus and family size can be found in Neenan and Davis. Also, following Buse and Salathe's findings, an interaction variable between family size and race (FS.RACE) is introduced in the model.

Price's results suggest that a change in food expenditures following a change in household size may not be independent of the size of the household because of economies of size. In order to account for such economies, the square of the family size (FS^2) is included as an additional explanatory variable in the model.[6] Also, Chavas has found evidence that interactions exist between income and location, and between location and family composition. For this reason, the variables INC.LOC, BON.LOC and Ni.LOC (i = 1 to 5) are added in the model specification. Although the model is probably misspecified because of the omission of interaction effects or sociodemographic variables that are likely to influence tastes and preferences,[7] it may provide a reasonable approximation to the Engel function for low income households.

THE DATA

The data utilized in this study come from the 1972–73 Consumer Expenditure Survey completed in June, 1974, by the Bureau of Labor Statistics (BLS). The survey contains information on food expenditures, income, and a number of sociodemographic characteristics of the households surveyed (Carlson). For the purpose of this study, low income respondents in the Southern region were selected for the analysis.[8] Although the South is not a homogeneous region, it provides a reasonable basis for the investigation of food expenditures patterns.

Data obtained from the diary survey were further processed before conducting the analysis. First, households identified by Buse as having data problems were eliminated from the data set. Second, since the survey was conducted during two consecutive weeks, the data on expenditures were averaged over the two weeks for the households that were surveyed during both weeks. Third, a criterion had to be defined in order to identify low income households. Since one of the objectives is to investigate the effects of the FSP, low income households are defined here as households eligible for food stamp . A family is assumed eligible for the FSP if, for a given family size, its gross income is less than the maximum gross income listed in Table 1. This maximum gross income is calculated by adding the total deduction to the maximum net income allowance that gave eligibility for food stamps in 1974.[9] Using this criterion, 659 families were selected from the diary survey. They represent the low income household sample that constitutes the basis for the analysis. Table 2 presents some summary statistics of this sample. It shows a participation rate in the FSP of about 18 percent. On the average, a participant household has a larger family size, a lower income, and spends more on food than a non-participant household.

ESTIMATION AND RESULTS

The error term in the econometric model (2) is assumed to be distributed with mean zero and covariance matrix

$$E[e_{it}\, e_{jt'}] = \begin{cases} 0 \text{ for } t \neq t' \\ \sigma_{ij} \text{ for } t = t' \end{cases}$$

[3] The industries are classified into three broad categories: Sector I (IND1): agriculture, forestry, fishing, or mining; Sector II: construction, manufacturing, transportation, communications, utilities, finance, insurance, real estate; Sector III (IND3): trade, service, public administration.

[4] A SMSA is a metropolitan area (population greater than 50,000).

[5] A logarithmic model was not used because variables such as family composition (Ni), food expenditures (Y_i), and bonus (BON) take the value zero for a number of households.

[6] This specification assumes that economies of family size are uniform across age categories. At the suggestion of a reviewer, this uniformity of economies of size was tested using an F test. The results suggest that economies of family size may differ across age categories for commodities such as fats and oil, prepared food and alcoholic beverages. Since these commodities do not constitute a major share of food expenditures and to limit the number of explanatory variables, the model presented here assumes uniformity of economies of size across age categories.

[7] For example, the model assumes that family size, rather than family composition, interacts with income or bonus. Although this specification restricts these interaction effects to be equal among different age groups, it was adopted here primarily to limit the number of explanatory variables in the model. Further research is needed to investigate whether or not these interactions vary among age groups.

[8] The Southern region includes the following states: Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Virginia, Maryland, West Virginia, Kentucky, and Tennessee.

[9] Total deductions and purchase requirement by gross income were obtained from: *Characteristics of Food Stamp Households, Sept. 1975,* Food and Nutrition Service, U.S.D.A. May 1976, FNS-160.

TABLE 1. Estimated Maximum Gross Income for F.S.P. Eligibility by Family Size

Family Size	Monthly Gross Income Limit
1	$ 347.39
2	516.66
3	698.09
4	859.03
5	932.25
6	955.04
7	1,111.40
8	1,250 & up

Source: Food Stamp Program U.S. Department of Agriculture (1973-1975) Food and Nutrition Service, Washington D.C. PA-1123

TABLE 2. Selected Statistics of the Sample Data for the Southern Region of the U.S.

