An Analysis of the Hispanic Consumers' Demand for Food Eaten at Home[1]

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Abstract

The Hispanic population in the United States has grown significantly in the last 20 years, becoming the largest minority group in the U.S., accounting for 14.8% of the total U.S. population. Hispanics have also become an important economic force in U.S. consumer spending. This study analyzes factors affecting the demand for meats relative to Hispanic consumers' region of origin, such as Mexico (Mexican, Mexican-American, and Chicano), Puerto Rico, Cuba (Cuban and Cuban American), Central and South American, and other Hispanics. Since Hispanic consumers tend to live in communities with similar ethnic origins, this is expected to impact the demand for food in these communities. Factors such as income, household size, age, gender, and educational attainment are included in the analysis.

Introduction

The Hispanic population in the United States has grown significantly in the last 20 years. In the 1980s the documented legal population accounted for more than 6 percent of the U.S. population; this percentage nearly doubled by the year 2000 (Paulin, 2003). In July 2006, the Hispanic population reached 44.3 million, which makes up 14.8% of the total U.S. population (U.S. Census Bureau, 2007). The official report of the legal population for 2004 was 26.6 million Hispanics of Mexican origin, 3.84 million Puerto Ricans, 1.61 million Cubans, 3.16 million Central Americans, 2.11 million South Americans, and 3.07 other Hispanics (U.S. Census Bureau, 2004).

The Hispanic population can be separated into authorized/documented and unauthorized/undocumented categories. The Pew Hispanic Center, a nonpartisan research organization in Washington, previously estimated that from 11.5 million to 12 million

"unauthorized migrants" lived in the U.S. in 2006 (Selig Center for Economic Growth, 2003), based on the Current Population Survey (CPS) published in 2005.

Hispanic buying power was estimated to reach $9.27 billion in 2007, representing the largest buying power of all the minority groups (Selig Center for Economic Growth 2003). Consumer spending for food among Hispanics has become an increasingly important segment of the economy (Paulin, 1998), accounting for 15% of their average annual household expenditures of $40,123 in 2005 (U.S. Department of Labor, 2007b).

This research focuses on the third largest expenditure among Hispanics – food (only housing and transportation reported higher expenditures). The Consumer Expenditure Survey (CES) divides food expenditures into three types: (a) Food at home (FAH); (b) Food away from home (FAFH); and (c) Total food (TF). The average annual expenditures on FAH are 91.6% higher than FAFH; in fact, the FAH average annual expenditures for Hispanics in 2005 were around $3,883, while the FAFH expenditures were $2,027, totaling a TF average annual expenditure of $5,910 (U.S. Department of Labor, 2007b). For the purpose of this study, the type of food expenditures to be considered is the FAH, focusing on meats: Hispanics spent, on average, 16.4% more on meat than non-Hispanic consumer units in 2005.

This study employs data from the 2005 CES and complements previous studies on food consumption behavior. More specifically, our objective is to analyze how Hispanic groups allocate their FAH expenditures on meat relative to income, socioeconomic and demographic characteristics. We hypothesize that cultural differences prevail among Hispanic communities linked to regions of origin, and that these differences affect the meat consumption patterns for the focus group. We account for that variation using region of Hispanic origin, such as Mexican, Mexican-American, Puerto Rican, Central and South American, and other Hispanics.

Literature on Hispanics' Demand for Meat

The only research that has studied meat groups within the U.S. Hispanic community is Lanfranco (1999). He observed Mexican, Puerto Rican, Cuban, and other Hispanic groups and employed USDA's 1994-96 Continuing Survey of Food Intakes by Individuals in exploring nine main food groups: grains, vegetables, fruits, milk, meat, legumes, fats, sugar and beverages. Most interesting are the three meat subgroups: beef, pork and chicken. Engel functions were estimated using both the Heckman Two-Step (TS) procedure and the Two-Part model (TP) in order to estimate income and household size elasticities. On average, the demand for particular food groups appeared to be relatively inelastic with respect to income and moderately to unitarily elastic with respect to household size.

Lanfranco, Ames, and Huang (2002) estimated a system of demand equations for disaggregated meat products consumption by Non-Hispanic whites and other minority groups, such as Hispanic Americans and African Americans. Their analysis focused on 10 meat products: four types of beef (ground beef, roast, steak, and other beef), four types of pork (bacon, pork chops, ham, and other pork), one type of poultry (fresh and frozen chicken), and one seafood category (canned fish and seafood). Using the 1998 CES data, the incomplete demand systems approach was adapted to derive and specify a demand equation for empirical estimation; the original LinQuad form was estimated using a two-step estimation procedure for a system of censored equations. The authors found that Hispanic households food consumption patterns differed with other ethnic groups in the U.S. and showed that the size of the household had a positive effect on the probability of consuming a particular meat product. However, once a household chose to consume, household size had a negative effect on the expenditure on that item, especially among the higher-priced meats (Lanfranco, Ames, & Huang, 2002).

