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ABSTRACT

Income elasticities of demand were estimated for nine aggregate food categories for a sample of Hispanic consumers. In general, the demand for food appears to be relatively inelastic with respect to income, although the situation may be quite different when more disaggregated food categories are considered. Government subsidies received by households may also impact the demand for specific food groups. Although not conclusive, the results of this study indicate that Hispanic households participating in the WIC program consume more fruits, milk and pork, and less total fats, beverages, and chicken than households not participating in the income transfer programs. The results for food stamps were less conclusive.

Key words: Engel curves, food demand, WIC, food stamps, Hispanic households

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Abstract

Income elasticities of demand were estimated for nine aggregate food categories for a sample of Hispanic consumers. In general, the demand for food appears to be relatively inelastic with respect to income, although the situation may be quite different when more disaggregated food categories are considered. Government subsidies received by households may also impact the demand for specific food groups. Although not conclusive, the results of this study indicate that Hispanic households participating in the WIC program consume more fruits, milk and pork, and less total fats, beverages, and chicken than households not participating in the income transfer programs. The results for food stamps were less conclusive.

Keywords: Engel curves, food demand, WIC, food stamps, Hispanic households.

1. Introduction

The United States is currently experiencing the largest sustained wave of immigration in its history. Camarota (1999) reported 26.3 million foreign-born persons in the United States; 13.4 million came from Latin America with Mexico accounting for 53%. The U.S. Census Bureau estimates that by 2010 the Hispanic population is expected to comprise 15.5% of the population; by 2020, 20% of American children will be of Hispanic origin.

Corporations and businesses perceive the emergent Hispanic communities as a major sector of the U.S. economy. According to the University of Georgia's Selig Center for Economic Growth, the nation's Hispanic buying power, estimated at $350 billion nationwide, grew at a compound annual growth rate of 7.5% in the 1990-97 period (Emling, 1998; Holsendoph, 1998). Income growth combined with high birth and immigration rates is responsible for the emergence of the Hispanic market in the United States (Fan and Zuiker, 1998).

In the 1990s, income growth in the U.S. was not uniform across ethnic groups. Twenty-six percent of all Hispanic families in the U.S. were living below the poverty level in 1996 (Reed and Ramirez, 1998). This percentage almost doubles the 13.7% reported by the U.S. Bureau of Labor Statistics (1998) for the whole population in the same year. Income plays an important role in determining individuals demand for food. Low income households may be eligible to receive benefits from major government transfer programs, such as the food stamps, and the Women, Infants and Children programs (USDA, 2000a; 2000b). It means that a large proportion of the Hispanic households may be eligible, in terms of their household income, to receive benefits from these programs. In that sense it seems important to identify any relationship between participation of Hispanic households in these two programs and their demand for specific food groups.

2. Objectives

The primary objective of this paper was to analyze the demand for food among a sample of the Hispanic population in the U.S. for nine main food groups: grains, vegetables, fruits, milk, meat, legumes, fats, sugar, and beverages and three meat subgroups, beef, pork and chicken. A secondary objective was to determine the extent to which government income transfer programs, such as the Women, Infants, and Children, influence household's demand for targeted food groups.

3. The Food Stamps and WIC Programs

Engel's Law defines the relationship between a consumer's money income and his/her expenditure on a particular good or service. Generally, low income consumers spend a larger share of their budgets on food than high income consumers, leaving little income available for other basic necessities. Social transfer programs that increase low income consumers' budgets

will increase their ability to purchase food and improve family nutrition, *ceteris paribu*s. The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and food stamp program are two federal income transfer programs targeting consumers' ability to increase their food consumption and improve family nutrition.

The WIC program was established in 1972 as a two-year pilot program, partially in response to a 1969 White House Conference on Food, Nutrition, and Health. The WIC program targets nutritional deficiencies among low-income women and children, which can threaten their health and lead to learning difficulties, poor health and higher medical costs. WIC seeks to improve the diets and the health of low-income pregnant, breast feeding, and postpartum women, infants, and children up to age five.

There are three parts to the WIC program: (a) vouchers to purchase specific high-nutrition foods, (b) limited nutritional and health counseling, and (c) referrals to health care providers. WIC vouchers are valid for 1 to 3 months after which the vouchers must be reissued. Eligible participants receive one of seven basic WIC food "packages," depending on their recipient category and nutritional need. The food packages are not physical bundles of goods but a list of grocery items, which typically include iron-fortified infant cereal and formula, fruit juice, milk, cheese, eggs, peanut butter, and beans. WIC participants exchange their vouchers at participating food stores. WIC agencies, mainly health services, tailor food packages to meet the nutritional deficiencies of individual clients.

In 1999, the average WIC food package was worth about $33 per month while a postpartum mother and her newborn infant may receive two WIC food packages worth approximately $100 per month (Besharov and Germanis, 2000). Fortified infant formula may cost between $90 and $140 per month while the mother may receive WIC vouchers worth approximately $17 month, allowing her to purchase one gallon of milk, one dozen of eggs, two

cans of fruit juice, carrots and canned tuna fish. Children between one and five years old may quality for WIC vouchers valued at approximately $15 to $21 per month which can be exchanged for milk, eggs, cheese, peanut butter, cereal, and dry lentils. The average monthly benefit per person was $29.91 in 1994, increasing to $31.19 in 1996. Current benefits are approximately $32.53 per person, covering approximately 7.3 million individuals (USDA, 2000b; 2000c).

