FOOD CONSUMPTION PATTERNS OF THE HISPANIC COMMUNITY IN THE UNITED STATES

by

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Para mis adorados Mami y Papi, con todo mi corazón

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CHAPTER I

INTRODUCTION

The Growth of the Hispanic Population in the U.S.

Since April 1998, *The Atlanta Journal Constitution* has been dedicating broad coverage to one of the most outstanding population phenomena of this decade. "The United States is currently experiencing the largest sustained wave of immigration in its history, with 1.2 million legal and illegal aliens arriving here each year" (Emling, April 19, 1998). This new wave of immigration comes mainly from Mexico, which represents more than 50% of the Latin American emigration to the United States, and other Latin American countries. Camarota (1999) reported that the March 1998 *Current Population Survey* (CPS) estimated 26.3 million foreign-born persons in the United States. Of this number, 13.4 million came from Latin America: 7.1 million from Mexico (53%), 2.8 million from Caribbean countries (11%), 1.8 million from Central America (7%), and 1.6 millions from South America (6%). The U.S. Census Bureau estimated that in 1996, 28.4 million persons of Hispanic origin resided in the United States (10.8% of the total population). A year later in 1997, the Hispanic population was estimated at 29.7 million, representing 11.1% of the total population. (U.S. Census Bureau, *Current Population Reports*, 1997, 1998). According to U.S. Census Bureau population projections, by 2010 the Latino population is expected to comprise 15.5% of the U.S. population. *The Washington Post* reported that by 2020, more than one in five children will be of Hispanic origin (*The Atlanta Journal Constitution*, July 15, 1998 p. A1).

The term Hispanic, as defined in the Longman Dictionary of American English, refers to individuals or population groups from or related to a country where Spanish or Portuguese is spoken. This is a broad definition that includes different ethnic groups with different cultures and traditions, besides sharing common or similar languages, Spanish or Portuguese. The U.S. Census Bureau (1993) has been using a similar definition for the CPS: "Persons of Hispanic origin were identified by a question that asked for self-identification of the person's origin or descent. Respondents were asked to select their origin (and the origin of other household members) from a 'flash card' listing ethnic origins. Persons of Hispanic origin, in particular, were those who indicated that their origin was Mexican, Puerto Rican, Cuban, Central or South American, or some other Hispanic origin. It should be noted that persons of Hispanic origin may be of any race." For the purpose of this study, we define the terms Hispanic and Latino as synonyms, referring to households whose members recognize their national origin as either Mexican, South or Central American, or Caribbean.

Corporations and businesses perceive the emergent Latino communities as a major sector of the U.S. economy. Latino's buying power has also been growing very fast during the last decade, and today it can be estimated at $350 billion nationwide (*The Atlanta Journal Constitution*, April 19, 1998 p. P1). According to Georgia's Selig Center for Economic Growth, the nation's Latino buying power grew 65.5% in the 1990-97 period, an outstanding compound annual growth rate of 7.5% (Holsendoph, April 19, 1998). Income growth combined with high birth and immigration rates for the Latin American population are responsible for the emergence of the Hispanic market in the United States (Fan and Zuiker, 1998).

Immigrants usually carry with them many of their traditions, customs, and food habits as they settle in the U.S. When possible, the new immigrants try to maintain a diet at least similar to what they were accustomed to eating in their country of origin. This helps make the adaptation process less traumatic in their new country. The increasing demand for ethnic food represents a challenge for food processors, distributors and retailers. Thus, for the food industry it is very important to know more about the consumption patterns of this growing sector of the U.S consumers. This opens a vast area for research opportunities in this field.

Researchers have hypothesized that there exist differences in household budget allocation patterns between Hispanic and non-Hispanic households. In a recent study, Fan and Zuiker (1998) analyzed 13 years of Consumer Expenditure Survey data to study consumption patterns of the Hispanic population. The study concluded that Hispanic households, *ceteris paribus*, allocate significantly more money to food eaten at home and less to food away from home than do non-Hispanic households (Fan and Zuiker, 1998, p. 167). They found that differences in income, prices, and demographic characteristics other than ethnicity explain part of the budget allocation differences between Hispanic and non-Hispanic households. However, controlling for all these variables, the differences decrease but still remain significant in the majority of the expenditure categories considered. Since ethnic origin has been shown to influence the demand for food, estimating expenditure patterns for the Hispanic community could have important implications for the demand for food in the U.S. and the response of farmers, food processors, wholesalers and retailers.

Objectives

The primary objective of this thesis was to analyze food expenditure patterns of the Hispanic population in the United States during the period 1994-1996. Two specific studies were conducted to accomplish this objective. In the first study, the expenditure patterns for total food (TF), food eaten at home (FAH) and food eaten away from home (FAFH) were examined. Cross sectional data were utilized to investigate how Hispanic households allocate their food budget in response to income and household size through their respective expenditure elasticities, and more specifically, how they allocate food expenditures between food eaten at home and food eaten away from home.

In the second study, the objective was to analyze the demand for food among 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 demographic and socioeconomic characteristics of the Hispanic population influence households' food demand. Differences in national origin among groups in the Hispanic community were hypothesized to influence food demand patterns. Other factors, such as age, sex and education of the household head, geographic location of the household, dwelling ownership status, and participation in government transfer payment programs (Food Stamps and Women, Infant and Children certificates), were also considered potentially significant.

According to Engel's law, food expenditures represent a higher share of total expenditure for poorer households than for higher income households, and the same is true for large households over small households at the same level of expenditures (Deaton and Muellbauer, 1980, p. 193). Previous studies have confirmed the validity of

Engel's law for the U.S. population (Holcomb, Park, and Capps, 1995). Since the Hispanic population is a subset of the whole, it is hypothesized that Engel's law holds for this study.

Organization of the Thesis

The thesis is composed of six chapters organized as separate analytical sections. The introduction, statement of the research objectives, justification, and organizational aspects of the study are presented in the first chapter of this thesis. The next chapter provides a characterization of the Hispanic population in the United States. The data base and population sample used in this research effort are described in detail. Strengths and limitations of the selected sample are evaluated. Then, in the next section, basic descriptive sample statistics are presented and compared with other studies and information published periodically by the Census Bureau.

The basic aspects of the consumer demand theory found in the literature are reviewed in the first section of the third chapter. The foundations for using Engel curves for the analysis of expenditure and demand patterns and their relationships with empirical demand studies, when using cross sectional data, are evaluated. The second section presents a discussion of the econometric issues that support the estimation procedures used in the analytical research.

In chapters four and five, two studies comprising the research about food demand and expenditure patterns of the Hispanic population in the U.S. are presented. Chapter four analyzes the expenditure patterns of the Hispanic population in the United States for total food, food eaten at home and food eaten away from home. The analysis in chapter five examines the demand for food in the Hispanic community for nine primary food groups and three meat subgroups. Each individual study includes sections devoted to their own specific methodological details, such as model specification, construction of the data set, presentation of results, discussion of their findings and concluding remarks. Finally, the last chapter of the thesis presents the summary and the conclusions derived from the whole research. While tables presenting basic statistics and major results are placed in the text, the complete set of results of the econometric estimations is provided in the corresponding files contained in the floppy disk accompanying this thesis.

CHAPTER II

THE HISPANIC POPULATION IN THE U.S.

Definition of the Data Set and Construction of the Variables

The data set used in this research was constructed from information collected from the USDA 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII94-96). Only households of Hispanic origin that participated in the 1994-96 two-day survey and provided information about food consumption were selected for analysis. The total sample consisted of 643 households.