Garcia (2006) employed a censored incomplete demand system of the LinQuad form for recognizing the consumption patterns of Hispanics and comparing them with those of whites, African Americans, and other minorities. Using the 2003 CES, three sets of demand systems were presented and elasticities were estimated for ground beef, roast beef, beef steak, other beef, bacon, pork chops, ham, other pork, poultry, and seafood. He concluded that the responsiveness to changes in demand were due to changes in own prices, cross prices, income, and household size for each ethnic group. Hispanics on average allocated more for total food expenditures, consumed more at home, and spent 21.5%, 8.1%, 5.4% more on meat products than whites, African Americans, and other minorities, respectively (García, 2006).

Data and Methodology

Using cross-sectional data from the 2005 Consumer Expenditure Survey (CES), the present study examines Hispanics' expenditure patterns related to ethnic region of origin – Mexican (Mexican, Mexican-American, and Chicano), Puerto Rican, Cuban (Cuban and Cuban American), Central and South American, and other Hispanics. Including the region of origin helps us to comprehend whether significant differences exist in consumption by Hispanic groups by origin in relationship to food eaten at home. Variables such as income, household size, region of domicile (West, Northeast, South, Midwest), and the age, gender, and educational attainment of the survey respondent are included in the analysis.

The current research provides a new analysis using a recent CES (2005), complementing previous studies on food consumption behavior but providing two main contributions. The first relates to the geographic origin of Hispanics, since differences in consumption patterns among ethnic groups have been demonstrated and divergence in expenditure behavior within Hispanics also exists. The second contribution relates to food expenditures. Many meat groups have been

analyzed; however, goat and lamb, two relevant meats in the diet of Hispanics, have not been included as a separate meat group.

Several reasons account for differences between prior studies of demand for meats and the current study. For instance, tastes and preferences could have changed due to the Hispanic population eventually adapting themselves to the different food supplies in the U.S. They can now incorporate some U.S. products in their daily consumption as well. On the other hand, the growth of Latino food suppliers and Hispanic restaurants has broadened their food options. Another reason why there might be differences between the estimation in this and prior research may be due to changes in the demographic characteristics, especially the growth of the U.S. Hispanic population and the growth of U.S. Hispanics' buying power.

The current Consumer Expenditure Survey (CES) program began in 1980. The survey, which is conducted by the U.S. Census Bureau for the Bureau of Labor Statistics, consists of two components: 1) diary, or recordkeeping survey, completed by participating consumer units for two consecutive 1-week periods, and the sample is surveyed across a 12-month period; and 2) an interview survey, in which expenditures of consumer units are obtained in five interviews conducted at 3-month intervals. Each component of the survey queries an independent sample of consumer units that is representative of the U.S. population. For the Diary Survey, about 7,500 consumer units are sampled each year. Each consumer unit keeps a diary for two 1-week periods, yielding approximately 15,000 diaries a year. The interview sample, selected on a rotating panel basis, surveys about 7,500 consumer units each quarter. Each consumer unit is interviewed once per quarter for five consecutive quarters. Data are collected on an ongoing basis in 105 areas of the U.S.

The diary component of the 2005 CES is the one utilized in this thesis. It is designed to capture expenditures on small, frequently purchased items that normally are difficult for respondents to recall. Detailed records of expenses are kept for food and beverages. The diary also provides national representation and detailed socioeconomic, cross-sectional, market segment data, relating the expenditures and incomes of consumers to the characteristics of those consumers. Furthermore, the 2005 CES contains information on the Hispanic population by region of origin, a fundamental characteristic of the population for this study.

The Hispanic ethnicity in the sample was found to be distributed as follows: 35% were Mexican households, 29% Mexican-American households, 14% other Hispanic households, 12% Central and South American households, and 9% Puerto Rican households. The fact that Mexicans were the group with the highest presence in the sample was expected, since the statistics of the U.S. Census Bureau show basically the same trend. Regarding the geographic distribution, Hispanics are mainly located in the South and West; in fact, these two regions accounted for 74% of Hispanics in the sample. Some differences can be found in the geographic distribution among groups. While more than 47% of Mexicans and Mexican-Americans are located in the West, more than 56% of Puerto Ricans are located in the Northeast. Moreover, while more than 70% of Central and South Americans are located in the South and West, more than 73% of other Hispanics are located in the Northeast and South. Additionally, 97% of the sample lives in urban areas.

In the estimation of demand equations using micro-data, one issue arises that needs to be addressed. This issue is the censored-response problem and is due to individuals reporting zero consumption for a particular item in a specific period of time. The expenditures in the CES are presented on a weekly basis. Thus, it is expected that some Hispanic individuals do not consume

all meat categories during the week they were interviewed. For instance, an individual could consume pork and beef during one week but not consume fish and lamb. However, this does not mean that this individual does not consume fish and lamb at all.