Item	Participants	Non-Participants
Number of Households	118	541
Average Family Size	2.91	2.25
Average Income (cents/week)	5438	7653
Average Bonus (cents/week)	1432	——
Average Expenditure (cents/week)		
-Cereals and Bakery	352	227
-Beef and Veal	439	253
-Pork	421	258
-Other Meat	150	103
-Poultry	231	156
-Fish and Shellfish	82	70
-Eggs	136	88
-Dairy Products	332	237
-Fruits	150	119
-Vegetables	248	155
-Sugar and Sweets	80	70
-Fat and Oil	127	88
-Non-Alcoholic Bev.	227	152
-Prepared Food	168	145
-Alcoholic Bev.	52	90
Average Food Expenditures (cents/week)	3195	2209

Source: Diary Expenditure Survey, Bureau of Labor Statistics, 1973–74.

where e_{it} is the error term corresponding to the i^{th} commodity and the t^{th} household. Thus, for a particular household, the error terms are assumed correlated across commodities. Given this assumption, the model (2) is estimated by Seemingly Unrelated Regression (SUR)[10] for the 15 food items. Although a number of regression estimates exhibited low t-values, all variables were left in the model, even if they were not statistically significant. Indeed, model specification was based as much as possible on a-priori knowledge obtained from economic theory and previous research, with minimum use of "data dredging" (Wallace). The goodness of fit (R^2), as well as the variables that have a significant impact (at the 10-percent significance level) on the selected food expenditures, are presented in Table 3. The goodness-of-fit of the estimated equations varies from .05 to .33. These low R^2 are fairly typical of the analysis of cross-section micro-units because of the difficulty of explaining the differences in tastes among households (Hassan and Johnson).

Statistical tests conducted on the model show that income or bonus has a significant (at the 10-percent level) influence, either directly or through interactions with other variables, on the expenditures of most food items. The marginal propensity to spend (MPS), measuring the marginal impact on food expenditures of a change in income or bonus, can be estimated from the model. The MPS-income represents the change in household expenditures for a particular item, because of a change in family income ($\delta Y_i / \delta INC$). The MPS-bonus represents the specific effect of the participation in the food stamp program measuring, ceteris-paribus, the change in food expenditures following a change in the bonus value received by a household ($\delta Y_i / \delta BON$).[11] A number of the estimated coefficients of the interaction variables involving income or bonus are statistically significant (Table 3). For example, the income-bonus interaction effect is positive and significant at the 10-percent level for commodities such as cereals, beef and veal, pork, eggs, and fat and oil. It implies that the MPS-income is an increasing function of the bonus value received, or, alternatively, that the MPS-bonus is an increasing function of the family income for these food commodities. It suggests that the bonus food stamps are increasingly effective in raising expenditures on cereals, beef and veal, pork, eggs, and fat and oil as family income rises. When negative, the income-bonus interaction effect is not significantly different from zero.

[10] The linear model can be written as $Y_i = X \beta_i + e_i$; $i = 1,\dots,15$, where X is the matrix of explanatory variables and β_i is a column vector of parameters. Since the explanatory variables are the same in each equation, the 15 equation model can be alternatively expressed as (Theil, pp. 306–10) $Y = (I \otimes X)\beta + e$, where I is an identity matrix and $\otimes$ is the Kronecker product. Furthermore, $E(e\,e') = \sum \otimes I$ where $\sum = [\sigma_{ij}]$ is a (15×15) covariance matrix. The SUR estimation of β is (Theil, p. 310) $\hat{\beta} = \{I \otimes (X' X)^{-1} X'\}\, Y$. With covariance matrix $V(\hat{\beta}) = \sum \otimes X' X)^{-1}$ implying that SUR estimation gives the same parameters and same standard errors of the parameters as OLS estimation. Also, a linear combination of the parameters, denoted by $R\beta$, is estimated by $R\hat{\beta}$ with variance $V(R\hat{\beta}) = R\sum \otimes (X' X)^{-1} R'$. With an appropriate choice of the R matrix, the marginal impact of selected variables (such as income or bonus value) on food expenditures can be investigated.