Households which did not report any amount of money for weekly income (INCWK), total food expenditure (TF) and food eaten at home expenditure (FAH) categories were excluded from the study. Households reporting zero expenditure for the category food away from home (FAFH) were kept in the data set. Income and expenditure values were constructed on a weekly basis. Reported annual, before-tax household income for the previous calendar year was used as a proxy for actual income. The annual income was transformed into weekly income (INCWK) by dividing by 52. In cases where respondents were allowed to report their expenditures per month, the values were transformed into dollars per week by dividing by four. In all cases, the answers represent the amount in dollars the household spent on each food category, during the last three months preceding the survey. The amount of total TF is a summation of FAH and FAFH. The value of the expenditures for the category FAH was obtained from responses given by the survey respondents as follows:

$$FAH = SHP\_GROC - SHP\_NONF + SHP\_SPECS + SHP\_FAST \quad (2.1)$$

Where SHP_GROC represents weekly expenditure at grocery stores, food stores, salad bars, delis, etc., including purchases made with Food Stamps, during the three months prior to the survey. The amount spent on nonfood items (SHP_NONF), like cleaning or paper products, pet food and cigarettes, was subtracted from the SHP_GROC variable. The SHP_SPEC variable measures weekly expenditure on food brought into the home from specialty stores (bakeries, liquor stores, delicatessens, meat markets, vegetable stands, health food stores, etc.) during the previous three months. The variable SHP_FAST reports how much money was spent per week at fast food outlets, when the food was *brought into the home*, during the same period.

Expenditures on FAFH were reported directly in the survey as the usual amount of money spent per week for food purchased and eaten away from home. This included food and beverages that never entered the home, like food eaten at restaurants, fast food outlets, cafeterias at work or at school or purchased from vending machines, for all household members during the previous three months.

Information about expenditures for specific food groups was not available from the CSFII94-96 survey. Physical quantities were used in this case, so that demand for specific food groups was measured as the quantity consumed, in grams per week, for each of the food groups and subgroups. The nine food groups included in this study were: grains (GRAIN0); vegetables (VEG0); fruits (FRUITS0); milk (MILK0); meat (MEAT0); legumes, nuts, and seeds (LENUSE0); fats (FATS0); sugar (SUGAR0); and beverages (BEV0). Three meat subgroups were also considered: beef (MEAT1), pork (MEAT2), and chicken (MEAT3).

Hispanic Households Demographic and Socio Economic Variables

Several demographic and socio-economic variables were included in the analysis. One of the most important variables is household size. The use of the number of individuals in the household as a measure for household size may not be appropriate, since it is expected that adults and children, and even male and female members of the same age, influence household expenditures on food in a different way. Deaton and Muellbauer (1980, p. 193) indicated that this issue can be reconciled with the use of adult equivalent scales. Buse and Salathe (1978) pointed out that the use of one number to account for individuals of various types can simplify the measurement and testing of expenditure behavior. The theoretical and practical implications of household equivalence scales have brought 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). Many studies that use different approaches to derive different weights or scales are available in the literature (Muellbauer, 1908). However, Deaton (1997, p. 242) concluded that how these adult equivalent scales are calculated by researchers has not been adequately discussed.

For the purposes of this study, I chose the so-called Amsterdam scale, based on nutritional studies (Deaton and Muellbauer, 1980, p. 193). This variable was identified as HHSIZE. Stone (1954) used this scale in his study of consumer's expenditure and behavior in the United Kingdom, during the period 1920-1938. 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 are 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, p. 193). 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.

Information about national origin allowed the classification of the households in four categories: Mexican (O_MEX), which includes persons classified as Mexican-American or Chicano; Puerto Rican (O_PRICAN); Cuban (O_CUBAN), and persons Other Spanish/Hispanic origin. Dummy variables representing origins were used to take into account possible differences among these groups in expenditure patterns. To avoid collinearity problems, the dummy for Other Spanish/Hispanic consumers was dropped. Since the Hispanic population is not evenly distributed in the U.S., I specified variables representing four main regions. While West is the default region, three binary variables account for Northeast (R_NEAST), South (R_SOUTH) and Midwest (R_MWEST).

Other variables were hypothesized to influence food demand. The tenure status of the household dwelling was considered through a simple binary variable (T_OWNER), accounting for dwelling owners. Four binary variables account for differences in education of the household head: G_ELEM accounts for individuals who completed or attended one or more years of elementary school; G_HIGH variable correspond to individuals with one or more years of high school, have a high school degree or a General Education Degree (GED); households whose household head has one to four years of college education are identified by the variable G_COLL, and those with five or more years of college correspond to G_GRAD. The value by default corresponds to persons who never attended school.

Another set of dummy variables allows for shifts in food demand due to urbanization status. Two variables account for households located in Metropolitan Statistical Area, that is Central City location (U_MSAINC), and Outside Central City (U_MSAOUT). The default identifies households located outside the Metropolitan Statistical Area or non-MSA. Binary variables for two income transfer payments for low-income households were also considered in this study; these included the Women, Infants and Children or WIC Program and the Food Stamp Program (FS_RCV12).

Finally, two binary variables were used to identify the year of the sample. While the value by default corresponded to households interviewed in 1994, the variables Y_95 and Y_96 were used to represent households surveyed in 1995 and 1996, respectively.

Characterization of the Hispanic Population Data Set

The CSFII94-96 survey includes information about 8067 U.S. households, surveyed between 1994 to 1996. From those, 727 were identified as Hispanic households, about 9% of the sample. The U.S Census Bureau estimated that the Hispanics accounted for 10.8% of the proportion in 1996. As explained in the previous section, only 643 of the 727 Hispanic households (88.5%) were included in the data set.

As illustrated in Table II.1, households of Mexican origin, the vast majority of the Latin population in the United States, averaged 43.9% of the sample during the study period. Puerto Ricans averaged 11.0%, Cubans 2.6%, and households of other Hispanic origin accounted for the remaining 42.5%. All these categories include not only recent immigrants but also households of Hispanic origin with more than one generation in the U.S. In fact, more than one-half (55.8%) of Hispanics were born in the United States, according to reports of the Census Bureau (Reed and Ramirez, 1998).

Concerning geographic location, 51.2% of the households sampled were located in the Western region of the U.S. (Table II.2). The Southern region accounts for 26.0% of the Hispanic population. Schmid (April 10, 1998) reported that, traditionally, Latino immigrants settled down in the West, with the South being the second most important region. Fan and Zuiker (1998) reported the same ranking order, but with the South following more closely to the leading Western region, which is again consistent with the observation of Schmid (April 10, 1998) that the Southern states experienced a dramatic growth in the Latino population during the 1990-96 period. The Northeast region accounted for 15.2% of the Hispanic households sampled. The Midwest region consistently appears to account for the smallest number of Hispanic households in all the study period, only 7.6%.

On the other hand, Table II.3 illustrates the distribution of households with respect to metropolitan statistical areas (MSA). Households located in the suburban areas (MSA-OCC, outside central city) represented more than 40% of the Hispanic households. Households living in the central city (MSA-ICC, inside central city) averaged about 36% of the sample, while households living outside the metropolitan statistical area (Non-MSA) constituted the smallest urbanization status group with about 21%.

The average household consisted of four individuals, ranging from one to eight members. Eleven households had more than eight members; the maximum number was 13 members, reported by one household. Almost 52% of the households have no children 5 years of age or less (Table II.4). The percentage of households with only one child was uniform during the study period, 31%. Thirteen percent of the households reported 2 children, while the remaining 4%, reported up to four children 5 years old or younger. The average age of household head was 41 years old, with 73% of them in the range of 25 to 55 years old, and in almost 62% of the cases were men, as can be observed from Table II.5. These figures are consistent with the data reported by Fan and Zuiker (1998).

Educational level of the household head is presented in Table II.6. About 1.3 % of the household heads never attended school. In 27.6% of the cases, the household head reported that he or she had received primary education (elementary school level), although only 5% finished 8th grade; 41.1% attended at least one year of high-school, but the percentage of individuals that earned a high school or a General Education Degree (GED) degree was only slightly more than 27%. On average, 23.5% of the household heads attended at least one year of college, but only 6.5% went to graduate school. These statistics are greater than the numbers reported by Fan and Zuiker (1998) for Hispanic households, although similar with reports published by the Census Bureau stating that 53% of all Hispanics 25 years and older had at least a high school diploma in 1996 (Reed, 1997a).

