Food Stamp Program Participation: An Exploratory Analysis

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This article addresses the questions of who, among eligible low-income consumers, participates in the Food Stamp Program and which variables are influential in determining whether eligible persons will participate. Variables found to be statistically significant in the probit analysis were the number of adult equivalents in the household, the number of persons 65 or older in the household, whether the household head had more than a high school education, whether the household owned a home, whether the household resided in Ohio, whether the household head was employed, whether the household had only unearned income, whether the household did not have any income either earned or unearned, whether the household received public assistance, the monthly household income, whether the respondent was Mexican-American, and lastly, in two of the three equations estimated, whether the respondent was Black. The value of the Food Stamp allotment was not significant. Further investigation using appropriately measured theoretical components to estimate the extent to which command over market goods and services and nonmarket social consequences for households enter into the Food Stamp Program participation decision is indicated.

This paper addresses the questions of who, among eligible low-income consumers, participates in the Food Stamp Program (FSP) and which variables are influential in determining whether eligible persons will participate. The total number of FSP participants would be higher if eligibility had not been restricted in the Food and Agriculture Acts of 1977 and 1981, but, even among those who remain eligible, only a fraction participate. National estimates of the proportion of eligibles who participate cannot be definitive, since the number of eligibles has not been precisely determined, but the available estimates suggest a participation rate of 68 percent or less for 1981 (USDA, 1981). The FSP is the program of last resort for many low-income households that do not qualify for other programs, such as those for the aged, disabled, or destitute parents of dependent children. Thus, understanding participation in the FSP is an essential part of understanding how economic welfare is shared among segments of the population and over time in the U.S. economy.

At the aggregate level and in a historical sense, variables that have been associated with participation in the FSP have been identified by Claffey, Matsumoto, and Stucker. Using monthly data for the 1964–77 period, they found that the unemployment rate, the consumer price index for food, disposable income per capita, and a trend variable all were highly statistically significant in regression and together explained 99 percent of the variation in participation. Since the period studied by Claffey, Matsumoto, and Stucker, the removal of the purchase re-

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quirement (EPR) in the Food and Agriculture Act of 1977 (effective before June 1979 in all states) further increased participation in the FSP. The purchase requirement had been found to be a major constraint on participation (Rungeling and Smith; Scearce *et al.*; Epperson *et al.*; Greenleigh Associates; Love; USDA 1967).

Knowing the association of participation with program parameters and population characteristics may be especially important if the states are given more control of the FSP, as is being considered at the federal level. If nutrition programs are funded by block grants to states, as is currently the case in Puerto Rico (Congressional Quarterly, p. 1489), states will need to design programs that are responsive to the sociodemographic characteristics of their populations.

An explicit model of the household's participation decision is developed in the next section of this paper. In the following, or third, section of the paper the data used in the study and the empirical specification are described. The findings and a summary and conclusions are contained in the fourth section.

A Model of the Food Stamp Participation Decision

The eligible household is hypothesized to maximize a utility function,

$$u = U(G, F + S, Q, X) \tag{1}$$

where F is food bought with cash, S is food bought with stamps, G is a Hicksian composite of all other goods, Q is a composite representing the household's status and privacy, and X is a vector of household characteristics such as the age and sex of household members. Utility is maximized subject to constraints,

$$P_g G + P_f F \leq Y, \tag{2}$$

$$P_f S \leq A, \text{ and} \tag{3}$$

$$Q = Q(S, X, p). \tag{4}$$

Of these, (2) is the money income constraint with prices P_g and P_f and income Y, (3) is the stamp allotment constraint with total allotment A, and the production of household status and privacy (the opposite of stigma) is carried on according to $Q_S \leq 0$.[1] Variable p is zero if the household does not participate in the food stamp program and one if it does. The function Q is such that $Q(S, X, p = 1) \leq Q(S, X, p = 0)$; i.e., the household may be stigmatized by participating in the food stamp program, regardless of how much food it buys with the stamps. The effect of participation on utility through the variable p is any lump-sum effect of the certification process for eligibility and the acquisition and use of stamps as it lowers the status and invades the privacy of the household. The derivative Q_S represents any marginal stigma that is associated with using stamps, that stigma perhaps increasing as more food is bought with stamps.