[11] To illustrate, consider our model of the form $Y = b_0 + b_1\,BON + b_2\,INC.BON + b_3\,BON.RACE + b_4\,BON.EDU + b_5\,FS.BON + \dots$ The MPS-bonus is then $\delta Y/\delta BON = b_1 + b_2\,INC + b_3\,RACE + b_4\,EDU + b_5\,FS$. It measures the marginal impact of the Food Stamp bonus on food purchases when the influence of other variables such as income or family size are already taken into consideration. The marginal impacts of income or family size are obtained in a similar fashion.

TABLE 3. Selected Results from the Model

Commodities	R^2	Significant Variables And Corresponding Coefficient Signs For Selected Food Commodities[a]
Cereals and Bakery Products	.29	N1(+), N4(+), N5(+), IND3(-), INC.BON(+), BON.RACE(+)
Beef and Veal	.28	N5(+), LOC(+), INC.BON(+), BON.RACE(+), FS^2(+), N1.LOC(-), N2.LOC(+), FS.INC(-), INC^2(+), FS.BON(-)
Pork	.26	N1(+), N2(+), N3(+), N4(+), N5(+), MAR(+), EDU(+), INC.BON(+), INC.EDU(-), INC.RACE(-), FS.RACE(+), FS.INC(-), INC^2(+), FS.BON(-), BON.LOC(+)
Other Meat	.19	N5(+), OCC(-), IND3(+), N5.LOC(-), BON.LOC(+)
Poultry	.16	INC(+), INC.RACE(+), N2.LOC(+), INC^2(-)
Fish and Shellfish	.05	EDU(+), INC.EDU(-)
Eggs	.23	N1(+), N4(+), IND1(-), INC3(-), INC.BON(+), N3.LOC(+), N4.LOC(+), FS.RACE(-), INC.LOC(-), BON.LOC(+)
Dairy Products	.33	INC(+), MAR(-), OCC(-), IND3(-), BON.RACE(+), BON.EDU(-), FS.INC(+)
Fruits	.13	INC(+), N1(+), N3(+), N4(+), N5(+), IND3(-), BON.RACE(+), N3.LOC(-), N5.LOC(-), FS.RACE(-), FS.BON(-)
Vegetables	.26	N1(+), N2(+), N3(+), N4(+), N5(+), N2.LOC(-), N4.LOC(-), BON.LOC(+)
Sugar and Sweets	.12	INC(+), BON(+), N1(+), RACE(+), N3.LOC(+), N4.LOC(+), N5.LOC(+), INC.LOC(-)
Fat and Oil	.16	N5(+), MAR(-), INC.BON(+), BON.LOC(+)
Non-Alcoholic Beverages	.21	N1(+), N4(+), N5(+), BON.RACE(+), FS.RACE(-), BON.LOC(+)
Prepared Food	.17	INC(+), N3(+), RACE(+), OCC(-), INC.RACE(-)
Alcoholic Beverages	.06	N1(-), N2(-), N5(-), FS^2(+), FS.RACE(+), FS.INC(-)

[a] Significant at the 10-percent significance level.

Among the other interaction variables, the "bonus-race" and "bonus-location" variables, when significant, have positive estimated coefficients (Table 3). It implies that being black or living in non-metropolitan areas tends to increase the MPS-bonus and thus to improve the effectiveness of the program by increasing food expenditures on selected food items. Similarly, the "bonus-education," "income-education," and "income-location" variables, when significant, have negative estimated coefficients.[12] It follows that college education tends to decrease both MPS-income and MPS-bonus, while a location in a non-metropolitan area tends to decrease MPS-income (compared to a metropolitan area). Thus, college education of the household head may be expected to lower the effectiveness of the FSP. Also, the coefficients of the INC^2 variable for beef and veal, and pork are significant and positive, implying that MPS-income is an increasing function of income for these commodities. Except for poultry, which exhibited a negative and significant coefficient for INC^2, there is no strong evidence that MPS-income may decrease with income. This suggests that, as income rises, the decline in MPS-income reported in previous studies (Buse and Salathe; West and Price) may occur for income levels beyond those of our low income sample for most food items.