Information about the employment status of the household head is contained in Table II.7. About 54% of the respondents claimed to be fully employed the week preceding the survey. However, the level of unemployment for the sampled household heads was very high, 32%. With 1% of the households reporting undetermined employment status, the remaining 13% of the respondents reported to be employed part-time or were employed but did not work the week prior to the survey. About 18% of the individuals declared they were professionals, managers, officers, or proprietors. About 42.3% were classified as service worker or similar, operative, craftsman or foreman, and 6.7% worked as clerical or sales workers. These figures are similar to the profiles presented by Fan and Zuiker (1998) for the Hispanic population.

Annual income can be expressed as a percentage of the poverty threshold as defined by the Federal Government. According to Dalaker and Naifeh (1998), the Census Bureau uses a set of money income thresholds that vary by family size and composition to detect who is poor, following the Office of Management and Budget's (OMB's) Directive 14. "If a family's total income is less than that family's threshold, then that family, and every individual in it, is considered poor. The poverty thresholds do not vary geographically, but they are updated annually for inflation with the Consumer Price Index (CPI-U). The official poverty definition counts money income before taxes and excludes capital gains and non-cash benefits, such as public housing, medical aid, and food stamps" (Dalaker and Naifeh, 1998).

In the July 1998 issue of the Current Population Reports of the Census Bureau, Reed and Ramirez (1998) reveal that 26.4% of all Hispanic families in the U.S. were living below the poverty level in 1996. The data presented in Table II.8 from the CSFII94-96 survey show that roughly 48% of the selected household can be categorized as ranging from zero to 130% of this poverty threshold, according to their reported annual total income and household size.[1] In the next level, 37% of the households fall in the category between 131 to 350% of this poverty threshold. Only slightly more than 15% average a total annual income that is 350% above the poverty threshold (approximately $56,126).

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[1] The actual poverty thresholds vary in accordance with the makeup of the family. In 1996, the average poverty threshold for a family of four was $16,036; for a family of nine persons or more, the threshold was $31,971; and for an unrelated individual aged 65 and over, it was $7,525. The poverty thresholds are updated each year to reflect changes in the Consumer Price Index (CPI-U) for All Urban Consumers (U.S. Bureau of Labor Statistics, 1998).

A total of 144 households in the study (22.4%) received some food stamps[2] for at least one month in the previous calendar year. For households with annual total income above $25,000, the percentage of households receiving food stamps was below 10%, although important variations were observed in particular years. Households with total income above $50,000 did not receive food stamps in any of the years. Another income transfer payment for low-income households considered in this study was the Women, Infants and Children Program (WIC). The percentage of households receiving benefits under the WIC program, in the form of either checks or food instruments, was never more than 20%.

Finally, information concerning the general food shopping practices of the Hispanic households is reported in Table II.9. About 19% of the Hispanic households reported doing their food purchases more than once a week in 1994 and 1995. For the 1996 sample this percentage declined to 16% in 1996, giving an all-period average of 18.7%. Nevertheless, about 39% of the surveyed households declared that they shopped once-a-week. Almost 26% of the households shopped for food once every two weeks and more than 15% shopped just once a month or less frequently. Supermarkets have been by far the major food outlet where Hispanic households shopped for food, accounting for more than 94% of the shoppers. Only 4.5% of the households shopped most of the time in small stores, food warehouses, specialty stores and food outlets.

[2] Cash subsidies from the government worth $73 per person (Agricultural Statistics, 1998).

Table II.1. National Origin of Hispanic Households in the U.S., 1994-96

National Origin	1994 No.	1994 %	1995 No.	1995 %	1996 No.	1996 %	TOTAL No.	TOTAL %
Mexican	98	45.0	86	38.2	97	48.5	281	43.9
Puerto Rican	24	11.0	27	12.0	20	10.0	71	11.0
Cuban	7	3.2	8	3.6	2	1.0	17	2.6
Other	89	40.8	104	46.2	81	40.5	274	42.5
Total	218	100.0	225	100.0	200	100.0	643	100.0

Source: CSFII94-96 sample.

Table II.2. Regional Distribution of Hispanic Households in the U.S., 1994-96

Geographic Region	Years							
	1994		1995		1996		TOTAL	
	No.	%	No.	%	No.	%	No.	%
Northeast	37	17.0	37	16.4	24	12.0	98	15.2
Midwest	25	11.5	10	4.4	14	7.0	49	7.6
South	50	22.9	71	31.6	47	23.5	168	26.0
West	106	48.6	107	47.6	115	57.5	328	51.2
Total	218	100.0	225	100.0	200	100.0	643	100.0

Source: CSFII94-96 sample.

Table II.3. Location of Hispanic Households, 1994-96

Urbanization Status	1994 No.	1994 %	1995 No.	1995 %	1996 No.	1996 %	TOTAL No.	TOTAL %
MSA-ICC [a]	91	41.7	81	36.0	62	31.0	234	36.4
MSA-OCC [b]	91	41.7	106	47.1	78	39.0	275	42.8
Non-MSA [c]	36	16.6	38	16.9	60	30.0	134	20.8
Total	218	100.0	225	100.0	200	100.0	643	100.0

Note: MSA-Metropolitan Statistical Area
a - MSA, living inside central city
b - MSA, living outside central city
c - Living outside MSA

Source: CSFII94-96 sample.

Table II.4. Number of Children between 1 and 5 years old in Hispanic Households

Children Between 1-5	Years 1994 No.	%	1995 No.	%	1996 No.	%	TOTAL 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	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: CSFII94-96 sample.

Table II.5. Characteristics of the Hispanic Household Head

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: CSFII94-96 sample.

Table II.6. Educational Levels of Hispanic Household Head, in the U.S.

Education Level	Years							
	1994		1995		1996		TOTAL	
	No.	%	No.	%	No.	%	No.	%
No Education	3	1.4	2	0.9	3	1.5	8	1.3
Elementary School	59	27.1	60	26.7	58	29.0	177	27.6
High School	28	12.8	30	13.3	30	15.0	88	13.7
H.S. Diploma or General Edu. Degree	59	27.1	60	26.7	57	28.5	176	27.4
College	57	26.1	57	25.3	38	19.0	152	23.5
Graduate School	12	5.5	16	7.1	14	7.0	42	6.5
Total	218	100.0	225	100.0	200	100.0	643	100.0

Source: CSFII94-96 sample.

Table II.7. Employment Status and Occupation of Hispanic Household Heads

Employment and Occupation	Years							
	1994		1995		1996		TOTAL	
	No.	%	No.	%	No.	%	No.	%
Current Status								
Employed Full Time	123	56.4	130	57.8	97	48.5	350	54.4
Employed Part Time	15	6.9	20	8.9	18	9.0	53	8.2
Empl. not work [a]	11	5.0	7	3.1	10	5.0	28	4.4
Not employed	66	30.3	67	29.8	72	36.0	205	31.9
Not ascertained	3	1.4	1	0.4	3	1.5	7	1.1
Occupation								
Not employed	66	30.3	67	29.8	72	36.0	205	31.9
Prof./Technical	23	10.6	29	12.9	16	8.0	68	10.6
Manager/Officer	19	8.7	20	8.9	8	4.0	47	7.3
Farmer	0	0.0	1	0.4	0	0.0	1	0.1
Clerical/Salesman	19	8.7	14	6.2	10	5.0	43	6.7
Craftsman/Foreman	24	11.0	30	13.3	32	16.0	86	13.4
Operator	24	11.0	18	8.0	19	9.5	61	9.5
Service worker	31	14.2	31	13.9	37	18.5	99	15.4
Other	9	4.1	14	6.2	3	1.5	26	4.0
Not ascertained	3	1.4	1	0.4	3	1.5	7	1.1
Total	218	100.0	225	100.0	200	100.0	643	100.0

[a] – Employed, but did not work the week previous to the survey.

Source: CSFII94-96 sample.

Table II.8. Income Level Hispanic Households compared to Poverty Threshold

Level Respect to Poverty Threshold[1]	Years							
	1994		1995		1996		TOTAL	
	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

[1] – Poverty threshold was $16,036 per year in 1996 for a 4-member family (U.S. Bureau of Labor Statistics).