The Lagrangian function for the utility-maximization problem is

$$\begin{aligned} L = {} & U(G, F + S, Q, X) \\ & - t_1(P_g G + P_f F - Y) \\ & - t_2(P_f S - A) \end{aligned} \tag{5}$$

where constraint (4) has been incorporated into the objective function. The first-order conditions for utility maximization are

$$U_G - t_1 P_g \leq 0, G \geq 0, \tag{6}$$

$$U_F - t_1 P_f \leq 0, F \geq 0, \tag{7}$$

$$U_S + U_Q Q_S - t_2 P_f \leq 0, S \geq 0, \tag{8}$$

$$P_g G + P_f F - Y \leq 0, t_1 \geq 0, \text{ and} \tag{9}$$

$$P_f S - A \leq 0, t_2 \geq 0. \tag{10}$$

We assume nonsatiety and an interior solution, such that $G > 0$ and $F + S > 0$. From (8), it is possible that the household may not use all of its stamps if the marginal utility of food is fully offset by the

[1] Subscripts are used to denote partial derivatives, except for prices.

marginal disutility of lost status and privacy (stigma) before the allotment is exhausted. It seems likely, however, that the marginal stigma effect of stamp use will be negligible. The stigma that is felt from using stamps is likely to increase little simply because the number of stamps used is larger, given that there is no necessary relationship between the number of stamps used and the number of times stamps are used. Stigma is more likely to increase with the number of shopping trips on which stamps are used, and that sort of increase can be avoided by using stamps infrequently to "stock up" on nonperishables.[2] Hence, in the remainder of this paper we assume that the stamp allotment is exhausted.

To determine whether to participate in the program, the household compares its maximum utility when participating with its maximum utility of not participating. The conventional way to represent the maximum utility attainable is the indirect utility function. Assuming that (6), (7), and (8) hold as equalities, along with the constraints they may be solved simultaneously to obtain demand functions

$$G(*) = G(P_g, P_f, Y, A, X), \quad (11)$$

$$F(*) = F(P_g, P_f, Y, A, X), \text{ and} \quad (12)$$

$$S(*) = S(P_g, P_f, Y, A, X). \quad (13)$$

Since we assume that the allotment is exhausted, (3) gives the identity

$$S = A/P_f. \quad (14)$$

The solution of the first-order conditions simultaneously yields functions for the Lagrange multipliers, $t_1(*)$ and $t_2(*)$. The indirect utility function can be obtained by substituting the demand functions into (1) or by substituting the demand functions and $t_1(*)$ and $t_2(*)$ into (5). These are equivalent, since the constraints are identically zero in the Lagrangian function. The indirect utility function is denoted

$$u = V(P_g, P_f, Y, A, X, p). \quad (15)$$

The household's participation decision may be represented by the difference between the value of the indirect utility function when participating and when not participating. When the household does not participate, $A = 0$ and $p = 0$, so that the participation decision is described by

$$D = V(P_g, P_f, Y, A, X, p = 1) - V(P_g, P_f, Y, 0, X, p = 0) \quad (16)$$

where $D \geq 0$ implies the household will participate and $D < 0$ implies nonparticipation.[3] The comparative-static responses of participation to income and the stamp allotment can be obtained from the partial derivatives of (16). For the allotment (by the envelope theorem) $D_A = t_2(*) > 0$. An increase in the allotment, *ceteris paribus*, will increase participation.

In general, the comparative-static response with respect to income, D_Y, cannot be signed. An additional hypothesis, which we invoke in the empirical section, is sufficient to sign D_Y. Suppose that the utility function is additively separable in market goods (G and F + S), nonmarket status and privacy effects, and household characteristics unrelated to status or privacy. Furthermore, suppose that food stamps are equivalent to a cash transfer in the market goods component of utility. These conditions, along with the hypothesis of negligible marginal stigma effects from stamps are sufficient to give (16) the more specific form,

$$D = V^1(y, P_f, P_g, X) + V^2(X, p = 1) - V^1(Y, P_f, P_g, X) - V^2(X, p = 0) \quad (17)$$

where $y = Y + A$. If the marginal utility of income in the market goods component

[2] The ability to use stamps only for nonperishables will be diminished to the extent that stamps are a large part of household food expenditures.

[3] We arbitrarily allocate the case of $D = 0$ to participation.

is diminishing, $D_Y = V^1_Y(y) - V^1_Y(Y) < 0$, since $y > Y$. That is, a higher income level will be associated with less participation.

In addition to differences in the stamp allotment or income, differences in household characteristics that are peculiarly related to status or privacy are of interest. Let X_i be a variable reflecting the "social sensitivity" of the household, and let X_i appear only in Q. If $X_i' > X_i$, and

$$Q(0, X_i', p = 0) - Q(A/P_f, X_i', p = 1) > Q(0, X_i, p = 0) - Q(A/P_f, X_i, p = 1) > 0,$$

the comparative static response to a greater value of X_i will be negative. That is, the condition above characterizes a variable such that the loss of status or privacy from participating in the FSP is greater when the household has a higher value of the variable. For instance, if the household is from a background of relatively high socioeconomic standing, participating in the FSP may do relatively great harm to household status. In this case, X_i would represent social status of the household head's background. On the other hand, if the household resides in a neighborhood where welfare program participation is the norm, the household may feel little loss of prestige or invasion of privacy in participating. In the second case, X_i could represent the proportion of households in the neighborhood that do not participate in welfare programs.