Evaluated at mean-values, the MPS-income, MPS-bonus, and corresponding income elasticities are presented in Table 4 for households with a non-black household head, without college education, and located in a metropolitan area.[13] The marginal propensity to spend on total food is also computed in Table 4 as the sum of the MPS for each food commodity. The estimates show that, except for "fat and oil" and "alcoholic beverages",[14] all food commodities are normal goods (income elasticity between 0 and 1). The income elasticity of total food is .383. Given that one may expect the income elasticity of food commodities to be somewhat higher for low income households, compared to high income households (Hymans and Shapiro), these results compare favorably with previous research (George and King; Buse and Salathe). The results relative to MPS-income and MPS-bonus obtained in terms of total food expenditures are summarized in Table 5. They suggest that MPS-bonus tends to be much larger than MPS-income. For example, MPS-bonus and MPS-income for total food expenditures are .370 and .126, respectively, for a family with a non-black household head without college education, and located in metropolitan areas. The results appear to be mutually reinforcing because they compare favorably with those obtained from previous stud-

[12] Although the number of households with college-educated head is rather small in the sample (70 households among which only 6 households participate in FSP), college education has a significant influence on the consumption of a number of food items.

[13] We selected the group of households with non-black family head without college education, and located in a metropolitan area, to illustrate the marginal impact of income and bonus on the expenditures of the 15 food items (Table 4), because it constitutes the largest group in our sample (195 families out of 659) and thus may provide more meaningful comparisons with previous research (e.g., George and King).

[14] "Fats and oil" is found to be an inferior good, although its negative income elasticity is not significantly different from zero. The income elasticity of "alcoholic beverages" is estimated to be greater than one.

TABLE 4. Marginal Propensity to Spend (MPS) for Households with a Non-Black Family Head without College Education and Located in Metropolitan Areas (LOC=RACE=EDU=O)[a]

Commodities	MPS Income[b/]	Income Elasticity	MPS Bonus[b/]
Cereals and Bakery	.0124 (.0050)	.3623	.0803 (.0285)
Beef and Veal	.0014 (.0084)	.2890	.0542 (.0479)
Pork	.0148 (.0082)	.3743	.0520 (.0465)
Other Meat	.0054 (.0043)	.3496	-.0083 (.0243)
Poultry	.0059 (.0057)	.2531	.0334 (.0324)
Fish and Shellfish	.0066 (.0050)	.6713	-.0166 (.0283)
Eggs	.0047 (.0026)	.3592	.0131 (.0150)
Dairy Products	.0140 (.0053)	.4019	.0504 (.0302)
Fruits	.0056 (.0034)	.3298	-.0024 (.0195)
Vegetables	.0023 (.0039)	.0985	.0274 (.0222)
Sugar and Sweets	.0090 (.0024)	.9148	.0185 (.0138)
Fat and Oil	-.0010 (.0035)	-.0784	.0256 (.0201)
Non-Alcoholic Bev.	.0074 (.0043)	.3238	.0077 (.0243)
Prepared Food	.0111 (.0043)	.5400	.0219 (.0248)
Alcoholic Bev.	.0161 (.0068)	1.3781	.0132 (.0385)
Total Food[c/]	.1259 (.0357)	.3829	.3704 (.2037)

[a] The MPS and income elasticities are evaluated at the mean values: Family Size = 2.37; Income = 7253 cents/week; Bonus = 255 cents/week.
[b] Standard errors are in parentheses below the corresponding estimates. They are computed as discussed in footnote 10.
[c] The estimates for total food are computed from the estimates of the 15 food items.

ies (Hymans and Shapiro; Neenan and Davis; West and Price; West). For instance, in agreement with Hymans and Shapiro's results, ceteris paribus, a dollar increase in bonus stamps increases total food expenditures less in a SMSA (LOC = 0) than outside a SMSA (LOC = 1).