Zero consumption is assumed to be due to sample selection. There is a decision process that must be taken into account, which in turn has to be modeled separately (Lanfranco, 1999). Not accounting for this issue will yield biased estimates. In this respect, Tobin (1958) stated that, when estimating relations in the presence of the accumulation of observations with zero values, the OLS estimator produces inconsistent estimates (García, 2006). The use of the OLS estimation technique is no longer useful, then, given the selectivity bias problem derived from zero consumption unless this issue is accounted for. To overcome the difficulty with self-selectivity bias, a Two Step (TS) procedure developed by Heckman (1979) is implemented.

Two-step Heckman procedure

The zero consumption is also known as the issue of Limited Dependent Variable (LDV). The LDV is broadly defined as a dependent variable whose range of values is substantively restricted (Wooldridge, 2006, p. 582). To respond to this situation, the TS procedure is employed to estimate the probability of purchase and to adjust for those who did not consume from a certain meat category on the days they answered the survey but who may consume from it on another day. The TS procedure was followed by Lanfranco (1999), Lanfranco, Ames and Huang (2002), and Garcia (2006).

Zero consumption reflects the lack of homogeneity among the surveyed Hispanic participants. In the first step of the Heckman procedure, the selection process, which is responsible for selection bias problems, is studied with the so-called selection model. The bias is caused by the existence of differences between those who consume and those who do not

consume meat, and it is necessary to compare these groups. The representation of the willingness of each individual to consume one meat category can be represented as a Linear Probability Model (LPM). The LPM has two main disadvantages: the fitted probabilities can be less than zero or greater than one, and the partial effect of any explanatory variable is constant (Wooldridge, 2006, p. 582). To avoid the LPM limitations, one can consider a class of binary response models of the form in the equation 1 as shown in Wooldridge (2006, pp. 583-584):

$$P(Y = 1 | X) = G(\beta_0 + \beta_1 X_1 + ... + \beta_k X_k) = G(\beta_0 + X\beta) \quad (1)$$

Note that: $X\beta = (\beta_1 X_1 + ... + \beta_k X_k)$ where G is a function taking values strictly between zero and one and states for the standard normal cumulative distribution function (cdf), which describes the probability distribution of a real valued random variable; the choice of G ensures that equation 1 is strictly between zero and one for all variables.

Heckman (1979) proposed a method for dealing with the issue of zero expenditure, modeling the participation decision using a probit model that determines the response probability. In the first step, the probit equation models the process of buying or not buying a specific commodity as a binary decision. A probit regression is computed in order to estimate the probability that a given household consumes *ith* meat category.

In the estimation of nonlinear binary response models, maximum likelihood estimation is indispensable. Following Wooldridge (2006), to obtain the maximum likelihood estimator conditional on the explanatory variables, the density of Y_t given X_t is needed. This can be written as such:

$$f(Y | X_t; \beta) = \left[G(X_t\beta)\right]^{y}\left[1 - G(X_t\beta)\right]^{-y}, Y = 0,1 \quad (2)$$

From this equation, when $Y = 1$, we get $G(X_t\beta)$ and when $Y = 0$, we get $1 - G(X_t\beta)$. By taking logs of equation 2, the following probit log-likelihood function is obtained, which is the specification used to estimate equation 3:

$$\ell_t(\beta) = Y_t \log\left[G(X_t\beta)\right] + (1 - Y_t)\log\left[1 - G(X_t\beta)\right] \quad (3)$$

So far, the estimates of the probit model do not tell about the effect of the unmeasured characteristics of the respondents on the consumption decision. This information is not available in the coefficients of the explanatory variables. Heckman (1979) noted that when self-selectivity exists, there is an omitted variable bias in the OLS estimates, with a magnitude given by the so-called Inverse Mills Ratio (IMR). If this omitted variable was included in the regression, then OLS is consistent (Lanfranco, 1999). In the Heckman procedure, the selection equation (probit model) is used to construct a selection bias control factor, which is called Heckman's Lambda, or IMR. This factor is a summarizing measure, which reflects the effects of all unmeasured characteristics that are related to the consumption. Then, the final equation that is estimated is augmented with the IMR for correcting the selectivity bias in the demand equation. Following García (2006), $q = f(\beta X)$ is the equation of interest and $\frac{\phi(x_1'\hat{\beta}/\sigma_e)}{\Phi(x_1'\hat{\beta}/\sigma_e)}$ is the instrumental variable called IMR. In the final estimation, when only observations with non-limit responses are used, the IMR becomes a variable that links the participation decision with the equation that represents the quantity demanded (García, 2006).

Empirical model

The set of dependent and explanatory variables employed in the empirical model were constructed based on the economic and demographic profile provided earlier. Most prior studies of demand for food, and specifically demand for meat, have used the CES, and the variables

employed in this study are consistent with those used in prior research. The dependent variables are the expenditures on meat categories. The first step models the decision to purchase and the second step models the levels of expenditures. For the first step, binary/dummy variables were created for defining positive expenditures, coded as value of 1, so that the contrast is made with those who did not report weekly expenditures on meat. For the dependent variable in the second step, the log of expenditure on the i^{th} meat category is computed.