Specification of Empirical Analysis

Previous studies identifying factors which explain participation in the FSP using cross-section data have, for the most part, focused on particular relatively small localities and used pre-EPR data (Control Systems Research; Love; Lane 1978; Mara; Scearce *et al.*; Rungeling and Smith; MacDonald; Epperson *et al.*). This study was based on survey data from four states. Eight hundred ninety-six eligible households were interviewed between July 1979 and May 1980, i.e., a period sufficiently after EPR in each state for the data to reflect behavior adjusted to the revised incentives for participation.

In each participating state a random selection was made of one metropolitan and one nonmetropolitan county (counties were grouped if one county was not populous enough to be expected to yield 100 households usable in the sample). Within each chosen county, a list was made of those census tracts or census county divisions with a 1970 percentage of households in poverty greater than or equal to the median percentage for counties of the state. Thus, tracts or county divisions with a relatively high incidence of poverty were identified, although the definition of high incidence could vary among states. This was done to reduce the cost of finding eligible households. A list of blocks (in tracts) or enumeration districts (in county divisions) was made for the metropolitan county poverty areas and another list for the nonmetropolitan county poverty areas. From these lists systematic random samples of blocks or enumeration districts were selected. Within the chosen blocks or districts, an attempt was made to screen all households for eligibility and to obtain interviews with all eligible households. The questionnaire used for the National Food Consumption Survey of 1977, which contained a section to determine FSP eligibility, was adapted for the screening (USDA, OMB). Sampling and interviewing procedures used are described in detail elsewhere (Lane and Kushman, 1981).

Five hundred thirteen of the interviewed households indicated they participated in the FSP during the last year before the interview. If the last year is taken as the frame of reference, then the sample participation rate was about 57 percent. This rate is in the range generally found for participation, although reported rates differ according to the definition of par-

ticipation.[4] Six hundred seventy-two questionnaires contained valid answers to all of the questions used in the analysis. After selecting only the subsample with valid responses to all relevant questions, and defining participants as those receiving stamps in the month of interview, the resulting participation rate was about 43 percent. It may be that the process of selecting only respondents with valid answers to all relevant questions acted to omit participants more than nonparticipants, but an extensive review of the frequencies with which individual variables would have resulted in exclusions revealed no pattern of bias in the reduction of the sample. It is not known to what extent the exclusion process may have biased the sample used in the analysis and the resulting parameter estimates.

The sample selection process and the reduction of the sample to its usable portion will limit somewhat the generalizability of the results reported below. Nonetheless, the data are reasonably numerous, drawn from areas in which the FSP has a relatively important impact on the population, and reflect household behavior post-EPR.

The statistical technique used to explain participation is based on the approach to binary choice developed by McFadden. The general model of binary choice is

$$P_n = F[B'(Z_{1n} - Z_{2n})]. \qquad (18)$$

P_n is the probability that alternative one will be chosen in observation n. In this study it is the probability that the nth household will participate in the FSP. F is any cumulative distribution function on the real line. A vector of K coefficients is represented by B, and the Z's represent K-vectors containing data for observation n. Data describing participation for household n are in Z_{1n}. Data describing the situation for household n if it did not participate are in Z_{2n}. The Z's can be available measurements of the attributes associated with each participation status or transformations of those measurements.

For the empirical analysis in this study, we adopt the hypothesis that the indirect utility function is additively separable, that stamps are cash equivalent in the utility of market goods, and that there are negligible marginal status and/or privacy effects connected with the number of stamps used or the amount of food bought with stamps. As a consequence of additive separability and cash equivalence in market goods, the participation equation takes the general form of (17) above.

It is assumed that F in (18) is the cumulative normal density, and, in agreement with the McFadden formulation, the participation equation is assumed to be linear in parameters. Together, these assumptions imply Probit estimation of the participation equation.[5]

Variables considered for the estimation process are those implied by the indirect utility function, and they fall into three general groups. First, household characteristics that have no apparent connection to the utility of market goods or to social sensitivity do not appear in the participation equation. Second, variables related to the household's total command over market goods and services when participating and when not participating in the program appear in V^1 or market goods components. Third and last, variables that are associated with the different social sensitivity levels of households appear in

[4] The participation rate will be greater, the longer the time period considered and if eligibles are required only to be certified, not necessarily to receive stamps, to be considered participants.

[5] An alternative derivation of the probit model is presented in Domenich and McFadden. Their derivation is based on random sampling from consumers whose indirect utility functions differ from a "representative" function by idiosyncratic error terms. Neither the estimation procedure nor the intuitive content of the model is changed by this more elaborate derivation.

the V^2 components. Below, the variables that were used in exploratory estimates of the participation equation are listed, and each variable is discussed briefly.