These results also provide some new evidence on the effects of the FSP on food purchases. First, Table 5 shows that the FSP is most effective in increasing total food expenditures for black families without college education, and living in non-metropolitan areas; it is least effective for non-black families with college education, and living in metropolitan areas. This is not surprising because low income households outside of SMSA and headed by a black without college education may be expected to have very few alternatives to deal with poverty and thus appear to be more responsive to a welfare program. Second, Table 4 provides some evidence about the selectivity of the FSP as it influences the consumption pattern of a number of food items. For example, when RACE=EDU=LOC=0, participation in the FSP sharply increases expenditures on cereals and bakery products, beef and veal, pork, and dairy products. From Table 4, ceteris paribus, a one-dollar increase in bonus increases expenditures on these four commodities by 8 cents, 5.4 cents, 5.2 cents, and 5 cents, respectively. The sum of these four numbers, 23.6 cents, represents abut 64 percent of the impact on total food expenditures (37 cents). Our results show that MPS-bonus is positive for most food items as long as it concerns families with a household head who does not have college education. This suggests that the FSP stimulates the purchase of most food commodities. While this is insufficient to assess the nutritional effectiveness of the FSP, it does provide some information concerning the composition of the food market basket purchased by participating households.

TABLE 5. Marginal Propensities to Spend (MPS) on Total Food with Respect to Income and Bonus[ab]

MPS	Non-Black		Black	
	No College Education	College Education	No College Education	College Education
MPS Income				
In SMSA	.1258 (.0357)	.1127 (.0483)	.0818 (.0494)	.0687 (.0636)
Outside SMSA	.0864 (.0431)	.0732 (.0547)	.0424 (.0504)	.0292 (.0651)
MPS bonus				
In SMSA	.3704 (.2037)	-.4201 (.6211)	.9659 (.2145)	.1754 (.6301)
Outside SMSA	.7556 (.2732)	-.0350 (.6571)	1.3511 (.2588)	.5605 (.6563)

[a] Evaluated at the sample mean values.
[b] Standard errors are in parentheses below the corresponding estimates. They are computed as discussed in footnote 10.

The estimates of Table 3 suggest that family composition has a strong influence on food purchases. Statistical tests (at the 10-percent level of significance) indicate that family composition has a significant effect on the expenditures of most food items through the variables FS, Ni, or their interaction with other variables. For example, commodities such as cereals and bakery products, pork, eggs, sugar and sweets, and nonalcoholic beverages are typical of children's diet. Indeed, adding one person less than 15 years of age to a household increases significantly the family expenditures for these commodities. Similarly, people older than 65 years of age appear to consider products such as cereals and bakery products, pork, vegetables, and fat and oil as part of their diet, because they have a positive and significant impact on the household expenditures for these food items. Also, the influence of family composition is different between the two locations for commodities such as beef and veal, poultry products, eggs, fruits, vegetables, and sugar and sweets. For example, persons above 25 years of age have a significantly (at the 10-percent level) stronger influence on sugar and sweets purchases in non-metropolitan areas than in metropolitan areas. This probably results from a relative preference for low calorie food by people living in a SMSA, compared to people living outside of a SMSA.

The marginal impact of a given household member on the expenditures for a particular food commodity ($\delta Y_i/\delta N_j$) can be computed from the estimated regressions. Evaluated at mean values, these marginal impacts are presented in Table 6 for non-black families. They represent the change in food expenditures associated with a change in family composition. For example, for a non-black family located in a metropolitan area, adding one person between 45 and 65 years of age increases pork expenditures by $1.81 per week. The results in Table 6 exhibit some of the same characteristics uncovered by Price, Buse and Salathe, and Huang and Raunikar. For example, from Table 6, it appears that children are relatively high consumers of milk, and cereals and bakery products (Price; Buse and Salathe). Table 6 presents also the influence of adding a particular person to a household on total food expenditures ($\delta Y_i/\delta N_j$). It shows that, in agreement with results from previous research, a child has less impact on total food expenditures than an adult.

However, our results suggest some new evidence on the influence of family composition on food purchase. First, for a number of food items, this influence was found to vary significantly depending on the location of the household. For example, partly because an elderly person (more than 65 years old) has less influence on purchases of beef and veal, other meat, fruits and vegeta-

TABLE 6. Marginal Impact of a Change in Family Composition on Expenditures of Selected Food Items ($\partial Y_i/\partial N_j$)[ab]