The CES provides consumer unit characteristics, characteristics of the reference person of the consumer unit/household and characteristics of the members of the consumer unit; these three types of consumer characteristics represent the explanatory variables of the single equation model. The consumer unit economic and demographic characteristics employed in this thesis are household income, family size, Hispanic origin, and the region where the U.S. Hispanic respondents live. The characteristics of the reference person of the household and members of the consumer unit used refer to benefits from Food Stamp program, educational attainment, gender, and age.

The variable income identifies the amount of the consumer unit's income before taxes in the past 12 months. This variable was coded as a continuous variable of log transformations on income. The variable FamSize provides information about the number of members in the consumer unit and was coded as a continuous variable. The variables representing the Hispanic origin groups are Mex (Mexican), Mex-Am (Mexican-American), PR (Puerto Rican), C&SA (Central and South American), and OHisp (Other Hispanic); these groups were coded as dichotomous variables. The categories Cuban, Cuban-American, and Chicano were grouped into the category Other Hispanic, due to few observations in the data set. These categories allow taking into account differences in expenditures among Hispanic groups.

Accounting for the region where the U.S. Hispanic respondents live, the survey includes the four regions that constitute the U.S. territory; they are Northeast, Midwest, South, and West. These variables were coded as dichotomous and compared to consumption in the South.

The variable FSrec was constructed by identifying whether any members of the consumer unit received food stamps during the past 12 months, coded as value of 1 so that the contrast is made with those who did not receive that benefit. The different levels of education of the household's reference person were grouped into the variable HSedu; this variable represents a range of respondent's education from never having attended school to high school education coded as value of 1, so that the contrast is made with those who reported to have more than high school education. The marital status was grouped into the category Married; thus, this variable takes a binary value comparing married reference persons, coded as value of 1, being the default of the contrast to widowed, divorced, separated, or never married.

Results

In regards to general results, the Second Stage (SS) results showed a considerable number of explanatory variables that were not statistically significant at the standard levels, principally in the cases of pork, lamb and goat, fish and seafood, and other meats (Tables 1 and 2). However, some of the same explanatory variables in those expenditure estimates were found to be statistically significant in the likelihood to purchase, First Stage, estimation. The same number of variables in the FS and in the SS was used for the six meat categories. In this respect, Tomek and Robinson (1990) recommend retaining variables with *t* values of one or larger, and this is a commonly used criterion for adding or dropping variables. This standard is based on the notion that variables that are deemed logical in the model should not be dropped on stringent statistical grounds (Tomek and Robinson, 1990). The discussion of the results presented here includes

those variables that are statistically significant at less than 10%, and those that show a *t-value* greater than one; in either case, the levels of significance are specified throughout the discussion.

The sign of the income variable was found to be negative in the first step and in the estimates of second step for beef, pork, poultry, lamb and goat, fish and seafood. These results would generally imply that these meat categories are inferior goods for U.S. Hispanics, meaning that as U.S. Hispanics' incomes increase, they consume less meat. However, the income variable was not statistically significant at 10% in most of these estimations. So, to infer these meat categories as inferior or as normal goods for this sample is not possible.

Hispanic household expenditures and income had high variation, measured in terms of the standard deviation. Outliers for beef, pork and seafood expenditures were removed, using only expenditures within three standard deviations from their mean. Even so, plots of the income and expenditures showed that there is no consistent pattern in the relationship between these two variables.

Given the low levels of significance in the income variable, it is difficult to make inferences about the expenditure elasticities, at least given the expenditures utilized. However, these meat expenditures are the sum of other sub-categories. For example, the beef expenditure includes other beef sub-categories, such as ground beef, chuck roast, round roast, other beef roast, round steak, sirloin steak, other steak, and other beef. In the components of the beef category, there are some expenditures generally considered normal goods ($\eta_Q > 0$), such as steak (sirloin and other steak), and inferior goods ($\eta_Q < 0$), such as ground beef and chuck roast. The interaction among these beef categories could cancel out the effects between the categories. This may influence the income variable to be not significant at the standard levels for the meat categories proposed. In this respect, Lanfranco (1999) pointed out that one possible explanation

in not finding precise estimates in the elasticities occurs when using broad categories with different quality characteristics, which are lost when estimated in aggregate (Lanfranco, 1999).

As an example showing that these effects could cancel each other, an estimation using two groups from the beef category was performed. The SS for ground beef and chuck roast showed Hispanics consume less of these two expenditures as income increases (inferior goods); the second step for sirloin and other steak showed that Hispanics consume more of these two expenditures as income increases (normal goods).

The FS models the likelihood of purchase; the variables used in this stage are determinants of whether the Hispanics buy or not buy the meat categories proposed during the observation period. The variables used in the SS are determinants of Hispanic expenditures on meats consumption given the likelihood to purchase. The goodness-of-fits of the equations range from R^2 of 0.03 to 0.33. The high levels of censoring and left skewed distributions of expenditures are possible causes of this outcome. Additionally, fewer socio-economic variables had significant effects on the decision of how much to purchase than on the probability of purchasing meats. However, several variables were found to influence the consumption of beef, poultry, other meats and pork products.