Monthly household income from all sources (excluding the value of stamps) should have a negative relationship to the probability of participation in the FSP. First, the negative relationship is implied by the diminishing marginal utility of income in market goods. Second, in a cross-sectional sample, higher income individuals are likely to have social backgrounds and to live in neighborhoods that create and reinforce greater perceived loss of status from participating in any welfare program.

The theoretical content of income, Y in the model, includes the money equivalents of any in-kind flows of services from assets. A dummy variable was assigned the value one if the household owned its residence and zero otherwise. A second dummy variable was one if the household had nonpurchased food available and zero otherwise. The most obvious effect of these in-kind flows of housing services and food would be to reduce participation through the diminishing marginal utility of income. In the context of cross-sectional data, however, there are subtle differences in the possible influences of these variables. Ownership of a home would undoubtedly produce an in-kind flow of housing services, but it also may represent a mortgage obligation that restricts the flexibility with which income may be used and reduces the effective value of money income.[6] Nonetheless, a priori judgment suggests a negative effect for home ownership.

The dummy variable for nonpurchased food is not subject to the same caveats as home ownership, since nonpurchased food is subject to essentially free disposal and will not be a net burden. This dummy variable may have a negative sign in the participation equation. The theoretical model implicitly assumes a standard household in terms of the number, ages, and sexes of household members. Across the sample, however, the number of people in the household and the age and sex of each will affect the income necessary to sustain a given standard of living or, in terms of the dual to the "cost of living," to achieve a given value of the indirect utility function underlying the participation equation. The formulation of the participation decision above, particularly the hypothesis that stamps are cash equivalent in market goods, makes it clear that income should be standardized for the effects of numbers, ages, and sexes on purchasing power for all goods and services. Such standardization is prevented by the lack of exogenous appropriate weights for ages and sexes and by the lack of any means to aggregate money and in-kind income components. An alternative procedure would be to enter separate variables for the numbers of household members in each of many age/sex categories. This lat-

[6] This may be especially a concern in a sample of households with current incomes so low that, if incomes always had been at these levels, home ownership would be unusual. That is, there may be some tendency in a cross sectional sample of food stamp eligibles for home ownership to correspond to households whose incomes are at lower levels than previously and who are attempting to "hold on" to their principal asset until better times. Excluding homes from the assets counted in determining eligibility for the FSP may have, as part of its rationale, facilitating households weathering temporary setbacks without parting with an economically and psychologically important asset. Temporarily, home ownership may be a net burden in meeting current expenses. Likewise, in a cross section of FSP eligibles, home owners may tend to be households for which low incomes represent a new or temporary state and who are relatively sensitive to the status and privacy effects of FSP participation. The net relationship of home ownership to FSP participation is ambiguous in general. If, however, mortgage payments are typically no larger than rent payments would otherwise be in the sample (or less for elderly eligibles who own homes outright), home ownership would be expected to have a negative association with the probability of participation.

ter alternative would introduce a large number of variables into the model. As a compromise, the number of adult equivalents for food was used as a variable, although food is a narrower category of consumption than is general purchasing power.[7] The probability of participation should be related positively to the number of adult equivalents through the marginal utility of stamp income.

Long periods between income payments may lead to waste and an effective reduction in income for families with poor money management skills. The number of weeks between income payments was entered as a variable with a potentially positive coefficient arising from the diminishing marginal utility of income.

Variables also were included to capture income expectations. That is, the formal model presented above implies no particular planning horizon, and the usual questions about current income versus permanent income (or some combination of these) are relevant. Employment status may be related to income expectations. Voluntary unemployment of the household head was the modal case in the sample, and deviations from it were represented by dummy variables. The first variable was one if the household head was employed and zero otherwise. A second variable was one if the household head was involuntarily unemployed and zero otherwise.

The employment variables reflect only the status of the household head, but other potential earners also may be present. Two more inclusive variables were defined according to the type of income received by the household. A dummy variable was one if no household member was employed. Another dummy variable was one if the household reported no earned or unearned money income. These households apparently were receiving only in-kind transfers insofar as the survey could determine. The type-of-income variables were included for completeness, although the latter corresponds to very few cases and any findings must be regarded as very tentative. The excluded group contained 118 households in which the head did not work but another member had earned income.[8]

A recent decrease in household income could trigger a negative reassessment of income expectations and induce a greater probability of participation in the FSP. The amount of any decrease between the last current year's incomes squared was entered as a variable based on the hypothesis that the effect of a decrease would be more than proportionately related to its size.

The value of the FSP allotment will be positively related to participation. The value of the allotment was taken from the survey data for households participating in the month of interview and imputed using the screening data and the FSP regulations for other households.

Distance from the nearest FSP office was entered as a cost of acquiring stamps and, therefore, an effective reduction in the value of the allotment received. The probability of participation may decrease with distance.

Education of the household head was represented in the participation equation by a dummy variable equal one for no

[7] An adult equivalent is a proportionate measure based on food intake by age and sex. The standard is a male 20 to 54 years old (Peterkin and Kerr).