Commodities	Non-Black in SMSA N1	N2	N3	N4	N5	Non-Black Outside SMSA N1	N2	N3	N4	N5
Cereals and Bakery	54.96	18.42	43.49	62.86	85.44	63.19	41.00	56.55	67.03	95.32
	(16.75)	(23.03)	(29.10)	(25.22)	(26.45)	(21.89)	(24.33)	(30.79)	(27.35)	(29.66)
Beef and Veal	53.18	-2.32	95.39	94.44	128.35	-32.92	92.09	134.04	28.18	38.58
	(28.11)	(38.65)	(48.84)	(42.33)	(44.40)	(36.75)	(40.83)	(51.68)	(45.91)	(49.78)
Pork	73.73	70.37	122.31	180.57	120.84	48.43	66.74	165.43	207.43	180.85
	(27.34)	(37.60)	(47.51)	(41.17)	(43.19)	(35.74)	(39.72)	(50.27)	(44.66)	(48.42)
Other Meat	14.02	39.87	26.38	35.15	56.01	1.85	18.34	40.56	36.12	7.97
	(14.25)	(19.60)	(24.77)	(21.46)	(22.51)	(18.63)	(20.70)	(26.20)	(23.28)	(25.24)
Poultry	-9.63	9.04	44.62	38.70	59.82	-6.26	65.76	65.59	59.61	49.94
	(19.05)	(26.21)	(33.12)	(28.70)	(30.10)	(24.91)	(27.68)	(35.04)	(31.13)	(33.75)
Fish and Shellfish	-10.97	7.09	33.07	26.65	-4.07	9.68	-6.38	5.78	8.46	13.53
	(16.63	(22.87)	(28.89)	(25.04)	(26.26)	(21.74)	(24.15)	(30.57)	(29.16)	(29.45)
Eggs	32.62	14.97	17.86	31.57	23.35	29.34	29.18	71.88	59.28	44.10
	(8.81)	(12.12)	(15.32)	(13.27)	(13.92)	(11.52)	(12.81)	(16.21)	(14.40)	(15.61)
Dairy Products	54.19	-2.82	85.59	7.76	62.05	56.52	29.92	42.01	48.26	34.82
	(17.76)	(24.43)	(30.87)	(26.75)	(28.06)	(23.22)	(25.81)	(32.67)	(29.02)	(31.46)
Fruits	37.76	21.61	37.01	34.99	68.34	32.91	7.29	-7.31	22.69	16.38
	(11.43)	(15.72)	(19.86)	(17.21)	(18.06)	(14.94)	(16.60)	(21.02)	(18.67)	(20.24)
Vegetables	47.67	68.65	97.73	113.40	106.13	25.33	16.65	53.61	54.01	64.65
	(13.04)	(17.93)	(22.66)	(19.63)	(20.60)	(17.05)	(18.94)	(23.97)	(21.30)	(23.09)
Sugar and Sweets	20.56	-15.98	-25.30	.91	-3.53	19.29	-5.16	14.42	29.63	27.23
	(8.10)	(11.14)	(14.08)	(12.20)	(12.80)	(10.59)	(11.77)	(14.89)	(13.23)	(14.35)
Fats and Oil	7.37	7.64	37.55	36.68	60.87	-2.03	14.77	41.51	47.04	43.68
	(11.83)	(16.27)	(20.56)	(17.82)	(18.69)	(15.47)	(17.19)	(21.76)	(19.33)	(20.96)
Non-Alcoholic Bev.	49.14	37.93	46.17	63.61	64.50	39.95	16.70	85.83	54.49	42.86
	(14.26)	(19.61)	(24.78)	(21.47)	(22.52)	(18.64)	(20.71)	(26.22)	(23.29)	(25.25)
Prepared Food	23.74	29.03	50.88	13.16	18.98	36.17	34.79	11.41	16.07	25.13
	(14.54)	(20.00)	(25.27)	(21.90)	(22.97)	(19.01)	(21.13)	(26.74)	(23.75)	(25.75)
Alcoholic Bev.	-54.09	-87.43	-38.48	-35.10	-99.16	-94.25	-85.28	-.13	-56.82	-93.35
	(22.64)	(31.14)	(39.35)	(34.09)	(35.77)	(29.60)	(32.89)	(41.63)	(36.98)	(40.10)
Total Food[c/]	394.26	216.08	674.28	705.40	747.94	227.22	336.43	791.20	681.50	591.72
	(119.62)	(164.50)	(207.89)	(180.13)	(188.97)	(156.39)	(173.77)	(219.96)	(195.39)	(211.85)