WIC applicants must present valid identification, evidence of residence, and monthly income when they apply. Application forms are available at public health centers in English but translators are available via phone. Under federal rules, eligibility for WIC vouchers is based on income status and nutritional risk (USDA, 2000c). Household income eligibility is set at up to 185% of the poverty income guidelines ($31,543 for a family of four as of July 2000). Recipients of temporary assistance for needy families, food stamps, and Medicaid benefits are automatically deemed income eligible. Given the liberal eligibility criteria, income and nutritional risk, WIC expenditures and recipients have grown rapidly in the last decade. In 1990, WIC participants had reached 4.5 million while program costs had climbed to $2.1 billion. By 1997, participation increased to 7.4 million at a cost of $3.7 billion. Since formula manufacturers are encouraged to provide rebates to the program, the actual value of WIC benefits are more than Congressional appropriations, adding another $1.3 billion to the program in 1997 (Besharov and Germanis, 2000).

In 1996 about 23% of WIC participants were women, 25% were infants, and 52% were children ages 1 to 4, making this the largest target group served by the program (Besharov and Germanis, 2000). WIC program expenditures generally correlate with participant categories. WIC has experienced a certain amount of "eligibility creep" since its inception. Officials of the Office of Management and Budget reported the that percentage of WIC participants in families

with annual incomes above the target poverty level (185%) was 29.4% in 1996, up from 21% in 1988 (Besharov and Germanis, 2000, p. 8). Recent legislation increased income eligibility levels for Medicaid beyond 185% of poverty, thereby automatically increasing eligible households.

The effectiveness of WIC in terms of improved participant health and well being is subject to debate, which is beyond the scope of this research. The current study focuses on the increased consumption of nine broad food categories. WIC should be expected to increase the Hispanic household's consumption of dairy products, eggs, vegetables, and fruit juice since vouchers target these specific foods. On the other hand, food stamps should contribute to overall food consumption since this program has less focus on targeted food groups.

The concept of food stamps grew out of the dissatisfaction with direct food distribution for low-income households. President Kennedy, in his first executive order, issued a command to expand domestic food distribution. In early February 1961, Kennedy announced initiation of a pilot food stamp program. Later, food stamps became part of the permanent legislation in 1964. Since the early 1970s, the food stamp program has been the primary food assistance program, accounting for nearly 70% of all food assistance spending (Knutson, Penn and Flinchbaugh, 1998, p. 453).

The food stamp program was designed to provide low-income households supplemental purchasing power, enabling them to purchase more nutritious diets through regular market channels. A household's food stamp allotment is based on three factors: food costs, income and family size. A nutritionally adequate diet should cost no more than 30% of family income, according to program objectives. The amount of supplemental income is determined by the monthly cost of USDA's thrifty food plan, adjusted for household income, family size, and composition. The thrifty food plan specifies the quantity of food in 15 different food groups needed to meet the recommended dietary allowances. The cost and composition of the thrifty

food plan has been widely debated by nutritionists, government officials and public policy advocates.

With a peak of 27.5 million people receiving food stamps in 1994, the program suffered from a pronounced decline in participation in the subsequent years, specially from 1996 to 1998, due to improvements in the general economic conditions and changes in social welfare programs (Wilde et al., 2000). In 1996, 25.8 million people participated in the food stamp program, accounting for approximately 10% of the population (Knutson, Penn and Flinchbaugh, 1998, p. 454). Monthly benefits averaged about $73 per person, or $292 of a family of four (Statistical Abstract, 1999; USDA, 2000a). In 1996, federal food stamp program costs were approximately $25.7 billion.

Food stamp recipients are generally households with children. Eligible household income is set at 130% of the federal poverty level (USDA, 2000a). In the mid 1990s, the federal poverty level was $14,808 for a family of four (Connecticut Association for Human Services, 2000). Ninety-one percent of food stamp households have gross incomes at or below the poverty line. Households below half of the poverty line receive 57% of all benefits. Almost 40% of the benefits go to preschool children. The average size of a food stamp household was 2.6 persons while the average food stamp household with children was 3.4 persons.

Food stamp recipients may have better nutrition; however, there is also evidence that as income increases, the effectiveness of food stamps in improving health diminishes to zero. This is mainly due to food stamp replacement of earned income by transfer benefits. The extent to which food stamps are perceived to increase food consumption partially explains support for the program. Producers of cereal grains, beef, pork, dairy products, and poultry appear to be the main beneficiaries of the program (Knutson, Penn and Flinchbaugh, 1998, p. 455).

Recent reforms in income transfer programs have impacted the food stamp program. The

Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA), better known as welfare reform, instituted major changes in social safety net programs. The 1996 law restricts the eligibility for food stamps for many legal immigrants and able-bodied adults without dependents and restructures the cash welfare system in ways that may reduce participant in the program. The data set in this analysis was collected just before these reforms were implemented (1994-96), thus our analysis focuses on the program at its peak level of participation, 23.9 million persons nationwide.

4. The Hispanic Consumer Data Set

The data set used in this research was constructed using information collected from the USDA 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII 94-96). It includes information about 8,067 U.S. households nationwide, surveyed between 1994 and 1996. Only households of Hispanic origin that participated in the 1994-96 two-day survey and provided information about food consumption were selected for analysis. While 727 Hispanic households were identified in the survey, households not providing all the needed information were excluded from the study. Thus, the total sample consisted of 643 households.

Demand for food was measured as the quantity consumed, in grams per week, for each of the food groups and three subgroups. Household income was constructed from reported annual, before-tax household income for the previous calendar year. It was transformed into weekly income by dividing the annual amount by 52.