[8] Of the 100 percent of households in the sample, the household head is employed in 37.64 percent, so that these households must have earned income. Another 43.54 percent have unearned income only or no earned or unearned income, so that they cannot contain earners. This leaves 18.82 percent or 118 households in which the head does not work but someone other than the head earns income. The distribution of the 118 households according to whether the head is in the labor force is unknown. The linear specification of the model implies the same effect of the employment and income variables on the value of B'Z regardless of the labor force status of the household head.

more than grammar school and a second dummy variable equal one if the head had some vocational training or college after graduating from high school. Those who had attended or completed high school were the excluded group.

In nearly all studies of household behavior (for instance, those of labor market participation), education has many potential effects with an ambiguous overall influence. This study is no exception. In terms of the utility of market goods, greater education may increase efficiency in utilizing income, both moving the effective location of the margin of income and, possibly, shifting the marginal utility of money or stamp income. Better-educated people may find it easier to obtain and deal with program information and procedures, effectively increasing the value of the addition to their income represented by the allotment.

In the status component, education also may have various effects. More educated people may be drawn, in general, from socioeconomic backgrounds in which more stigma is attached to welfare programs. On the other hand, there may be a tendency for education, especially at the college level, to have a "liberalizing" influence, teaching people that it is the responsibility of society (the government) to provide employment and other means for people to advance themselves and to facilitate this advancement or prevent hardship. In sum, the associations of the education dummy variables with participation are not clear a priori.

Age of the household head and the number of people 65 or older in the household are expected to reflect the extent to which the household has relatively "conservative" views of welfare programs. Older households are likely to participate less frequently because they associate greater loss of status and privacy with participation. Disability and immobility may also be more characteristic of older households with a corresponding increase in difficulty in obtaining and using stamps. The result would be a reduction in the effective value of the allotment to older households and less participation.

Dummy variables were defined to represent households with Black heads, Mexican-American heads, and heads from other minority groups. As historically disadvantaged minorities, these groups are apt to suffer less loss of status from participation than the excluded white group. In a cross section they also are more likely to reside in areas with relatively high concentrations of welfare recipients who would be sympathetic to participants. These influences would tend to produce relatively high rates of participation among minorities. Minorities may encounter cultural or language barriers in getting certified as eligible and in obtaining stamps, but massive efforts to provide bilingual and relatively receptive program staff appear to have substantially reduced these barriers. On balance, an hypothesis of greater participation among minority members is entertained here.

A dummy variable was equal to one if the household was receiving Aid to Families with Dependent Children or General Assistance. These households are likely to associate relatively less stigma with participation insofar as participating in the FSP is an incremental decision, the initial decision to enter the "welfare" network already having been made. They also are likely to suffer relatively smaller "neighborhood" effects on status and privacy. Welfare eligibility and case workers routinely inform clients about the FSP and help them get certified, thereby increasing the effective value of the allotment.[9]

Another binary variable was one when the household had received information about the FSP from friends or relatives. Like participation in AFDC or General

[9] Certification for the FSP can be done by the public assistance eligibility worker.

TABLE 1. Sample Means and Standard Deviations.

Variable	Means	Standard Deviation
1. Participating in Food Stamp Program	.4290	.4953
2. Number of Adult Equivalents	2.3995	1.4096
3. Age of Household Head	44.5630	19.4170
4. Number of Persons 65 or Older in Household	.2616	.5041
5. Household Head has Grammar School Education or Less	.2919	.4550
6. Household Head has More Than High School Education	.1834	.3873
7. Household Owns Residence	.3461	.4761
8. Resides in Metropolitan County	.5231	.4999
9. Resides in Indiana	.2408	.4279
10. Resides in Ohio	.1563	.3634
11. Resides in Virginia	.2616	.4398
12. Male Household Head	.4450	.4973
13. Household Head Employed	.3764	.4849
14. Household Head Involuntarily Unemployed	.1021	.3030
15. Household Has Unearned Income Only	.4242	.4946
16. Household Has No Unearned or Earned Income	.0112	.1052
17. Square of Negative Change in Annual Income	1.2335×10^6	9.4868×10^6
18. Household Has Nonpurchased Food Available	.4354	.4962
19. Value of Food Stamp Allotment	79.1470	88.9990
20. Household Participates in Aid to Families with Dependent Children or General Assistance	.3046	.4606
21. Received Food Stamp Information From Friends or Relatives	.1579	.3649
22. Monthly Household Income	445.7100	279.9100
23. Respondent was Black	.2887	.4535
24. Respondent was Mexican-American	.0367	.1881
25. Respondent was Member of Another Ethnic Minority	.0159	.1254
26. Distance to Food Stamp Office in Miles	7.4641	6.9641
27. Weeks Between Income Payments	2.7945	1.2579

Assistance, this variable should be associated with greater participation in the FSP.