Source: CSFII94-96 sample.

Table II.9. Food Shopping Practices of Hispanic Households

Shopping Practices	Years							
	1994		1995		1996		TOTAL	
	No.	%	No.	%	No.	%	No.	%
Shopping Frequency								
More than once /wk.	42	19.3	45	20.0	33	16.5	120	18.7
Once a week	79	36.2	83	36.9	90	45.0	252	39.2
Once every 2 weeks	60	27.5	63	28.0	45	22.5	168	26.1
Once or less /month	37	17.0	33	14.7	29	14.5	99	15.4
Never	0	0.0	1	0.4	3	1.5	4	0.6
Major Food Store								
Supermarket	210	96.3	212	94.4	185	92.5	607	94.4
Small store	2	0.9	4	1.8	4	2.0	10	1.5
Food warehouse	5	2.3	3	1.3	3	1.5	11	1.7
Specialty store	0	0.0	0	0.0	0	0.0	0	0.0
Commissary	0	0.0	2	0.9	1	0.5	3	0.5
Cooperative	0	0.0	0	0.0	0	0.0	0	0.0
More than one	0	0.0	1	0.4	2	1.0	3	0.5
Other	1	0.5	1	0.4	0	0.0	2	0.3
Not ascertained	0	0.0	1	0.4	2	1.0	3	0.5
Not applicable	0	0.0	1	0.4	3	1.5	4	0.6
Total	218	100.0	225	100.0	200	100.0	643	100.0

Source: CSFII94-96 sample.

CHAPTER III

THEORY AND METHODOLOGY

Estimation of Demand and Expenditure Patterns using Engel Curves

The theory of consumer behavior provides two related approaches to modeling decisions, the *preference-based approach* and the *choice-based approach*. In the former, the core of the theory is the assumption that the decision-maker has a preference for a set of possible choices that satisfies certain rationality axioms. These preference relations can often be described by means of a utility function that the consumer tries to maximize subject to a budget constraint. In the latter approach, the focus is brought on the direct observation of decision maker's choice behavior, where restrictions that parallel the rationality axioms of the preference-based approach are imposed (Mas-Colell, Whinston, and Green, 1995, p.17).

The basic hypothesis in both cases is that a rational consumer will always choose the most preferred bundle from the set of affordable alternatives. This utility-maximizing, or most preferred, bundle of goods can be expressed as the quantity of each commodity the consumer desires at a given level of prices and income. The correspondence that relates the vector of prices ($\mathbf{p}$) and income (y) to the demanded bundle is called the consumer's *demand correspondence*. When this correspondence is single-valued for all ($\mathbf{p}$,y) it can be referred as a *demand function*. This demand function is observable and is known as Marshallian demand function (Varian, 1992, p. 98-105; Silberberg, 1990, p.

309) or more generally, Walrasian demand function (Mas-Colell, Whinston, and Green, 1995, p. 51). For the of the ith good, it can be written as:

$$q_i = g_i(y, \mathbf{p}). \tag{3.1}$$

Each Marshallian demand function, $q_i = g_i(y, \mathbf{p})$ defines the rules by which the consumer decides how much to purchase of each good, as a function of a vector of prices and total expenditure. If prices are absorbed into the functional form, we obtain $q_i = g_i(y)$, a function that relates income to the demand for each commodity at constant prices. This relationship is commonly referred to as an *Engel curve* (Varian, 1992, pp. 116-118):

$$q_i = g_i(y). \tag{3.2}$$

The derivation of an Engel curve can be illustrated graphically, as in Figure III.1, adapted from Binger and Hoffman (1998, p. 138). On the left graph, the successive increase of income from y_1 to y_2 and y_3, holding the prices of goods i and j constant, shows the utility-maximizing bundles the consumer chooses at each level of income. These income levels used to derive the income expansion path on the left curve can be projected in the consumption-income space for good **i** to obtain the corresponding Engel curve. The income values y_1, y_2, and y_3, are the same as the points that appear on the horizontal axis of the right graph (the Engel curve). The utility maximizing choices of q_i on the left graph (q_1^*, q_2^*, and q_3^*) are the same as those appearing on the vertical axis of the right graph. The Engel curve is constructed connecting all the pairs (y , q*).

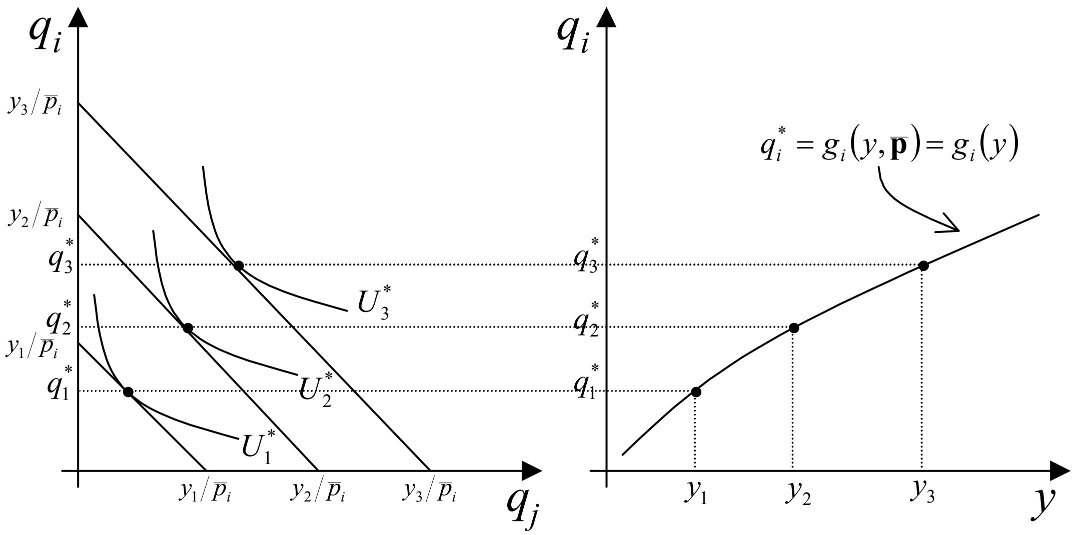

Figure III.1. Derivation of an Engel curve for the **i**<u>th</u> good

Source: Binger, B. R. and Hoffman, E. 1998.

Sadoulet and de Janvry (1995) contend that we are limited to the estimation of Engel curves when all of the observations that we have are cross-sectional data from household budget surveys that do not contain observations in price variations. Multiplying equation (3.2) by price $\boldsymbol{p}_i$ we obtain expenditures, $\boldsymbol{p}_i\boldsymbol{q}_i$, also as functions of total expenditure $\boldsymbol{y}$, which also defines an Engel curve (Deaton and Muellbauer, 1980, p. 19).

Engel curves can be used to classify goods into luxuries, necessities and inferior goods, through the derived income elasticities:

$$\eta_i = \frac{\partial q_i}{\partial y} \cdot \frac{y}{q} = \frac{\partial \ln q_i}{\partial \ln y} \quad . \tag{3.3}$$

An income elasticity with a value greater than, or less than one defines a certain commodity respectively as a luxury ($\eta > 1$) or a necessity ($\eta < 1$). A negative value ($\eta < 0$) value indicates an inferior good. Thus, if Engel's law holds for a given commodity, then its income elasticity should be less than unity (Holcomb, Park and Capps, 1998).

Several functional forms have been used to estimate Engel curves. Mas-Colell, Whinston, and Green (1995, p. 76) suggest that there are two ways to specify demand functions that can be related back to an underlying preference relation. One is to specify various utility functions and derive the demand functions that seem statistically tractable. An easier alternative is to directly specify a tractable demand function and then simply check whether it satisfies the necessary and sufficient conditions to be considered as generated from rational preferences.