As a measure of household size, the use of equivalent scales has been widely explored in the academic literature. Their theoretical and practical implications have captured the attention of researchers because they play an important role in the analysis of welfare policies (Buse and Salathe, 1978; Muellbauer, 1980; Brown and Johnson, 1984; Deaton, 1997). Different

approaches to measuring household size use different weights or scales, and there has been no consensus in how they should be calculated (Deaton 1997). In this study, the so-called Amsterdam scale, based on nutritional studies (Stone, 1954) as a variable that acts as a proxy for household size. The main reason for this choice was its simplicity. This scale represents household members in relation to the reference unit, an adult male, 18 years old and over. Each adult female is represented by 0.90 equivalent adult males; males and females from 14-17 years represent 0.98 and 0.90 equivalent adult males, respectively, and individuals under 14 years old from both sexes are valued as 0.52 equivalent adult males, in terms of the Amsterdam Scale (Deaton and Muellbauer, 1980). Although it could be argued that different scales should be used for different food groups, the same is true for using the number of household members as the measure for household size.

Concerning their national origin, households of Mexican origin, the vast majority of the Latin population in the United States, accounted for 43.9% of the sample; Puerto Ricans averaged 11.0%, Cubans 2.6%, and households of other Hispanic origin accounted by the remaining 42.5%. These categories include not only recent immigrants but also households of Hispanic origin with more than one generation in the U.S.

The average Hispanic household consisted of four individuals, ranging from one to eight members. On the average, almost 52% of the households had no children under 5 years of age (Table 1). The average household head was 41 years old, with 73% ranging from 25 to 55 years old; almost 62% of the households were headed by men (Table 2).

On the average, about 54% of the respondents claimed to be fully employed the week preceding the survey. The unemployment level for the sample household heads was very high, 30% to 36% depending on the year of the sample.

Annual income can be expressed as a percentage of the poverty threshold defined by the

federal government. Approximately 48% of the selected households were categorized as having an annual income equal or less to 130% of the poverty threshold (approximately $16,036 in 1996 for a family of four), as observed in Table 3.

Finally, we analyzed the participation of Hispanic households in two important income transfer payment programs: Food Stamps (FS) and Women, Infants, and Children (WIC) certificates.

As the level of household income increases and the average proportion of income spent on total food decreases, the percentage of households also receiving food stamps decreases dramatically. In contrast, the distribution of Hispanic households receiving WIC certificates at each level of income is fairly uniform for income levels under $40,000, ranging between 20 and 30% (with the exception of the 30,000-34,999 range, with only 4.7%). These points are illustrated in Table 4.

However, it should be noted that while 22.2% of the Hispanic households in our sample received some food stamps for at least one month in the previous calendar year, only 18.8% participated in the WIC program. Besharov and Germanis (2000) contended that very often, nutritional risk is assumed if the family meets WICs income criteria. In addition, children comprise the fastest growing group of WIC recipients, with a participation that increased by 81% from 1990 to 1998, compared to a 67% increase in participation of women and 33% for infants, during the same period (Oliveira and Gundersen, 2000). If we take into account that 48% of the Hispanic households in our sample reported to have at least one children under 5 years old, participation by these families in income transfer and nutritional programs is less than the national average indicating coverage in these supplemental programs is less than complete.

5. Methodology and Econometric Procedures

We are limited to the estimation of Engel curves when we have cross-sectional data from

household budget surveys, which do not contain observations on price variations (Sadoulet and De Janvry, 1995). Income elasticities obtained from the cross-sectional analysis can be used to express consumption patterns. Several functional forms with different theoretical and empirical strengths and weaknesses have been used to estimate Engel curves. Properties of these models have been widely discussed in the literature (Prais and Houtakker, 1955; Deaton and Muellbauer, 1980; Holcomb, Park and Capps, 1995; Sadoulet and De Janvry, 1995).

In this study, a semi-logarithmic model is selected for the estimation of Engel curves. The semi-logarithmic model is one of the most popular functional forms used by many researchers in studying demand for foods. This model is linear in the parameters and could be estimated by ordinary least squares (OLS). However, since most of the households reported "zero" consumption for at least one food category, a potential selectivity bias problem could arise, and estimation of this model by OLS gives inconsistent estimates of the parameters (Maddala, 1983, pp.257-267). In addition, Haines, Guilkey, and Popkin (1988) suggested that food consumption decisions should be modeled as a two-step, rather than as a one-step decision process, such as the Tobit model, which considers the decision to consume and the decision about the amount to consume as the same.

To deal with these issues, we estimated the model using both the so-called two-step Heckman's procedure (HP) and a sample selection (SS) or Type II Tobit method, in addition to OLS using only the observations for which households reported positive consumption on the specific food group. The latter is the regression or level equation of a two-part model (TP), whereas the first part is represented by a binary or decision equation, which is usually represented by means of a probit equation. Further discussion about these methods and some other variations can be found in Heckman (1979), Amemiya (1985), Maddala (1983), Davidson and MacKinnon (1993), Holcomb, Park and Capps (1995), Leung and Yu (1996).