Sex of the household head was represented by a variable that was one when the head was male. The direction of effect of this variable is ambiguous a priori.

In order to permit variations in the administration of the survey and the FSP, as well as other systematic differences not explicitly considered here, to be represented, dummy variables were added for metropolitan status of the county of residence and the state. The states were represented by variables Indiana, Ohio, and Virginia. California, which had the largest number of entries in the data, was the excluded category. Likewise, the modal case of nonmetropolitan was used as the reference, and a variable was one for metropolitan households. No hypotheses are advanced for the signs of the associated coefficients.

Descriptive statistics for the variables are given in Table 1. The next section reports the results of Probit estimates.

Findings and Implications

The results of estimating the Probit model appear in Table 2. The first column of the Table shows the results when all variables were included in the equation. Overall, the coefficients of variables for which definite expectations of sign were advanced have the expected signs. Many of them are statistically significant at conventional levels of confidence. Strong support for the diminishing marginal utility of income and its effect on participation

TABLE 2. Estimates of Probit Coefficients and Standard Errors.

Variable	Coefficient (Standard Error) 1	2	3
Constant	−.6875*	−.6809***	−.5136**
	(.3823)	(.2129)	(.2072)
Number of Adult Equivalents	.1951***	.1768***	.2656***
	(.0629)	(.0652)	(.0628)
Age of Household Head	−.0066		
	(.0054)		
Number of Persons 65 or Older in Household	−.3175*	−.4051***	−.5095***
	(.1672)	(.1409)	(.1400)
Household Head Has Grammar School Education or Less	.0495		
	(.1476)		
Household Head Has More Than High School Education	.3163*	.3508**	.2614*
	(.1717)	(.1640)	(.1592)
Household Owns Residence	−.3894***	−.4167***	−.4962***
	(.1359)	(.1298)	(.1271)
Resides in Metropolitan County	.0481		
	(.1500)		
Resides in Indiana	.3088	.2878	.0964
	(.1904)	(.1770)	(.1688)
Resides in Ohio	.6571***	.6490***	.4641**
	(.2004)	(.1935)	(.1853)
Resides in Virginia	.2989	.2603	.0331
	(.2077)	(.1947)	(.1854)
Male Household Head	−.0581		
	(.1296)		
Household Head Employed	−.4879***	−.5549***	−.5153***
	(.1780)	(.1508)	(.1477)
Household Head Involuntarily Unemployed	.0911		
	(.2206)		
Household Has Unearned Income Only	.3838**	.3910**	.5683***
	(.1899)	(.1689)	(.1619)
Household Has No Unearned or Earned Income	1.1296*	1.1263*	1.0996*
	(.6519)	(.6463)	(.6660)
Square of Negative Change in Annual Income	$.2820 \times 10^{-8}$		
	$(.6912 \times 10^{-8})$		
Household Has Nonpurchased Food Available	−.0127		
	(.1208)		
Household Receives Public Assistance	.6365***	.7354***	
	(.1545)	(.1384)	
Value of Food Stamps	.0008	.0009	.0009
	(.0008)	(.0008)	(.0008)
Received Food Stamp Information From Friends or Relatives	−.1595		
	(.1537)		
Monthly Household Income	−.0008***	−0008***	−.0009***
	(.0003)	(.0003)	(.0003)
Respondent was Black	.1995	.2467*	.2760*
	(.1666)	(.1485)	(.1456)
Respondent was Mexican-American	.6514**	6120*	.7836***
	(.3218)	(.3142)	(.2986)

TABLE 2. Continued.

Variable	Coefficient (Standard Error) 1	2	3
Respondent was Member of Another Ethnic Minority	.3005 (.4585)		
Distance to Food Stamp Office	−.0002 (.0098)		
Weeks Between Income Payments	.0858 (.0656)		
Log-Likelihood	−336.7965	−339.2689	−353.6439
Chi-Square	182.9376	177.9928	149.2428
Number of Observations	627	627	627

* Significant at ten percent in two-tail test.
** Significant at five percent in two-tail test.
*** Significant at one percent in two-tail test.

is found in the results for household income and adult equivalents. The in-kind income effect of home ownership also may be largely responsible for the significant negative association of participation and ownership. With a single cross section, however, it is not possible to say how much of this association may be due to correlation of ownership with socioeconomic background and financial history. The variable for availability of nonpurchased food, which would represent another source of in-kind income, has the expected negative sign but is not significant. The length of intervals between income payments, a potential source of budgeting problems, has the anticipated sign but also lacks significance.

Among the employment and type-of-income variables that might capture income expectations, the expected signs are observed for all coefficients, although involuntary unemployment of the household head does not have a statistically significant coefficient. The salient factor appears to be that the household head is unemployed, not whether the unemployment is involuntary.