Sadoulet and de Janvry (1995) enumerate several desirable properties for the specification of an Engel curve to be used in empirical estimations: (a) it should satisfy the budget constraint; (b) it should have the ability to represent luxuries, necessities, and inferior goods; (c) it should allow for variable income elasticities; and (d) the consumption of many commodities should reach a saturation point as income increases. The first property is called *adding-up restriction*, and as pointed out by Deaton and Muellbauer (1980), it places a constraint on the equation $\boldsymbol{g_i}$ defined in (3.1) and (3.2):

$$\sum_k p_k q_k = \sum_k p_k g_k(y, \mathbf{p}) = \sum_k p_k g_k(y) = y . \tag{3.4}$$

Deaton and Muellbauer (1980) claim that more attention was given to the goodness-of-fit properties than to the traditional theoretical restrictions like adding-up when defining functional forms for empirical analysis. Although this is not a serious problem in cross-sectional analysis, they argue that failing to meet this restriction compromises the theoretical plausibility of the models. The reasons that Deaton and Muellbauer (1980) emphasize the importance of adding-up property is because it restricts total expenditure elasticities. Some of the functional forms used to model Engel functions are the following:

$q_i = \alpha_i + \beta_i y$	*Linear Model*	(LM)	(3.5)
$\ln q_i = \alpha_i + \beta_i \ln y$	*Double-Logarithmic Model*	(DL)	(3.6)
$q_i = \alpha_i + \beta_i \ln y$	*Semi-Logarithmic Model*	(SL)	(3.7)
$\ln q_i = \alpha_i - \beta_i y^{-1}$	*Logarithmic Reciprocal Model*	(LR)	(3.8)
$q_i = \alpha_i + \beta_i y + \gamma_i y^2$	*Quadratic Model*	(QM)	(3.9)

Sadoulet and de Janvry (1995) indicate that the first four models have been commonly used in empirical work. Prais and Houtakker (1955) have used the double-logarithmic, the semi-logarithmic and the log reciprocal functional forms to estimate Engel curves. Deaton and Muellbauer (1980, p. 19) pointed out that more complex forms like the cumulative distribution function of the log-normal distribution have also been suggested to be adequate. Nevertheless, they argue that none of these forms is fully consistent with the adding up restriction.

Holcomb, Park and Capps (1995) used four different models in their estimations, which are linear in the parameters and can be estimated easily by Ordinary Least Squares (OLS): double-logarithmic, semi-logarithmic, quadratic and the so-called Working-Leser functional form. According to Holcomb, Park and Capps (1995), the double-logarithmic function has been historically used to examine Engel's law. It provides a direct estimation of the income elasticities through the corresponding estimated parameters of the regression. However this means that the elasticities are constant over the range of observations (households) which is a very restrictive and not very plausible assumption. An alternative is the semi-logarithmic model recommended by Prais and Houthakker to be used with necessities like food (Holcomb, Park and Capps, 1995; Sadoulet and de Janvry, 1995). The third model, the quadratic function, includes squared terms of the independent variables as regressors and cross-product terms as well.

The last functional form, referred as the Working and Leser model, relates the value shares ($w_i = p_i.q_i/y$) linearly to the logarithm of total expenditure (Deaton and Muellbauer, 1980, pp. 19 and 75). The general form of this model is,

$$w_i = \alpha_i + \beta_i \ln y \qquad \textit{Working-Leser Model} \qquad \text{(WL)} \qquad (3.10)$$

The advantage of this function is that it allows for nonlinear Engel curves and satisfies the adding up condition provided that $\Sigma\alpha_i = 1$, and $\Sigma\beta_i = 0$. In addition, it gives a direct test of Engel's law from the coefficients of the logarithm of income, which is used as a regressor.

In this research, I used models (3.5), (3.6), (3.7), (3.9), and (3.10) to estimate Engel functions for total food and specific food groups. To study the expenditure patterns of the Hispanic population for total food, food eaten at home, and food eaten away from home, I followed the approach of Holcomb, Park and Capps (1995), using the same four functional forms: (3.6), (3.7), (3.9), and (3.10). This study follows in chapter 4. In the second study, presented in chapter 5, the lack of information about expenditures on specific food groups did not allow making inferences about budget shares among the food groups. As a consequence, the demand analysis was limited to physical quantities consumed, so that the Working-Leser model could not be used. The quadratic model was also excluded in this case. Instead, I used the direct linear model for the sake of comparison. Thus, the Engel functions for the nine food groups and the three meat subgroups were estimated using models (3.5), (3.6), and (3.7). The income elasticities for the quantities demanded can be estimated for the models included in this thesis, along with the equation defined in (3.3), as follows:

$$\eta_i = \frac{\partial q_i}{\partial y} \cdot \frac{y}{q_i} = \beta_i \frac{y}{q_i} \qquad \text{(LM)} \qquad (3.11)$$

$$\eta_i = \frac{\partial \ln q_i}{\partial \ln y} = \beta_i \qquad \text{(DL)} \qquad (3.12)$$

$$\eta_i = \frac{\partial q_i}{\partial y} \cdot \frac{y}{q_i} = \frac{\partial q_i}{\partial \ln y} \cdot \frac{\partial \ln y}{\partial y} \cdot \frac{y}{q_i} = \beta_i \cdot \frac{1}{y} \cdot \frac{y}{q_i} = \frac{\beta_i}{q_i} \qquad \text{(SL)} \qquad (3.13)$$

In the case of expenditures, as in the study including total food (TF), food eaten at home (FAH), and food eaten away from home (FAFH), the income elasticity for DL and SL models is estimated in the same way, letting e_i be the expenditure in the i^th food category and substituting by q_i in equations (3.12) and (3,13). In this study, the QM and WL models were also used, and their respective income elasticities computed as follows:

$$\eta_i = \frac{\partial e_i}{\partial y} \cdot \frac{y}{e_i} = \left(\beta_i + 2\gamma_i y\right) \cdot \frac{y}{e_i} \qquad \text{(QM)} \qquad (3.14)$$

$$\eta_i = \frac{\partial \ln e_i}{\partial \ln y} = \frac{\partial e_i}{\partial \ln y} \cdot \frac{\partial \ln e_i}{\partial e_i} \cdot \frac{y}{y}$$

$$= \frac{\partial e_i / y}{\partial \ln y} \cdot \frac{y}{e_i} = \frac{\partial w_i / \partial \ln y}{e_i / y} = \frac{\beta_i}{w_i} \qquad \text{(WL)} \qquad (3.15)$$

It should be noted that the empirical formulation of the QM model used in the study includes cross-product terms for the income variable that will be reflected in equation (3.14). Variable w_i for the income elasticity of the Working-Leser model in equation (3.15) stands for the expenditure value share, as in the formulation of the model presented in (3.10).

Finally, the household size elasticities computed for all the models were computed in exactly the same way, substituting the variable income (*y*) with the variable household size (*h*). Household size is hypothesized to have a positive relationship with food demand.

Review of Econometric Methods and Estimation Techniques

All the models used in this research are linear in parameters, and, in principle, they can be estimated by Ordinary Least Squares (OLS). In general, if we model the dependent variable (*Y*) as a linear combination of *k* regressors or independent variables (*X*), we can write this relationship as:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + ... + \beta_k X_{kt} + \varepsilon_t \qquad t = 1,\ldots,n \qquad (3.16)$$