The presence of heteroscedasticity was noted in all cases, using a simple Lagrangian Multiplier test on squared fitted values, a general White test (Greene, 1997), and a likelihood ratio test developed as an extension of the Goldfeld-Quandt test (Johnston and Dinardo, 1997). Thus, the standard errors of the coefficient estimates were computed using the heteroscedasticity consistent estimator proposed by White (1980), with the correction suggested by Davidson and MacKinnon (1993). Several demographic and socio-economic variables were also included in the analysis of Hispanic consumers. These complete set of variables used in this study are described in Table 5. The mathematical formulation of the semi-logarithmic equation is as follows:

$$Q_i = \beta_0 + \beta_1.\text{LINCWK} + \beta_2.\text{LHHSIZE} + \beta_3.\text{LAGE} + \beta_4\,\text{S\_FEM} + \beta_5.\text{O\_MEX} + \beta_6.\text{O\_PRI} + \beta_7.\text{O\_CUB} + \beta_8.\text{R\_NEAST} + \beta_9.\text{R\_MWEST} + \beta_{10}.\text{R\_SOUTH} + \beta_{11}.\text{U\_MSAINC} + \beta_{12}.\text{U\_MSAOUT} + \beta_{13}.\text{G\_ELEM} + \beta_{14}.\text{G\_HIGH} + \beta_{15}.\text{G\_COLL} + \beta_{16}.\text{G\_GRAD} + \beta_{17}.\text{TOWNER} + \beta_{18}.\text{FSTAMP} + \beta_{19}.\text{WIC}.$$

where Q_i is the quantity consumed of the i^{th} food group (grains; vegetables; fruits; milk; meat; legumes; fats; sugar; beverages) or subgroup (beef; pork; chicken). The independent variables are as defined in Table 5.

Income and household size elasticities for the sample means were calculated from the estimated regression coefficients. For the semi-logarithmic model, income elasticities for the i^{th} food group were estimated as the ratio between the corresponding estimated coefficient for logarithm of income (β_1) and the sample mean of the demanded quantity (Q_i). Household size elasticities were estimated in a similar way, computing the ratio between the coefficient for logarithm of household size (β_2) and the demanded quantity (Q_i) evaluated at the sample mean. Confidence intervals for both income and household size elasticities are presented at 90% significance level. We used the delta method (Greene, 1997), which allows us to specify the

limiting normal distribution for functions of random variables. Since the elasticities are expressed as ratios of normally distributed random variables, we can construct confidence intervals for these elasticities using linear Taylor Series approximations (see Dorfman, Kling and Sexton, 1990).

6. Results and Discussion

6.1 Income and Household Elasticities

The estimated regression coefficients utilized in the construction of the income and household elasticities for all the nine food groups are not reported in this article due to the lack of space but they are available from the senior author upon request. In general, the estimated coefficients of household size indicated better statistical significance than the coefficient estimates of income, for most of the food groups. However, as pointed out by Dorfman, Kling and Sexton (1990), "precision of estimation of regression coefficients neither implies nor guarantees similar precision of elasticity estimates" (p. 1006). Since in the logarithmic model the elasticities are computed as a function of the regression coefficient and the quantity demanded, which is also a random variable, their variability depends on the variability of this variable too. The income and household size elasticities of the nine main food groups and the three subgroups of meats are reported in Table 6. For each category, we present the elasticities computed from the three different estimation methods, with their corresponding confidence intervals at the 90% level.

We can see that when the model was estimated using the HP, the computed income elasticities were consistently higher in absolute value than with the other two methods, TP and SS, which in general provided very similar estimates. Nevertheless, for some food groups, the estimated elasticity values are not precise, since the 90% confidence intervals show wide ranges. In these situations, it is difficult to make valid inferences about consumers' behavior.

As a general result, we can observe that demand for all nine major food groups was very inelastic in terms of income variation, with elasticity point estimates smaller than 0.5 in absolute value but we find some exceptions with grains (0.64), vegetables (0.77), and fats (0.81). In all these cases, the model was estimated using the HP method. Moreover, fats appeared to be the food group with highest response to changes in income, followed in order by vegetables, and beverages. In all these cases, an increase in the income level leads to increasing consumption of these foods, although the confidence intervals show negative income elasticities in the lower bound. On the other hand, fruits and milk were the least responsive food groups with respect to the income variations.

Concerning the three subgroups of the meat category, we found that the demands for beef and pork computed from the regressions estimated with the HP method were elastic, with magnitudes of 1.59 and 1.35, respectively. The estimated value for chicken with this method was 0.69. Nevertheless, the same models estimated by TP and SS gave less elastic estimates.

When analyzing the estimated household size elasticities, we observed similar patterns in the elasticities. Again, estimates obtained from the HP regressions were in most cases higher in absolute value, than those obtained from TP and SS, which in general provided more comparable values. From these results, we can conclude that household size component seemed to have a greater effect on Hispanic household demand for particular food groups than income. In addition, household size elasticities were in general positive and greater than the income elasticities for all food groups.

The most elastic food group with respect to variations in household size was legumes, nuts, and seeds, with point estimates varying from 0.81 to 1.18, depending of the estimation method. This group was followed by the elasticity estimates for milk, which ranged from 0.63 to 0.89. On the other side, the elasticity estimates for fats were consistently the least responsive

group, ranging from –0.11 to 0.18.

Analyzing the meat subcategories, we observed that as the relative size of the Hispanic household increased, the demand for beef and pork increased substantially, *ceteris paribu*s. Household size elasticities for beef ranged from 0.70 to 15.77 depending on the estimation method while estimates for pork ranged from 1.35 to 2.96. The poultry meat, on the other hand exhibited a more inelastic behavior.