With regard to the fish and seafood, and the lamb and goat expenditures, no socioeconomic or demographic characteristics were found to determine how much the Hispanic households spend for those categories. These results were to be expected for lamb and goat, since only 50 observations out of 770 were positive. For fish and seafood, there may be other variables related to taste and preference that affect the decision of how much to consume that were not considered for this study. The empirical results of the decision to purchase beef, pork, poultry, and other meats are discussed below.

Probit First-Stage

Starting with beef, many of the explanatory variables were found to have statistical significance at less than 10% (Table 1). However, the results show that the higher the income, the lower the likelihood of total beef consumption (5%). The results also show that, as family size increases, Hispanics are more likely to consume beef (1%). There was a significant difference (at 5%) in the likelihood of beef consumption by Puerto Ricans and Mexicans, Puerto Ricans being less likely to consume beef than Mexicans. Hispanic households living in the Midwest were found to be significantly more likely to consume beef than those living in the South (5%). Households with a married reference person were more likely to consume beef than households with unmarried, divorced, single or separated reference persons (1%).

High school education and age of the household's reference person were not statistically significant at 10% but their *t-values* were greater than 1. The effects of these variables showed that high school education or greater decreases the likelihood of consuming beef, and the likelihood of purchasing beef is lower as age of the household's reference person is higher.

The results for pork show that family size increases the probability of consuming pork (1%). There was a significant difference (at 10%) in the likelihood of consuming pork among Central and South Americans and Mexicans; that is, Central and South Americans were less likely to consume pork products than Mexicans. Households with a married reference person were more likely to consume pork than households with unmarried, divorced, single or separated reference persons (1%). It was also found that as age increases, the likelihood of purchasing pork decreases (10%). Income and high school education of the household's reference person were found to be important, but they had less than a 20% level of significance; income and high school education decrease the likelihood of purchasing pork.

Differences among Hispanic groups and regional differences were not significant at 10%, but some of their *t-values* were greater than 1. These results imply that Mexican Americans are less likely to consume pork than Mexicans, and Hispanic households living in the Midwest were found to be more likely to consume pork than those living in the South.

For poultry, results show that as family size increases, Hispanics are more likely to consume poultry products (1%). Income was also found to be significant in the purchasing decision, but the higher the income, the less the likelihood of poultry consumption (5%). Significant differences (at 1%) were shown in the likelihood of poultry consumption among other Hispanics and Mexicans, with other Hispanics being more likely to consume poultry products than Mexicans (1%). Hispanic households living in the Midwest were found to be less likely to consume poultry than those living in the South (10%)

It was also found that households with a married reference person are more likely to consume poultry than households with unmarried, divorced, single or separated reference persons; while this effect was not significant at 10%, the *t-value* was greater than 1. The likelihood of purchasing poultry products increases with age of the household's reference person, and households with a male reference person are more likely to purchase poultry products than those with a female reference person. Although not significant at 10%, *t-value*s of age and gender of the household's reference person parameter estimates were greater than 1.

For Other Meats consumption, variables that were found to be significant at less than 10% were family size and male. These two variables increase the probability of consumption in the other meat category. Income and Hispanic households living in the West were not significant at 10%, but their parameters had estimated *t-values* greater than 1. Higher income was found to

increase the probability of consuming other meats, while Hispanic households living in the West were found to be less likely to consume other meats than those living in the South.

Expenditures Decision Second-Stage Results

The beef expenditures model performed well in the Second Stage (SS) (Table 2). The results for beef in the double-log (DL) model show that, as family size increases, the consumption on beef increases (5%). With regard to Hispanic origin, a significant difference (at 5%) was found in the decision on how much beef to purchase between Puerto Ricans and Mexicans, whereby Puerto Ricans consume less beef than Mexicans. Hispanic households in the Midwest (5%) and in the Northeast (1%) consume more beef than Hispanic households living in the South, given their decisions to purchase beef.

Households with a married reference person consume more beef than households with unmarried, divorced, single or separate reference persons (5%). It was also found that households with a reference person with less than high school education consume less beef than those with more than high school (5%). On the other hand, households receiving food stamps (10%) tend to consume more beef, as do households with a male reference person compared to those with a female reference person (12%). The linear (LM) and single log (SL) results showed similar effects; the only discrepancies arose in terms of the levels of significance for recipients of food stamps, age and male.

Origin was found to affect the level of consumption of pork products, given that pork was purchased. Other Hispanics were found to consume more pork products than Mexicans (18%). No other estimated parameters had *t-values* greater than one for level of pork consumption.

The results for poultry in the SS model show that, as family size increases, the consumption of poultry also increases (10%). Hispanic origin was also found to affect the

consumption of poultry; Central and South Americans consume significantly more poultry products than Mexicans (at 5%), given the decision to buy poultry. Gender of the reference person in the household (1%) influences the consumption of poultry category, as households with a male reference person consumed more poultry products than those with a female reference person. Expenditures by households in the Midwest, reference person with a high school education or higher, and food stamp recipient households were not significant at 10%, but their estimated *t-values* were greater than 1, implying importance in the decision on levels of poultry expenditures.