This is referred in the literature as the *classical linear regression model* (CLR). The β's are the coefficients associated with the independent variables, and ε_t represents the error term or *disturbances*. It can be noted that the variable associated with coefficient β_1 is X_{1t}=1. More compactly, writing equation (3.16) in matrix form:

$$\mathbf{y} = \mathbf{X}'\beta + \varepsilon \qquad (3.17)$$

where **y** is a t × 1 vector, **X** is a t × k matrix with a vector of ones as the first column, β is a vector of 1 × k regressors, and ε is also a t × 1 vector. Following Kennedy (1998, p. 43), the CLR model consists of five basic assumptions about the way in which the observations are generated: (a) the dependent variable can be estimated as a linear function of a specific set of independent variables, plus a disturbance term. The unknown coefficients of this linear function form the vector β and are assumed to be constant; (b) the expected value of the disturbance term is zero; i.e., ε has zero mean; (c) the disturbance terms all have the same variance and are not correlated with one another; i.e. ε is *white noise* with *homoscedastic* variance (not necessarily have to be normally distributed); (d) the observations on the independent variable can be considered fixed in repeated samples; i.e., **X** is non-stochastic; (e) the number of observations is greater than the number of independent variables and that there are no exact linear relationships between the independent variables; i.e., **X** has full column rank. If all these assumptions are valid, OLS is BLUE, or *Best Linear Unbiased Estimator*. This means that no other linear, unbiased estimator of the β coefficients can have smaller sampling variances than the OLS estimates (Johnston and Dinardo, 1997, p. 89). OLS is then unbiased and efficient. The vector of coefficients is estimated as:

$$\mathbf{b} = (\mathbf{X'X})^{-1}\mathbf{X'}y, \tag{3.18}$$

and the mean and variance of b are respectively

$$E(\mathbf{b}) = \beta, \qquad \text{and} \qquad Var(\mathbf{b}) = \sigma^2(\mathbf{X'X})^{-1}. \tag{3.19}$$

A problem arises when the values that the dependent variable can take are limited in some way. This is the case observed in most of the food categories considered in this study. For example, not all households spend money in food eaten away from home. Similarly, some households reported zero consumption during the week they were surveyed, for one or more specific food groups, such as beef, vegetables, or fruits. This situation presents a potential censored-response problem. In this case there could be a sort of selectivity bias and estimation of this model by OLS gives inconsistent estimates of the parameters (Maddala, 1983, pp. 257-267). The problem is that the participation in the FAFH category, for instance, is not randomly sampled; it is assumed that some households decide not to “participate”. There is a decision process that has to be taken into account, which in turn has to be modeled separately. In addition, Haines, Guilkey, and Popkin (1988) strongly argued against one-step decision methods for examining food consumption decisions. They argued that the determinants of the decision whether to consume from a particular food group are often not the same as the determinants of how much to consume, in particular when we refer to highly specified food groups. Haines, Guilkey, and Popkin (1988) conclude that ignoring the two-step decision process will miss the true behavioral patterns, leading to erroneous results in the estimations.

This opens the question to various estimation methods based in a two-step decision process. In the first step one can consider the existence of a *decision equation*, which models the process of buying or not buying a specific commodity as a binary decision. This process can be described by the following equation:

$$y_{1i}^* = \beta_0 + \beta_1 x_{1i} + e_i^* \qquad \textit{Probit or Decision Equation} \qquad (3.20)$$

The dependent variable y_{1i}^* is a reservation value, and it is unobserved. Instead, we observe the binary realization y_1, which takes the value $y_{1i} = 1$ (yes) when $y_{1i}^* > 0$, and $y_{1i} = 0$ (no) when $y_{1i}^* < 0$. Estimating this equation by OLS, as a linear probability model, has two major weaknesses: (a) it does not constrain the predicted value to lie between zero and one, as expected; and (b) it is *heteroscedastic*, which violates one of the assumptions of the CLR model (Johnston and Dinardo, 1997). In this case the error term is assumed to be normally distributed such that $e_i^* \sim N(\mu, \sigma^2)$. Thus, although the unobservable variable y_1^* is distributed normally, its realization y_1 is not. Equation (3.20) is a simple binary probit (BP), so it is also called the *probit equation*, and it can be estimated using Maximum Likelihood (MLE) method. Dropping subscript 1 for simplicity, it can be shown that,

$$\Pr(y_i = 1) = \Pr(y_i^* > 0) = \Pr\left(\frac{e_i^*}{\sigma} > -x_i\frac{\beta}{\sigma}\right)\Pr\left(\frac{e_i^*}{\sigma} < x_i\frac{\beta}{\sigma}\right) = \Phi\left(x_i\frac{\beta}{\sigma}\right), \qquad (3.21)$$

where Φ is the standard normal cumulative distribution function (cdf). It follows that,

$$\Pr(y_i = 0) = 1 - \Pr(y_i = 1) = 1 - \Phi\left(\frac{x_i}{\sigma}\right). \qquad (3.22)$$

Under the assumption of independent identical distributed sampling (IID) , the corresponding likelihood function can be derived as the product of the probability of each observation, as shown in Johnston and Dinardo (1997, p. 420). The likelihood function, denoted by L is then:

$$L = \prod_{i=1}^{T} \Phi\left(x_i \frac{\beta}{\sigma}\right)^{y_i} \left[1 - \Phi\left(x_i \frac{\beta}{\sigma}\right)\right]^{1-y_i}. \qquad (3.23)$$

The parameters β and σ go together, implying that the numerical scale of the latent variable is unobservable (β and σ are not separately identified). The standard deviation of the disturbance term, σ can be normalized to one, to be able to get β. Taking logs, we obtain the following probit log-likelihood function, which is the specification used to estimate equation (3. 20) by MLE.

$$\ln L = \sum_{i=1}^{T} \{y_i \ln[\Phi(x_i'\beta)] + (1 - y_i)\ln[1 - \Phi(x_i'\beta)]\} \qquad (3.24)$$

This likelihood function is globally concave in β. Local and global maxima will be the same and the Newton-Raphson estimation method provides a straightforward estimation method (Amemiya, 1994, p. 335). The correct specification of the likelihood function means that we have the asymptotic properties of MLE: consistency, asymptotic efficiency and asymptotic normality (Johnston and Dinardo, 1997, p. 143).

The second step considers a regression or *level equation*. It contains the information of those individuals for which the realization variable $y_{1i} = 1$ (yes), that is $y_{2i} = y_{2i}^*$ when $y_{1i}^* > 0$, being otherwise their information unobservable ($y_{2i} = 0$). This equation is denoted by:

$$y_{2i}^* = \gamma_0 + \gamma_1 x_{2i} + u_i^* \qquad \textit{Regression or Level Equation} \qquad (3.25)$$

In this equation, at least in principle, u_i^* is not necessarily normally distributed, and up to this moment it does not involve any sample selection or selectivity bias. Equation (3.25) could be estimated by OLS using only the observations for which $y_{1i} = 1$ (yes), and correcting for heteroscedasticity, when necessary. When the level of use, given any, is conditionally independent of the decision of use, the model is known in the literature as a *Two-Part* model (TP), as pointed out by Leung and Yu (1996). While this approach looks appealing to model two-step decisions where the level stage can be expressed by means of an unconditional equation, it does not seem appropriate to represent situations where selectivity bias is present. In this case, another family of models called generically as *Sample Selection* models (SS) can be used. In the SS models, equation (3.25) is no more an unconditional equation, but a conditional one. Now, the disturbances of equations (3.20) and (3.25) are assumed to be correlated through correlation coefficient ρ (rho), and following a bivariate normal distribution:

$$\left(e^*, u^*\right) \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \sigma_{eu} \\ \sigma_{ue} & \sigma^2 \end{pmatrix}\right], \qquad (3.26)$$

where $\sigma_e^2 = 1$ for identification purposes, so we can call $\sigma_u^2 = \sigma^2$ for simplicity. This extension provided by SS models is precisely the separation of the decision and the level process into two different but related equations. Amemiya (1983, p. 385) calls this sample selection model as a Type II Tobit model, which is a generalization of the original Tobit, widely used to estimate models with censored or truncated samples (Kennedy, 1998). The SS model connects the probit equation (3.20) that stands for the decision problem with the original regression equation (3.25) through the possible correlation between their disturbances, assumed to be joint normally distributed as denoted in (3.26).