Age of household head and number of persons 65 or older in the household have the anticipated negative coefficients, although only the latter coefficient is significant. This negative association of "older" households with FSP participation must be a subject of concern given the poor nutritional achievement of this age group and the extent to which it has seen fixed incomes eroded by inflation (Schaafama). Whether the low participation of older households is primarily due to mobility and access problems or to attitudinal barriers deserves further investigation.

It was expected, on balance, that members of minority groups would be more likely to participate in the FSP than would the white majority. Positive coefficients for all three minority dummy variables are in agreement with this hypothesis. Only the coefficient for Mexican-Americans is statistically significant, however.

Being a participant in some other form of public assistance has a highly significant positive Probit coefficient, indicating a relatively high probability of also participating in the FSP. Public assistance participation may identify persons who feel relatively little loss of status or privacy in enrolling in an additional "welfare" program and who have the assistance and encouragement of welfare workers in applying. To some extent, however, these same considerations imply

that the decisions to enroll in public assistance and the FSP are interdependent, raising the question of simultaneous-equations bias in the estimates. Below, estimates of the FSP participation equation omitting the public assistance variable are discussed.

Distance to the FSP office and residence in a metropolitan county have signs that would be in agreement with distance barriers reducing access and participation, but neither of the coefficients is statistically significant. The dummy variables for state of residence are insignificant in two of three cases, and no explanation for this finding is apparent, just as no specific interpretation could be given to the variables a priori.

Of the two dummy variables representing education, only the one for post-high school is significant. Apparently, education beyond high school has effects through the household's relative efficiency in various tasks and approaches to the social support system and (or) through attitudes that produce a relatively high propensity to participate in the FSP among those eligibles with post-secondary training. Relative efficiencies, attitudes or how much of each is at work are not matters of indifference for policy, but they can not be revealed by the data used here.

The value of the FSP allotment was expected to have a positive influence on the probability that a household would participate in the program. The coefficient is statistically insignificant, although of the correct sign. With strong a priori reasons to expect a positive coefficient, the insignificance of the coefficient could be put down to hypothesis-testing error. Alternatively, it might be thought that multicollinearity between the allotment value and other variables was producing the insignificance. For instance, suppose the allotment is the difference between the proportion (f) of household income that the household is thought to be able to "afford" to spend for food and the number of adult equivalents in the household times the minimum required food expenditure for each adult equivalent (e). An equation like

$$\text{Allotment} = e(\text{Adult Equivalents}) - f(\text{Household Income})$$

would prevail among the income, adult equivalent, and allotment variables. The allotment variable would be collinear with adult equivalents and income, and their standard errors would be inflated. A regression of the allotment value on *all* of the other explanatory variables (including income and adult equivalents) gave an R^2 of only 0.43. Thus, there is little evidence that multicollinearity is responsible for the insignificant coefficient on allotment value. The absence of a higher correlation is not as surprising as it may seem, since the equation above greatly oversimplifies the determination of FSP benefits. For instance, several categories of expenditure are partially deductible (dependent care, shelter costs, and so on) in determining income for the FSP, some of earned income is deductible, and there was a standard deduction that changed during the survey period. All of these rules, plus measurement errors, will introduce discrepancies between the allotment values that were given by respondents or imputed from the relevant data obtained in the survey screening and the allotment that would be suggested by the simple equation above. Hence, there is less reason to expect multicollinearity than first appears.

If the imputed allotment values for nonparticipants are systematically biased upward, the measurement bias could account for the insignificance of the allotment in a test of the hypothesis that the coefficient is positive. The imputations were based on detailed information and the actual program formulas, however, so that an important bias seems unlikely. Imputed values do not appear to be systematically biased as estimates of the participants' allotments. Two measures of income

(derived from the responses to a categorical total income question and from the sum of responses to questions about income by source) were available in the data, and the measure that predicted participants' allotments more closely, more often was used to impute allotments for nonparticipants.

A possibility that can be explored only in a more sophisticated model is that the linear specification of parameters and the income and allotment variables used here are inadequate to capture potential interaction between the value of stamps offered and the level of household income without stamps. With a diminishing marginal utility of income, the same dollar value of stamps will constitute a different cash-equivalent offer for households at different income levels. The first requirement for building a model of household behavior adequate to deal with this possibility is to combine money income, in-kind income, and the number and types of people in the household into a single measure of income. If that could be accomplished, the hypothesis of cash equivalence in market goods and no marginal stigma effect would make specification of an appropriate participation equation relatively straightforward. At present, the correct sign for the allotment variable, along with the other results for income, adult equivalents, and so forth, offers support for the general framework set forth in this paper and suggests that refined models be pursued.