There is a relevant difference in the decision to consume other meats among Puerto Ricans (16%) and Central and South Americans (17%) when compared to Mexicans; Puerto Ricans consume more and Central and South Americans consume less of other meat products than Mexicans. As age increases, the consumption of beef also increases (17%). These differences in consumption by Hispanic origin groups and age, while they were not significant at 10%, may be important in the decisions over levels of expenditures on other meats.

Comparison with Prior Research

In general, the above results are consistent with demand studies previously undertaken for the U.S. Hispanic population. For instance, Paulin (1998) found that three demographic characteristics affected expenditure patterns: income, family size, and age. Paulin (1998) also found that ethnicity is a factor that influences one's tastes and preferences, so differences existed among expenditure patterns across the Hispanic subgroups. This work supports Paulin's study in the sense that different patterns exist across Hispanic groups as well as the importance of family/household size in consumption patterns.

In regards to the studies of the demand for meat, household size effect results here agree with those calculated by Lanfranco, Ames and Huang (2002); household size had a positive effect on the probability of consuming a particular meat product. Furthermore, these authors also found that the demand for chicken appeared to be least responsive to the changes in household income; the same result shown here, since income was found to be not significant for poultry products. These results also agree with Lanfranco (1999), because national origin plays an important role in the demand for specific food groups.

There are some differences with those results found in the past. For instance, Paulin (2003) showed that neither Hispanic group differed in a statistically significant way from Mexican families; this conclusion indicated homogeneity by origin for food at home expenditures. Our results show differences from his study, made in 1998. In the current work, household size had a positive effect on beef and poultry. This differs from the outcomes of Lanfranco, Ames and Huang (2002), who found that household size had a negative effect on the amount of money spent on those items, especially among the higher-priced meats.

Lanfranco (1999) found that the only relevant variable for beef consumption was household size; as shown in the current work, besides household size, there were other important variables in determining the consumption of beef, such as Hispanic origin, region (Midwest/Northeast), marital status, high school education, gender, and recipients of food stamps. Furthermore, Lanfranco's study (1999) found that household size was not very important as far as the consumption of pork and chicken was concerned; the current study agrees with Lanfranco's standpoint on pork consumption but suggests otherwise compared with his conclusions about chicken, since household size was indeed important in consumption of poultry products.

Differences were also found in terms of the Hispanic origin. Lanfranco (1999) found that Cubans and Mexicans consume less pork than other meats. Here, Other Hispanics (including Cubans) consume more pork than Mexicans. Lanfranco (1999) found that the West region consumed more pork and chicken than the Northeast, the Midwest, and the South. In these results, none of the regions were important in determining the consumption of pork. Also, while the West was not important for poultry products, the Midwest was.

Conclusions

The overall objective of this study was to analyze the consumption behavior of the U.S. Hispanic population for high-valued foods in the meat categories with regard to selected socioeconomic and demographic characteristics. A CES sample containing socioeconomic and demographic profiles comprised 877 Hispanic households; the demographic profiles indicate Hispanics are not a homogeneous group. Differences were found in geographic distribution, age, household size, income, education, and family composition. These dissimilarities among Hispanic groups warranted the differentiation in the Hispanic category by ethnic origin in the analysis of their meat expenditures.

Hispanic household expenditures and income were found to have high variation, measured in terms of their standard deviations. Beef, pork and seafood consumption were estimated using only expenses within three standard deviations from their mean. The sample was also limited to consumer units within three standard deviations from the mean income. Although this treatment of outliers in the data further restricted the sample, the final data set containing 770 households provided more uniformity and robustness in the implications of the model.

The income variable was found to be negative in both the first step and in the second step for beef, pork, poultry, lamb and goat, fish and seafood, but it was generally not significant at the

10% level. Low levels of significance in the income variable did not allow making inferences about the expenditure elasticities. In interpreting the significance of household income, the fact that the expenditures utilized are aggregated into broad categories may confound the inferences. That is, the interaction of decisions within these meat categories could offset the effects among the sub-categories, which was demonstrated for two subgroups of beef: ground beef and chuck roast compared to sirloin and other steak.

In terms of demographic results, family size was found to be more important than income in determining the probability of purchase; once a household chooses to consume, family size remains more important than income in the decision to increase expenditures on meats. In general, household size was remarkably important for all models and estimations.

Originating from different regions affected the probability of purchase and the expenditure decision. In terms of the probability of purchasing, Puerto Ricans are less likely to consume beef and lamb and goat, Central and South Americans are less likely to consume pork, and other Hispanics are more likely to consume poultry products (the comparison group was Mexicans). In terms of the expenditure decision, beef, poultry and other meats were the meat categories most affected by region of origin. In this respect, Puerto Ricans spend less on beef and more on other meats than Mexicans, and Central and South Americans spend more on poultry products than Mexicans.