There are some alternative ways to deal with this new situation. Holcomb, Park and Capps (1995) chose the two-step Heckman procedure to circumvent this problem because they considered this method to be less restrictive than the Tobit estimation technique and easy to implement. Heckman (1979) noted that when there exists self-selectivity, there is an omitted variable bias in the OLS estimates, with a magnitude given by the so-called inverse Mills ratio. If this omitted variable were included in the regression, then OLS is consistent. The two steps are as follows: first, run the probit model in (3.20), which deals with the decision problem and compute the inverse Mills ratio, as:

$$\hat{\lambda} = \lambda\left(x_1'\hat{\beta}\right) = \frac{\phi\left(x_1'\hat{\beta}/\sigma_e\right)}{\Phi\left(x_1'\hat{\beta}/\sigma_e\right)}, \tag{3.27}$$

with $\sigma_e = 1$ as noted before, and ϕ is the standard normal probability distribution function (pdf). Second, estimate the Engel curve by OLS using equation (3.25), including the estimated inverse Mills ratio as one of the regressors (Heckman, 1979). The coefficient associated with λ in this regression is $\rho\sigma$, where ρ (rho) and σ (sigma) are defined as before. Since σ is always positive by definition, if this coefficient is significantly different from zero, it means that ρ is also significantly different from zero.

In the same way, if this coefficient is not significantly different from zero, then σ is not statistically significant.

Although the use of the two-step procedure of Heckman gained wide popularity, Johnston and Dinardo (1997) remark that there is no consensus among analysts on the value of selectivity bias methods and when their use is appropriate. Kennedy (1998) refers to Heckman's two-step procedure as a second best alternative to maximum likelihood. Davidson and MacKinnon (1993) suggest the use of a full step Maximum Likelihood method (FIML) which makes use of all the information about the covariance between the residuals of the probit and the regression equations, giving more efficient estimates. They also recommend the use of the two-step procedure only to test for the presence of selectivity bias, and in case it is detected, they suggest that the FIML should be used. In this case, both equations (3.20) and (3.25) are estimated simultaneously. This method, based on the maximization of a likelihood function, uses starting values from probit and OLS that in practice give better results than the Heckman procedure (TSP 4.5 Reference Manual, 1999, p. 239). The likelihood function of the SS model can be stated as:

$$L = \prod_0 f\left(y_{2i} = 0, y_{1i}^* \leq 0\right) \prod_1 f\left(y_{2i} = y_{2i}^*, y_{1i}^* > 0\right). \tag{3.28}$$

Following Amemiya (1983), equation (3.28) can be rewritten as:

$$L = \prod_0 \Pr\left(y_{2i} = 0 / y_{1i}^* \leq 0\right) \Pr\left(y_{1i}^* \leq 0\right) \prod_1 f\left(y_{2i} / y_{1i}^*\right) \Pr\left(y_{1i}^* > 0\right)$$

$$= \prod_0 \Pr\left(y_{1i}^* \leq 0\right) \prod_1 \int_0^{\infty} f\left(y_{1i}^*, y_{2i}\right) dy_{1i}^*$$

$$= \prod_0 \Pr\left(y_{1i}^* \le 0\right) \prod_1 \int_0^\infty f\left(y_{1i}^* / y_{2i}\right) f\left(y_{2i}\right) dy_{1i}^*$$

It can be noted that expression $f(.,.)$ is the joint density of y_{1i}^* and y_{2i}^*, so it can be written as the product of a conditional density and a marginal density. Also, the conditional distribution of y_{1i}^* given $y_{2i}^* = y_{2i}$ is normal with mean $x_{1i}'\beta + \sigma_{eu}\sigma_u^{-2}(y_{2i} - x_{2i}'\gamma)$ and variance $(\sigma_e^2 - \sigma_{eu}^2 . \sigma_u^{-2})$. Thus,

$$L = \prod_0 \left[1 - \Phi\left(x_{1i}'\beta / \sigma_e\right)\right]$$
$$\times \prod_1 \Phi\left\{\left[x_{1i}'\beta/\sigma_e + \sigma_{eu}\left(y_{2i} - x_{2i}'\gamma\right)/\sigma_e\sigma_u^2\right] \cdot \left[1 - \sigma_{eu}^2/\sigma_e^2\sigma_u^2\right]\right\} \phi\left[\left(y_{2i} - x_{2i}'\gamma\right)/\sigma_u\right]/\sigma_2$$

Defining the correlation coefficient *rho* as $\rho = \sigma_{eu}/\sigma_e.\sigma_u$ and letting $\sigma_e = 1$ and $\sigma_u = \sigma$ as before, we can take logs to write the final expression of the likelihood function used in the estimation with MLE:

$$\ln L_i = \left(1 - y_{1i}\right) \ln \Phi\left(-x_{1i}'\beta\right)$$
$$+ y_{1i}\left\{-\ln(\sigma) + \ln\phi\left(x_{2i}\frac{\gamma}{\sigma}\right) + \ln\Phi\left[\left(x_{1i}\beta + \rho x_{2i}'\frac{\gamma}{\sigma}\right)\left(1 - \rho^2\right)^{-0.5}\right]\right\} \quad (3.29)$$

Leung and Yu (1996) pointed out that a fundamental distinction between the SS and the TP models lies in the assumptions on the error terms of equations (3.20) and (3.25). The SS model assume that $E(u^*) = 0$, so that $E(u^*|y_1^*) = \rho\sigma\lambda(x_1'\beta)$. On the other hand, the TP model assumes that $E(u^*|y_1^*) = 0$. This difference is the core of the vigorous debate between the advocates of one model and the other. Leung and Yu (1996) considered that although the SS models have been vigorously criticized in favor of the TP models, the merits of the latter have been grossly exaggerated in the literature. They offer a more balanced account for the merits of the two models. “Our results do not support the contention that the two-part models dominate the sample selection model, nor do we find that the sample selection model is superior to the two-part model" (Leung and Yu, 1996, p. 200). A major weakness of the sample selection model is that it is sometimes affected by collinearity problems. In that sense, Leung and Yu (1996, p. 201) explain that "models with few exclusion restrictions, a high degree of censoring and a low variability among the regressors, or a large error variance in the choice equation, can all contribute to near collinearity between the regressors and the inverse Mills ratio, rendering the two-step estimator ineffective." In addition, TSP International reports in its software manual that some problems appear to occur when the probit equation is dominating the likelihood function. In this case the intercepts become distorted, the estimated correlation coefficient of the residuals is slightly less than one in absolute value, and the residual covariance matrix is nearly singular. The standard error or the correlation coefficient and its covariance with other parameters is set to zero, and in these cases it is not clear how to interpret the model (TSP 4.5 Reference Manual, 1999. p.257).

Estimation of the Engel Curves

All the food groups and subgroups considered in this research allow for zero consumption or expenditure. Thus, their corresponding Engel functions were estimated using both the sample selection (SS) model and the two-part model (TP). The former was computed using both the Heckman's two-step procedure (HP) and the full MLE (ML). In the latter, the decision equation is the same probit equation as in the HP method, and the level equation was estimated by OLS using only the observations where a positive amount of consumption was reported. The remaining food categories, total food (TF) and food eaten at home (FAH) do not present the selectivity problems, so they were estimated by least squares.

We tested all cases for heteroscedasticity using a simple Lagrangian Multiplier test on squared fitted values, a Likelihood Ratio test for heteroscedasticity, where the total sample is split in two equal halves, and the general White test (Greene, 1995, p. 549-555; Johnston and Dinardo, 1997, p. 166; TSP Reference Manual, 1999, p. 242). The general hypothesis for the White test has the form: H_0: $\sigma_i^2 = \sigma^2$, for all i; H_a: $\sigma_i^2 \neq \sigma^2$. To run this test, an auxiliary regression was computed on the squared OLS residuals, as the dependent variable, on a constant and all the non-redundant variables, their squares, and cross-products. Under the hypotheses of homoscedasticity, the statistic nR^2 is asymptotically distributed Chi-squared where q is degrees of freedom, being q the number of variables in the auxiliary regression minus the constant. That is,

$$nR^2 \xrightarrow{a} \chi^2_{(q)} . \qquad (3.30)$$

The White test does not provide clues about the form of the heteroscedasticity. Thus, the standard errors of the regression coefficients were computed using a heteroscedastic-consistent estimator, whenever necessary. If we let Cov(ε) = Σ = $\sigma^2\Omega$ be the t × t variance covariance matrix of the disturbance term ε of the linear model in (3.17), the correct form of the covariance matrix of the least squares estimator **b** can be stated as an expression called the *generalized OLS covariance matrix* by Davidson and MacKinnon (1993, p. 549):

$$Var(\mathbf{b}) = \sigma^2 [\mathbf{X'X}]^{-1} [\mathbf{X'\Omega X}][\mathbf{X'X}]^{-1} . \qquad (3.31)$$