6.2 Food Demand and Socioeconomic Characteristics of Hispanic Households

The effect of the different demographic and socio-economic characteristics considered in this study in the demand for food is presented in Table 7. Variables showing positive effects are illustrated, ranging from moderate to strong, with up to three plus signs (+) whereas negative effects are represented in the same way with minus signs (–). Variables denoting a strong positive (+++) or negative (– – –) effect were those in which their corresponding regression coefficients were statistically significant, at least at the 10% level, with all the estimation methods (TP, HP, and SS). Variables with an important positive (++) or negative (– –) effect were significant with two of the estimation methods, and so on.

The educational level of the household heads appeared to be an important variable explaining Hispanic consumers' demand for food. The level of education indicated a strong positive effect in the consumption of grains, fats, sugar and beverages, and a moderate to negative effect in the consumption of fruits and meats, especially pork and chicken. The location of the household dwelling with respect to the Metropolitan Statistical Area (MSA) indicated moderate to strong positive effects in the consumption of grains, fruits, milk, pork, and chicken. In addition, households located in the Northeast consumed more grains, vegetables, fats, and beef, and less legumes and pork. The socio-economic effects in the demand for chicken were not very clear, showing both positive and negative effects depending on the estimation method used.

With regard to the national origin, households of Puerto Rican origin consumed less vegetables, milk, and sugar, and moderately more pork and chicken, than other Hispanic groups. Cubans, on the other hand, consumed moderately more quantities of vegetables, legumes and chicken and less fats and pork. The age of the household head was positively related to the consumption of grains, beverages and meat, and negatively related to the consumption of milk, and fruits. Thus, as the household head aged, consumption of dairy products and fruits declined.

Only one out of four Hispanic households meeting income eligibility criteria (income at or below 185% of the poverty guidelines) received WIC certificates, in our sample. A strong positive effect was observed between households receiving benefits of the WIC program, and the consumption of some food groups. Households in the WIC program consistently consumed more milk and fruits, and less fats, which is consistent with the goals of the program. A moderate positive effect was also observed in the consumption of pork and a moderate negative effect for beverages and chicken.

On the other hand, participation of Hispanics in the FS program was higher in comparison to WIC program. Forty-two percent of eligible households in terms of income (at or below 130% of the poverty guidelines) received benefits from the FS program. The lower share of Hispanic households participating in the WIC program is understandable given the narrower criteria of women, infants and children under the age of five. Our results indicate that Hispanic households receiving food stamps presented a moderate positive association with the consumption of milk, and a negative association with pork and chicken.

7. Conclusions

Food processors and retailers should pay attention to some socioeconomic and demographic characteristics of the households in the marketing area when targeting Hispanic consumers with their products. Our analysis, incorporating several socioeconomic

characteristics of Hispanic households on their food consumption, suggests that, on average, the demand for particular broad food groups appears to be relatively inelastic with respect to income, and moderately to unitary elastic with respect to household size. These results are consistent with demand studies previously undertaken for the whole U.S. population, and suggest that Engel's Law holds for individual food categories with regard to Hispanic consumers in the U.S. However, the situation may be quite different when more disaggregated food categories, such as beef, pork, and chicken, are considered.

The education level of the household head, along with the geographic location of the household dwelling should also be regarded as an important factor determining the demand for food, in addition to income and household size. Hispanic consumers in the metropolitan statistical area and the Northeast region appeared to consume more grains, fruits, milk, pork, and chicken, *ceteris paribu*s, than other Hispanic consumers.

In addition, government subsidies received by households (FS or WIC programs) may also have moderately significant impact on the demand for specific food groups. A recent study carried out by Wilde, McNamara and Ranney (1999) for the whole U.S. population suggested that household participation in FS and WIC programs affect the demand for meats, sugar, and total fats. In particular, Wilde and Ranney (2000) found evidence that participation in the WIC program has a strong positive effect on food energy intake. However, higher caloric intake may not equate with better nutrition.

Although not conclusive, the results of this study indicate that Hispanic households participating in the WIC program consume more fruits, milk and pork, and less total fats, beverages, and chicken than households not participating in the income transfer programs. The increased consumption of milk and fruits is as expected since WIC program targets milk for new mothers and children.

The benefits of WIC and food stamps apply to only a select group of Hispanic households. Since 52% of the Hispanic households had no children under the age of five, limiting participation to 18.8% of our sample, then results are quite good, indicating increased consumption of those foods intended to improve the target's population's nutritional status. When the share of income spent on food ranges from 41 to 71% with Hispanic households with income less than $15,000, programs which improve food consumption and the nutritional status of the target groups should continue to receive political support, *ceteris paribus*.

References

Amemiya, T. (1985). *Advanced Econometrics*. Harvard University Press, Cambridge, MA.

Besharov, D.J., and Germanis, P. (2000). "Evaluating WIC." *Evaluation Review*. 24(2), 123-191.

Brown, M.G., and Johnson, S.R. (1984). "Equivalent Scales, Scale Economies, and Food Stamp Allotments: Estimates from the Nationwide Food Consumption Survey, 1977-78." *American Journal of Agricultural Economics*, 66(3), 286-293.

Buse, R.C., and Salathe, L.E. (1978). "Adult Equivalent Scales: An Alternative Approach." *American Journal of Agricultural Economics*, 60(3), 460-468.

Camarota, S.A. (1999). "Immigrants in the United States 1998-A Snapshot of America's Foreign-born Population." *Center for Immigration Studies*. Backgrounder 1-99, Washington, DC.