Living in different regions of the U.S. also affected the probability of purchase; for instance, households living in the Midwest are more likely to consume beef and lamb and goat; those living in the Northeast are more likely to consume fish and seafood. In terms of the expenditure decision, Hispanic households in the Northeast consume more beef than those living in the South. Other demographic characteristics found to affect the likelihood of purchasing

meats include marital status, age and gender. Likewise, in terms of decision of how much to spend, region, marital status, gender and age were found to affect meat consumption.

Implications

The findings of this study represent an opportunity for producers, retailers, restaurateurs, and the food industry in general to understand what Hispanic consumers want. Furthermore, the food distribution industry, including processors through retailers through restaurateurs, must understand the preferences for high-valued foods for Hispanics in order to harness the market opportunities that this segment of the population creates (García, 2006).

The most frequently consumed meat by Hispanic households was beef, with 484 households (of 877, or 55%) reporting weekly expenditures on that category, followed by 456 (52%) reporting poultry, 408 (47%) reporting pork, 397 (45%) reporting other meats, 280 (32%) reporting fish and seafood, and just 50 (6%) reporting lamb and goat. These preferences, together with the fact that the particular region of origin was found to affect the probability of purchase and the expenditure decision, can be used for the industry in terms of meat distribution.

The current study does not account for seasonality, special occasions, such as Cinco de Mayo, Independence days of Latin American countries, Christmas, and other festivities associated with religious holidays where Hispanics could increase or reduce their consumption of meats. Future research could use data that reflects Hispanics' preference for meat based on seasonality, special occasions, or holidays. Future research may also consider using more than one period or using data sets that record consumption over the time. The current study used single equation models, which raises some limitations, such as the assumption that households spend a fixed amount of income on meats.

Table 1. Probit First-Stage: Parameter estimates of U.S. Hispanic meat consumption, 2005

Variable	Beef	Pork	Poultry	Lamb & goat	Fish & seafood	Other meats
LNInc	-.147542 b (.060353)	-.085492 d (.057595)	-.116233 b (.058751)	-.114068 d (.085100)	-.062127 (.058606)	-.063622 (.056902)
FamSize	.111839 a (.035296)	.085694 a (.033410)	.131493 a (.033995)	.014671 (.051431)	.019390 (.033129)	.216098 a (.035569)
Mex-Am	-.117351 (.123752)	-.135843 (.120834)	-.115317 (.121463)	-.213651 (.189273)	-.174088 d (.124982)	.357235E-02 (.122081)
OHisp	.118290 (.165256)	.102194 (.161209)	.459657 a (.168632)	-.243415 (.253180)	.089978 (.160951)	.074772 (.160234)
PR	-.414244 b (.204176)	-.101622 (.200703)	-.072552 (.204354)	-.642017 c (.379237)	-.314726 d (.210029)	-.200535 (.202509)
C&SA	-.044620 (.165473)	-.294970 b (.161723)	.153888 (.165325)	-.359444 d (.274150)	-.072042 (.164297)	-.082487 (.163836
Married	.285330 a (.109961)	.327086 a (.106913)	.160713 d (.107998)	.220257 d (.172519)	.422034 a (.110729)	.030766 (.107602)
Northeast	.042426 (.164715)	-.466337E-02 (.161423)	.142652 (.167231)	.104083 (.264596)	.355884 b (.164352)	-.301455E-02 (.161895)
Midwest	.462104 a (.186457)	.214588 (.172457)	-.283516 c (.172629)	.311890 d (.237977)	-.050371 (.175265)	.082857 (.172264)
West	-.077508 (.114230)	.054127 (.112056)	-.027124 (.113005)	-.178714 (.180930)	.835493E-02 (.114908)	-.123708 (.112457)
HSedu	-.107435 (.103808)	-.147540 d (.100548)	-.097172 (.101934)	-.117195 (.155634)	.021106 (.102245)	-.015300 (.101290)
FSrec	.139674 (.157814)	-.023896 (.151264)	-.036260 (.153656)	-.057157 (.237468)	-.079573 (.154657)	-.015390 (.151106)
Age	-.392993E-02 (.331941E-02)	-.602326E-02 c (.325001E-02)	.343262E-02 (.329045E-02)	.880908E-02 c (.512249E-02)	-.596397E-02 c (.337442E-02)	.118556E-02 (.326955E-02)
Male	-.019132 (.097500)	.093387 (.095060)	.106362 (.095964)	.138914 (.148892)	.165634 c (.096612)	.154575 c (.095590)

Notes: Std Errors in parentheses. Significance: a = 1% level; b = 5% level; c = 10% level; d = 20% level. Fraction of correct predictions: Beef = 0.675; Pork = 0.593; Poultry = 0.637; Lamb & goat = 0.935; Fish & seafood = 0.658; Other meats = 0.609.