[a] Evaluated at the sample mean values.
[b] Standard errors are in parentheses below the corresponding estimates. They are computed as discussed in footnote 10.
[c] The estimates for "Total Food" are computed from the estimates of the 15 food items.

bles in non-metropolitan areas than in metropolitan areas, his impact on total food expenditures is lower in nonmetropolitan areas ($5.92/week) than in metropolitan areas ($7.48/week). Second, at least in metropolitan areas, our results do not show any evidence that elderly people increase household food expenditures less than their younger counterparts. The fact that this does not corroborate results obtained by Buse and Salathe suggests that this characteristic may be specific to low income households. Third, Table 6 shows the influence of the age structure of a family on the purchase of different items. It suggests that adding one person of any age to a household tends to reduce the purchase of alcoholic beverages, particularly for non-black families living in metropolitan areas. It also shows that expenditures on pork increase sharply as family size increases, especially if adults of more than 25 years of age are included in the family. Finally, our results indicate that race of the household head has a significant influence on the marginal impact of a change in family size on expenditures for pork, eggs, and non-alcoholic beverages; for black families, the marginal impact is larger for pork, but smaller for eggs and non-alcoholic beverages (compared to non-black families) (see Table 3).

The coefficients of the variable FS^2 are positive and significant for beef and veal and alcoholic beverages, implying that expenditures on these food items increase at an increasing rate with family size (Table 3). However, the estimated coefficients of FS^2, when negative, are not significantly different from zero. Thus, our results do not provide significant evidence that economies of size exist.[15] The fact that this finding does not corroborate previous research (Price; West and Price; Buse and Salathe) suggests that it may be specific to low income households. This is not a surprising result if the explanation for economies of size lies in large quantity purchasing and less food waste by larger families, since many low income families may not have the cash flow nor the storage capabilities to buy food in large quantity and may be more waste conscious than high income households.

The remaining variables in the model yield the following results (Table 3). For the commodities selected from the diary survey, the influence of housing tenure on the pattern of food purchase is not statistically significant. This suggests that wealth may not significantly influence the food consumption behavior of low income households. Also, except for sugar and sweets, and prepared food, the estimated coefficients of the variable "RACE" are not significant. Thus, race appears to influence consumption patterns of a number of food items mainly through its interaction with other variables such as bonus, income, or family size. The variable "marital status" shows that a family with an unmarried household head purchases significantly more pork, but less dairy products, and fat and oil than a family with a married head. Finally, the variables OCC, IND1, or IND3, representing the role of the household head in the productive economy, appear to have significant influences on the expenditures for cereals and bakery products, other meats, eggs, dairy products, fruits, and prepared food.

CONCLUSION

This study investigated the impact of the FSP and selected socio-economic variables on low income families in the Southern region of the United States. The consumption behavior of 15 food items was analyzed by estimating an econometric model using the 1973–74 BLS household expenditure survey. The results of the analysis, although not conclusive, suggest that variables such as race of the family head and location of the household may have a profound effect on the effectiveness of the FSP in terms of increasing food purchases. For example, it was found that the FSP is most effective on black families living outside a SMSA with a household head who does not have a college education. It was also found that, except when the household head had college education, the bonus value tends to increase family expenditures for most food items, and particularly so for cereals and bakery products, beef and veal, pork, and dairy products. These elements indicate that the FSP may be a fairly effective welfare program against poverty. However, they also raise questions concerning the eligibility of a college-educated household head for participating in the program, because college education tends to lower significantly the effectiveness of the FSP.

The results of the analysis also provide some evidence on the effects of family composition on food expenditure patterns for low income households. While some results were consistent with findings obtained in previous research, others were not. For instance, we did not find evidence of economies of family size for food expenditures. This suggests that consumption behavior of low income households may differ from the consumption behavior of high income households. More research is needed to investigate further the influence of a number of sociodemographic variables on food purchase behavior of low income families.

[15] Economies of size exists when average food expenditures per person is a decreasing function of the household size. Given our model specification of the form $Y = b_0 + b_1 FS + b_2 FS^2 + \ldots$, and considering $Y = 0$ when $FS = 0$, it follows that economies of size occur if and only if the coefficient of the variable FS^2 is negative.

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