Connecticut Association for Human Services (2000). "Food Stamp Questions and Answers." URL: http://info.med.yale.edu/chldstdy/CTvoices/kidslink/kidslink2/econ/texts/9603-21.html, Last modified: July 7, 2000.

Davidson, R., and MacKinnon, J. (1993). *Estimation and Inference in Econometrics*. Oxford University Press, New York, NY.

Deaton, A. (1997). *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. The Johns Hopkins University Press, Baltimore, MD.

Deaton, A., and Muellbauer, J. (1980). *Economics and Consumer Behavior*. Cambridge University Press, Cambridge, UK.

Dorfman, J.H., Kling, C.L., and Sexton, R.J. (1990). "Confidence Intervals for Elasticities and Flexibilities: Reevaluating the Ratios of Normals Case." *American Journal of Agricultural Economics*, 72(4), 1006-17.

Emling, S. (1998, April 19). "Booming Southeast Looks to Immigrants for Labor." *The Atlanta Journal-Constitution*, Special Report: 1998 Southern Economic Survey, p. P9.

Fan, J.X., and Zuiker, V.S. (1998). "A Comparison of Household Budget Allocation Patterns between Hispanic Americans and non-Hispanic White Americans." *Journal of Family and Economic Issues.* 19(2),151-174.

Greene, W.H. (1997). *Econometric Analysis*. Prentice Hall, 3rd edition, London, UK.

Haines, P.S., Guilkey, D.K., and Popkin, B.M. (1988). "Modeling Food Consumption Decisions as a Two-Step Process." *American Journal of Agricultural Economics*, 72(November 1990), 543-552.

Heckman, J.J. (1979). "Sample Selection Bias as a Specification Error." *Econometrica*, 47, 153-162.

Holcomb, R.B., Park, J.L., and Capps, O., Jr. (1995). "Revisiting Engel's Law: Examining Expenditure Patterns for Food at Home and Away from Home." *Journal of Food Distribution Research*, 26(2), 1-8.

Holsendoph, E. (1998, April 19). "Corporations See Green Gold Behind Wave of Latinos." *The Atlanta Journal-Constitution*, Special Report: 1998 Southern Economic Survey, p. P6.

Johnston, J., and Dinardo, J. (1997). *Econometric Methods*. Mc Graw-Hill, 4th edition, New York, NY.

Knutson, R.D., Penn, J.B., and Flinchbaugh, B.L. (1998). *Agricultural and Food Policy*. Prentice Hall, 4th edition, Upper Saddle River, NJ.

Leung, S.F., and Yu, S. (1996). "On the Choice between Sample Selection and Two-Part Models." *Journal of Econometrics*, 72, 197-229.

Maddala, G.S. (1983). *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge University Press, Cambridge, UK.

Muellbauer, J. (1980). "The Estimation of the Price-Houthakker Model of Equivalence Scales." *Econometrica*, 48(1), 153-176.

Oliveira, V., and Gundersen, C. (2000). "WIC and the Nutrient Intake of Children." *U.S. Department of Agriculture*, Economic Research Service. Foods and Rural Economics Division. FANRR-5. Washington, DC.

Prais, S.J., and Houthakker, H.S. (1955). *The Analysis of Family Budgets*. Cambridge University Press, Cambridge, UK.

Reed, J., and Ramirez, R.R. (1998). "The Hispanic Population in the United States." *U.S. Census Bureau*. Current Population Reports: Population Characteristics, March 1997 (Update). Series P20-511. Government Printing Office, Washington, DC.

Sadoulet, E., and De Janvry, A. (1995). *Quantitative Development Policy Analysis*. The John Hopkins University Press, Baltimore, MD.

Stone, J.R.N. (1954). *The Measurement of Consumer's Expenditure and Behavior in the United Kingdom, 1920-1938*. Vol. I. Cambridge University Press, Cambridge, UK.

U.S. Bureau of the Census (1999). *Statistical Abstract of the United States: 1999*. (119th Edition) Government Printing Office, Washington, DC.

U.S. Department of Agriculture (2000a). "Food Stamps: About FSP – Introduction." *Food Nutrition Service*. URL:http://www.fns.usda.gov/fsp/MENU/about/about.htm, Last modified: March 28, 2000.

U.S. Department of Agriculture (2000b). "Women, Infants, and Children: Frequently Asked Questions." *Food Nutrition Service*. URL:http://www.fns.usda.gov/wic/income eligibilityguidelines.htm, Last modified: September 12, 2000.

U.S. Department of Agriculture (2000c). "WIC Program Participation and Costs." *Food Nutrition Service*. URL:http://www.fns.usda.gov/pd/wissumary.htm, Last modified: August 29, 2000.

U.S. Department of Agriculture (1998a). "Continuing Survey of Food Intakes by Individuals and Diet and Health Knowledge Survey on CD-ROM." *CSFII/DHKS 1994-96*. Food Surveys Research Group, Beltsville Human Nutrition Research Center, Agricultural Research Center, Washington, DC.

U.S. Department of Agriculture (1998b). *Agricultural Statistics*. Government Printing Office. Washington, DC.

U.S. Bureau of Labor Statistics (1998). "A Profile of the Working Poor 1996." Labor Force Statistics from the Current Population Survey. Office of Employment and Unemployment Statistics. *Bureau of Labor Statistics*, Report 918. URL: http://stats.bls.gov/cpswp96.htm, Last modified: February 13, 1998.

White, J. (1980). "A Heteroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity." *Econometrica*, 48(4), 817-838.