Table 2. OLS-Second-Step. DL Parameter estimates of U.S. Hispanic meat consumption, 2005

Variable	Beef	Pork	Poultry	Lamb & goat	Fish & seafood	Other meats
LNInc	-.118455 (.112115)	.023574 (.129839)	-.055800 (.071562)	-.152676 (2.46772)	-.051528 (.205328)	.054189 (.071297)
FamSize	.183184 b (.081691)	.082529 (.119169)	.129439 c (.076090)	.109094 (.334556)	.025760 (.085925)	-.040913 (.135169)
Mex-Am	-.151884 (.140175)	-.206695E-03 (.233196)	-.077053 (.124563)	-.695423 (4.60563)	-.158853 (.636612)	-.037781 (.100002)
OHisp	-.012245 (.137709)	.273680 d (.202453)	.246888 (.276318)	-.802272 (5.26331)	-.027319 (.390500)	.123836 (.145876)
PR	-.900838 b (.381864)	.013630 (.230450)	-.054060 (.159168)	-2.03983 (13.8553)	-.247445 (1.06926)	.362780 d (.259309)
C&SA	.014400 (.118820)	.057598 (.479471)	.308032 b (.144436)	-.931578 (7.80864)	.028052 (.312279)	-.212770 d (.157012)
Married	.530651 b (.238577)	-.024994 (.522560)	.081487 (.129829)	.366518 (4.73555)	.534450 (1.51767)	-.895803E-02 (.100863)
Northeast	.310443 a (.113621)	.075252 (.139424)	.123358 (.138918)	.474535 (2.31541)	.606985 (1.19387)	.077417 (.133026)
Midwest	.629225 b (.296696)	.089492 (.336736)	-.252764 (.228908)	1.01285 (6.65069)	.865114E-02 (.268348)	-.013607 (.159352)
West	.084146 (.104644)	.089213 (.128963)	-.030509 (.085171)	-.623270 (3.90233)	-.076221 (.146766)	-.091653 (.132317)
HSedu	-.234690 b (.112319)	-.096485 (.231038)	-.115742 (.095094)	.031137 (2.52142)	.091945 (.125964)	-.055704 (.087524)
FSrec	.264023 c (.159039)	-.047131 (.128142)	-.117968 (.104385)	-.296639E-02 (1.29134)	.087875 (.352248)	-.124463 (.145076)
Age	-.430907E-02 (.366304E-02)	.599662E-02 (.987513E-02)	-.200211E-02 (.304741E-02)	.015230 (.190291)	-.797185E-02 (.022487)	.396644E-02 d (.291888E-02)
Male	.117106 d (.074497)	058219 (.154611)	.263077 a (.085736)	.753751 (2.96844)	.163642 (.599249)	.108148 (.133660)
IMR	2.81275 b (1.40234)	-.118125 (2.47169)	.890604 (1.11671)	2.53190 (25.4308)	1.30630 (5.11681)	-.667122 (1.12461)

Note: Std Errors in parentheses. Significance: a =1% level; b = 5% level; c = 10% level; d = 20% level. R^2 : Beef = 0.078; Pork = 0.072; Poultry = 0.074; Lamb & goat = 0.332; Fish & seafood = 0.034; Other meats = 0.066.

References:

García, C. I. (2006). *A comparative study of household demand for meats by U.S. Hispanics.* Unpublished Master Thesis, Louisiana State University, Baton Rouge.

Heckman, J.J. (1979). Sample selection bias as a specification error. *Econometrica*, 47 (1), 153-161.

Lanfranco, B. A. (1999). *Food consumption patterns of the Hispanic community in the United States.* Unpublished Thesis (M. S.), University of Georgia.

Lanfranco, B. A., Ames, G. C. W., & Huang, C. L. (2002). Comparisons of Hispanic households' demand for meats with other ethnic groups. *Journal of food distribution research*, *33*(1), 92-101.

Paulin, G. D. (1998). A growing market: Expenditures by Hispanic consumers. *Monthly Labor Review, 121*(3), 3.

Paulin, G. D. (2003). A changing market: expenditures by Hispanic consumers, revisited. *Monthly Labor Review*, *126*(8), 12-35.

Selig Center for Economic Growth. (2003). The multicultural economy. Athens, GA: Selig Center for Economic Growth, Terry College of Business.

Tobin, J. (1958). Estimation of relationships for limited dependent variables. *Econometrica,* 26 (1), 24-36.

Tomek, W.G., & Robinson, K.L. (1990). *Agricultural product prices* (3rd ed.). Ithaca and London: Cornell University Press.

U.S. Department of Labor. (2007). Consumer expenditures in 2005. Retrieved Octuber 15, 2007, from http://www.bls.gov/cex/csxann05.pdf

U.S. Census Bureau. (2004). Hispanic population of the United States. Retrieved February 10, 2007, from http://www.census.gov/population/www/socdemo/hispanic.html

U.S. Census Bureau. (2007). Newsroom. Retrieved August 22, 2007, from http://www.census.gov/PressRelease/www/releases/archives/population/010051.html