Columns 2 and 3 of Table 2 report versions of the participation equation that were estimated to test the sensitivity of the results to excluded variables. To obtain the estimates in column 2, all variables with t-values in the original estimates less than 1.5 were eliminated, except the value of the stamp allotment and the dummy variable for Virginia. There were relatively strong a priori expectations that the allotment value would be relevant and that there would be state-specific survey, FSP, or sociocultural effects, so the allotment and Virginia variables were retained. As column 2 shows, the change of variables made little difference in the results. Column 3 shows what happened when the variable for participation in other assistance programs was omitted. It was mentioned above that some simultaneity between FSP participation and participation in other programs might exist. The remaining parameter estimates change some when the assistance variable is omitted, but the coefficient signs, orders of magnitude, and significance are essentially unaffected. Whether the changes arise from removing simultaneous equations bias or from introducing omitted variable bias is not known.

In light of the exploratory theoretical developments and empirical findings reported here, a research agenda can be set forth. Exogenous information must be produced and brought to bear on the relationships between household characteristics and the theoretical constructs of income and status and privacy (or, put differently, stigma). The appropriately measured theoretical components must be used to estimate the extent to which command over market goods and services and nonmarket social consequences for households enter into the Food Stamp Program participation decision. The roles of the stamp allotment value and the social aspects of the FSP may differ systematically among households. In that case, effective and efficient public policy may call for flexible program designs fitting the different behavior patterns of different target populations.

References

Claffey, B. A., M. Matsumoto, and T. Stucker. *The Food Stamp Expenditure Cap.* Staff Report No. AGESS810106. National Economics Division, Economics and Statistics Service, United States Department of Agriculture. Washington, D.C., January 1981.

Congressional Quarterly Weekly Report, Vol. 39, No. 33, August 15, 1981.

Control Systems Research, Inc. *An Evaluation of Family Food Assistance Program Dual Operations in King, Pierce, and Snohomish Counties, Washington*. Prepared for U.S. Department of Agriculture, Food and Nutrition Service, Washington, D.C., September 1972.

Domenich, T. A. and D. McFadden. *Urban Travel Demand: A Behavioral Analysis*. New York: North Holland, 1975.

Epperson, J. E., C. L. Huang, S. M. Fletcher, and W. K. Scearce. "The Determinants of Food Stamp Program Participation," *Southern Journal of Agricultural Economics*, December 1980, pp. 93–97.

Greenleigh Associates, Inc. *A Study of the Food Stamp Program in Pittsburgh, Pennsylvania*. Prepared for U.S. Department of Agriculture, Consumer and Marketing Service, Washington, D.C., July 1970.

Lane, S. "Food Distribution and Food Stamp Program Effects on Food Consumption and Nutritional 'Achievement' of Low Income Persons in Kern County California," *American Journal of Agricultural Economics*, 1978, 60: 108–16.

Lane, S. and J. Kushman. *A Study of Persons Eligible for Food Stamps in Two California Counties*. Department of Agricultural Economics, University of California, Davis, April 1981.

Love, H. G. "The Reasons Participants Drop Out of the Food Stamp Program: A Case Study of Its Implications," *American Journal of Agricultural Economics*, 1970, 52: 387–94.

MacDonald, M. *Food Stamps and Income Maintenance*. New York: Academic Press, 1977.

Mara, M. J. and E. E. Brown. *Food Stamp Participation: Ware County, Georgia 1975*. Department of Agricultural Economics, University of Georgia, Research Bulletin 184. Athens, Georgia, August 1976.

McFadden, D. "Quantal Choice Analysis: A Survey," *Annals of Economic and Social Measurement*, 1976, 5: 363–90.

Peterkin, B. and Kerr, R. *The Effect of Household Size and Composition on the Cost of Diets of Equivalent Nutritional Quality, Needy Households, Spring 1965*. Report of Family Feeding Programs Work Project I. Memorandum of Understanding Food and Nutrition Service with Agricultural Research Service, 1974.

Rungeling, B. and L. H. Smith. *Factors Affecting Food Stamp Nonparticipation in the Rural South*. University of Mississippi, Center for Manpower Studies, January 1975.

Scearce, W. K., P. J. Marshall, and R. B. Jensen. *Food Stamps: A Study in Two Virginia Localities*. Blacksburg, Virginia: Department of Agricultural Economics, Virginia Polytechnic Institute and State University, March 1975.

Schaafama, J. "Inflation and the Standard of Living in Pensioners: A Case Study," *Canadian Public Policy*, Winter 1981, 7(1): 115–18.

U.S. Department of Agriculture, Economic Research Service. *Participation in USDA Food Programs, Two Mississippi Delta Counties*. (Administrative Report) Washington, D.C.: USDA Marketing Economics Division, 1967.

U.S. Department of Agriculture, Food and Nutrition Service. Questionnaire Used in National Food Consumption Survey. OMB.

U.S. Department of Agriculture, Food and Nutrition Service. Office of Policy, Planning, and Evaluation. Personal Communication, September 23, 1981.