Wilde, P.E., Cook, P., Gundersen, C., Nord, M., and Tiehen, L. (2000). "The Decline in Food Stamp Program Participation in the 1990's." *U.S. Department of Agriculture*, Economic Research Service. Foods and Rural Economics Division. FANRR-7. Washington, DC.

Wilde, P.E., McNamara, P.E., and Ranney, C.K. (1999). "The Effect of Income and Food Programs on Dietary Quality: A Seemingly Unrelated Regression Analysis with Error Components." *American Journal of Agricultural Economics*, 81(4), 959-997.

Table 1. Number of Children between 1 and 5 years old in Hispanic Households in the U.S., 1994-96

Children Between 1-5 Years Old	Years						TOTAL	
	1994		1995		1996			
	No.	%	No.	%	No.	%	No.	%
None	110	50.4	112	49.8	111	55.5	333	51.9
One	65	29.8	74	32.9	62	31.0	201	31.2
Two	35	16.1	30	13.3	19	9.5	84	13.0
Three	8	3.7	7	3.1	7	3.5	22	3.4
Four or More	0	0.0	2	0.9	1	0.5	3	0.5
Total	218	100.0	225	100.0	200	100.0	643	100.0

Source: CSFII 94-96 sample.

Table 2. Characteristics of Hispanic Household heads in the U.S., 1994-96

Age and Sex Categories	%
Age	
Under 25	8.9
Between 25 and 34	32.6
Between 35 and 44	27.0
Between 45 and 54	13.6
Between 55 and 64	9.7
Over 65 years old	8.2
Total	100.0
Sex	
Male	61.8
Female	38.2
Total	100.0

Source: CSFII 94-96 sample.

Table 3. Income Level of Hispanic Households in the U.S. compared to Poverty Threshold, 1994-96

Level with respect to Poverty Threshold [a]	Years						TOTAL	
	1994		1995		1996			
	No.	%	No.	%	No.	%	No.	%
Between 0-130%	95	43.6	104	46.2	106	53.0	305	47.6
Between 130-350%	89	40.8	83	36.9	67	33.5	239	37.1
Over 350%	34	15.6	38	16.9	27	13.5	99	15.3
Total	218	100.0	225	100.0	200	100.0	643	100.0

Note: a - Poverty threshold was $16,036 per year in 1996 for a 4-member family (U.S. Bureau of Statistics, 1998).

Source: CSFII 94-96 sample.

Table 4. Hispanic Households Receiving Food Stamps or WIC Certificates, by Level of Income, 1994-96

Income Level Categories (dollars per year)	Percentage of Income Spent on Food	All Households		Food Stamps		WIC	
		Number	% [a]	Number	% [b]	Number	% [c]
Under $5,000	71.3	14	2.2	11	78.6	3	21.4
$5,000 - $9,999	46.7	100	15.6	55	55.0	23	23.0
$10,000 - $14,999	40.6	102	15.9	38	37.3	31	30.4
$15,000 - $19,999	30.4	90	14.0	22	24.4	22	24.4
$20,000 - $24,999	25.9	82	12.8	10	12.2	21	25.6
$25,000 - $29,999	24.0	43	6.7	1	2.3	9	20.9
$30,000 - $34,999	20.0	43	6.7	2	4.7	2	4.7
$35,000 - $39,999	18.6	35	5.4	1	2.9	7	20.0
$40,000 - $44,999	16.1	27	4.2	2	7.4	1	3.7
$45,000 - $49,999	12.6	23	3.6	1	4.3	1	4.3
$50,000 and above	11.5	84	13.1	0	0.0	1	1.2
Total	29.4	643	100	143	22.2	121	18.8

Note: a - Percentage of Hispanic households in this income category wrt. total number of Hispanic households.
b - Percentage of Hispanic Households in this income category receiving food stamps.
c - Percentage of Hispanic households in this income category receiving WIC certificates.

Source: CSFII 94-96 sample.

Table 5. Variables used in the Estimation of Food Consumption Patterns of Hispanic Population in the U.S.

Variables	Name	Description of the Variable
Weekly Income	LINCWK	Natural log of total before-tax income of the household, in $/week.
Household Size	LHHSIZE	Natural log of household size, in adult equivalents.
Age of Household Head	LAGE	Natural log of age of household head or reference person, in years.
Sex (*Binary*)	S_FEM	Sex of household head or reference person (1-Female; 0-Male).
National Origin (*Binary*) default: Other Spanish/Hispanics	O_MEX	HH members identified as Mexican, Mexican-American or Chicano.
	O_PRI	Household members identified as of Puerto Rican origin.
	O_CUB	Household members identified as of Cuban origin.
Geographic Region (*Binary*) default: West	R_NEAST	Households located in Northeast region of the U.S.
	R_MWEST	Households located in Midwest region of the U.S.
	R_SOUTH	Households located in South region of the U.S.
Urbanization Status (*Binary*) default: Outside MSA	U_MSAINC	HH located in central city, inside Metropolitan Statistical Area (MSA).
	U_MSAOUT	HH located in central city, outside Metropolitan Statistical Area (MSA).
Education (*Binary*) default: No formal education	G_ELEM	HH head completed/attended one or more years of elementary school.
	G_HIGH	HH head completed some years, or completed High School or GED.
	G_COLL	HH head with one to four years of college education.
	G_GRAD	HH head with five or more years of college.
Tenure Status (*Binary*)	TOWNER	Tenure status of household dwelling (1-Owner; 0-Other).
Food Stamps (*Binary*)	FSTAMP	Any household member receiving food stamps (1-Yes; 0-No).
WIC Program (*Binary*)	WIC	Any household member participating in WIC program (1-Yes; 0-No).
Year of the Survey (*Binary*) default: Year 1994	Y_95	Household surveyed in 1995 (1-Yes; 0-No).
	Y_96	Household surveyed in 1996 (1-Yes; 0-No).
Inverse Mills Ratio	I.Mills Ratio	Included as a regressor for the two-step Heckman's procedure.
Additional Variables (*Only SS method*)	SIGMA	Standard deviation of the error term of the regression level equation.
	RHO	Correlation coefficient between disturbances of probit and level equations.

Table 6. Income and Household Size Elasticities at the Mean for Hispanic Consumer, 1994-96

Food Group	Income Elasticities			Household Size Elasticities		
	TP	HP	SS	TP	HP	SS
Grains	.0549 (-.0985, .2082)	.6358 (-.4330, 1.7049)	.0515 (-.0807, .1838)	.5879 (-.3362, 1.5121)	-.7296 (-2.2203, .7611)	.5929 (-.3389, 1.5247)
Vegetables	.1185 (-.1070, .3440)	.7696 (-.7607, 2.2998)	.1343 (-.1151, .3836)	.4192 (-.2959, 1.1344)	.9188 (-.7444, 2.5818)	.3799 (-.2704, 1.0301)
Fruits	-.0482 (-.1945, .0982)	.0580 (-.2334, .3494)	.0335 (-.1009, .1680)	.3653 (-.3300, 1.0605)	.7070 (-.8113, 2.2254)	.5357 (-.4689, .5403)
Milk	-.0286 (-.1354, .0783)	.2304 (-.1876, .6484)	-.0027 (-.1003, .0949)	.6383 (-.3872, 1.6639)	.8873 (-.5421, 2.3168)	.6308 (-.3822, 1.6437)
Meat	.1020 (-.1109, .3148)	.1270 (-.1239, .3779)	.0840 (-.0979, .2660)	.5903 (-.4251, 1.6057)	.3423 (-.3761, 1.0606)	.6116 (-.4405, 1.6637)
Beef	.2584 (-.5183, 1.0351)	1.5931 (-2.9696, 6.1527)	.1936 (-.4013, .7884)	.6994 (-1.2912, 2.6898)	15.77 (-29.46, 60.995)	1.2420 (-2.2312, 4.715)
Pork	-.6259 (-3.4721, 2.2198)	1.3474 (-2.9861, 3.2554)	.1620 (-.7841, 1.1082)	1.3499 (-4.6640, 2.2199)	2.9564 (-24.86, 30.768)	.9787 (-3.446, 5.4037)
Chicken	.2356 (-.4605, .9316)	.6913 (-1.5150, 2.8997)	-.0137 (-.2478, .2204)	.6122 (-1.0544, 2.2787)	-1.5553 (-8.4435, 5.3333)	.0117 (-1.707, 3.7299)
Legumes	.1062 (-.2136, .4260)	.0023 (-.4182, .4227)	-.0996 (-.4040, .2047)	.8139 (-1.2889, 2.9164)	1.1840 (-2.1355, 4.5026)	1.1089 (-1.750, 3.9674)
Fats	.2766 (-.3831, .9363)	.8099 (-1.7170, 3.3363)	.4544 (-.5940, 1.5029)	.1829 (-.3222, .6879)	-.1072 (-1.1181, .9032)	-.0331 (-.2995, .2334)
Sugar	.2024 (-.4242, .8291)	-.0539 (-.4466, .3388)	.1267 (-.2688, .5223)	.8785 (-1.5693, 3.3257)	.2621 (-.9153, 1.4394)	.8015 (-1.432, 3.0348)
Beverages	.1393 (-.1240, .4026)	.4776 (-.4138, 1.3689)	.1174 (-.1093, .3441)	.5478 (-.3780, 1.4736)	.4201 (-.3098, 1.1499)	.5092 (-.3564, 1.3748)

Note: TP – Two-Part Method; HP – Two-step Heckman's Procedure; SS – Sample Selection or Type II Tobit.

Table 7. Effect of Demographic and Socio-economic Characteristics in the Demand for Food of Hispanic Households in the U.S., 1994-96

	Grains	Vegs.	Fruits	Milk	Meat	Leg.	Fats	Sugar	Bevs.	Beef	Pork	Chkn.
LAGE	++		--	---	+				++	+		
S_FEM											-	+
O_MEX											-	-
O_PRI		---		--				--			+	+
O_CUB		+			+	+	--				-	+
R_NEAST	++	+++				--	++			++	-	++-
R_MWEST		+									-	-
R_SOUTH				--							-	+
U_MSAINC	++		++	+++					--		+++	+
U_MSAOUT	+++		++	+++					---		+	+
G_ELEM			-				+++	++	+++	-	-	-
G_HIGH	+		-				++	+	+++	-	---	-
G_COLL	+++		-				++	++	+++		-	-
G_GRAD	++		+				+++		+++		-	-
TOWNER					-	-	-				-	-
FSTAMP				+							-	-
WIC			+++	+++	-		---		-		+	-

Note: The signs reflect the sign of the regression coefficients associated with each variable, for each food group.
Positive Effect: +++ Strong; ++ Important; + Moderate.
Negative Effect: --- Strong; -- Important; - Moderate.
No statistically significant effect: Blank.