With homoscedasticity, Ω is the identity matrix I_t, so that $\Sigma = \sigma^2.I_t$, and equation (3.31) collapses to the expression for *Var*(**b**) presented in (3.19). In the presence of heteroscedasticity, the assumption of spherical disturbances is no longer valid and (3.31) is the correct equation to be estimated. If the correct form of the heteroscedasticity were known, then it is easy to compute Ω and use (3.31). White (1980) devised a *heteroscedasticity-consistent covariance matrix estimator*, which is consistent even in the case where the true form of the heteroscedasticity is completely ignored. Thus, (3.31) is computed using the estimator that has the general form:

$$Est.Var(\mathbf{b}) = [\mathbf{X'X}]^{-1}\left[\sum_{i=1}^{n} e_i^2 x_i x_i' \Big/ d_i\right][\mathbf{X'X}]^{-1} \qquad (3.32)$$

The term d_i can have four different forms. Denoting the i^{th} diagonal element of the "hat" projection matrix, $\hat{P}_x \equiv \hat{\mathbf{X}}(\hat{\mathbf{X}}'\hat{\mathbf{X}})^{-1}\hat{\mathbf{X}}'$ as h_i, the number of observations as n, and the number of regressors as k, we have,

1) $d_i = 1$ the usual Eicker-White asymptotic formula,

2) $d_i = n / (n – k)$ that uses finite sample degrees of freedom,

3) $d_i = 1 – h_i$ that is unbiased if ***e*** is truly heteroscedastic, and

4) $d_i = (1 – h_i)^2$ called the "jackknife" approximation.

Davidson and MacKinnon (1993) strongly recommend choosing between options 3) or 4) when the diagonals of the hat matrix are available, or option 2) otherwise. In this research, I followed this suggestion so that the corrections for heteroscedasticity were done computing the standard errors of the regression coefficients using equation (3.32) with the appropriate form of d_i.

Confidence Intervals for Elasticities

The computations performed in this research were completed with the estimation of the corresponding income and household size elasticities. In all cases, the elasticities were computed at the means of the data with the exception of the DL model, where the elasticities correspond to the respective β coefficients of the regression. As noted in the previous section, in the first study, expenditure elasticities were estimated, whereas in the second study, I computed the elasticities for physical quantities demanded.

Although all the estimated coefficients of the regressions were estimated along with their respective standard errors as indicated before, as noted by Dorfman, Kling and Sexton (1990), precision of estimation of regression coefficients neither implies nor guarantees similar precision of elasticity estimates. Attending to this, all the elasticity estimates presented in this research are reported with their confidence intervals.

Several methods for constructing confidence intervals for elasticities can be found in the literature. Miller, Capps, and Wells (1984) examined some alternative techniques that have been proposed for elasticities derived from linear models. They suggested a technique based on results due to Fieller, which in addition to its simplicity, produces exact confidence intervals for elasticities and flexibilities derived as ratios of linear combinations of normally distributed random variables. More recently, Dorfman, Kling and Sexton (1990), compared several techniques for construction of confidence intervals for elasticities and flexibilities believed to be distributed as ratios of normals: a technique based on First-order Taylor Series expansions (TS), Fieller's method (FM), a modification proposed by Scheffé (SC), and three bootstrapping techniques (BT). In their simulations, they found that both the FM and TS methods performed very well, generating nearly identical intervals on average. On the other hand, the authors rejected the SC method, whereas they found the three BT methods slightly underperformed the FM and TS methods. Dorfman, Kling and Sexton (1990) concluded that although their findings support the claim of Miller, Capps, and Wells (1984) in terms of the FM performance, they do not agree with the critics about the TS technique.

Based on the results reported by Dorfman, Kling and Sexton (1990), the confidence intervals for the elasticities presented in this thesis were constructed using the delta method (Greene, 1997, p. 124), which allows the researcher to specify the limiting normal distribution for functions of random variables. Given that the elasticities were expressed as ratios of normally distributed random variables, we can construct confidence intervals for these elasticities using linear Taylor Series approximations. Let elasticity η be a function g of the parameters θ, a vector of unknown random variable and data Z:

$$\eta = g(\theta, Z). \tag{3.33}$$

We can write the estimated variance of η as:

$$Var(\eta) \approx \left(\frac{\partial g}{\partial \hat{\theta}}\right)' Var(\hat{\theta}) \left(\frac{\partial g}{\partial \hat{\theta}}\right). \tag{3.34}$$

For a linear model of the form: $q = \alpha + \beta y + \varepsilon$, the estimated elasticity at the means is, from equation (3.11):

$$\hat{\eta} = \frac{\hat{\beta} \cdot \bar{y}}{\bar{q}}.$$

Assuming that y is non-stochastic, β and y are the elements of vector $\theta = (\beta, q)$’, and therefore they are random variables. Using the delta method, the variance of θ can be approximated by the following expression:

$$Var(\hat{\theta}) = \begin{bmatrix} Cov(\hat{\beta}) & \approx 0 \\ \approx 0 & s^2/n \end{bmatrix}. \tag{3.35}$$

Thus, we can plug expression (3.35) into (3.34) to estimate $Var(\eta)$ for the linear model (LM), assuming that the covariance term between β and q are negligible:

$$Var(\hat{\eta}) = \frac{Var(\hat{\beta}) \cdot \bar{y}^2}{\bar{q}^2} + \frac{Var(\hat{q}) \cdot \hat{\beta}^2 \cdot \bar{y}^2}{\bar{q}^4}. \tag{3.36}$$

The variance of the elasticities derived from the semi-logarithmic (SL), quadratic (QM) and Working-Leser models (WL) were estimated following exactly the same approach. Thus, denoting as α the pursued significance level for the computation of the lower and upper bounds, the (1-α)% confidence interval of the elasticities can be constructed as:

$$(1-\alpha)\%\text{C.I.} = \hat{\eta} \pm t_{(\alpha/2)} \cdot \sqrt{Var(\hat{\eta})} \tag{3.37}$$

CHAPTER IV

FOOD EXPENDITURE PATTERNS OF THE HISPANIC POPULATION IN THE U.S.

Objectives

Engel curves for three food categories: total food (TF), food eaten at home (FAH) and food eaten away from home (FAFH) were estimated using four different functional forms. According to Engel's law, food expenditures represent a higher share of total expenditure for poorer households than for higher income households, and the same is true for large households over small households at the same level of expenditures (Deaton and Muellbauer, 1980, p. 193). In this study, I attempt to verify if Engel's law is confirmed for the particular case of the Hispanic community living in the U.S. Engel curves were estimated for the three food expenditure groups using different functional forms, and the corresponding income and household size elasticities were computed and compared with previous research on U.S. food expenditure patterns. Confidence intervals for the elasticities are also reported.

Methodology

The analysis performed in this chapter follows, in part, the Holcomb, Park and Capps (1995) methodology, which examined the veracity of Engel's law applied to expenditures on both FAH and FAFH for private households in the continental United States (excluding Hawaii and Alaska). Four different functional forms were assumed in

Holcomb, Park and Capps (1995) to represent Engel curves: double-logarithmic, semi-logarithmic, quadratic and Working-Leser models. While the same functional forms are employed in this study, the data set corresponds to a different period, and includes all 50 states.

All the households reported a positive amount of expenditures. Thus, the models for TF and FAH were estimated by least squares. Since the presence of heteroscedasticity was noted in all diagnostic tests, the standard errors of the coefficient estimates were computed using the heteroscedasticity consistent estimator (HLS) proposed by White (1980), with the correction suggested by Davidson and MacKinnon (1993). The equations for FAFH were estimated using a two-part model (TP) and a sample selectivity model (Leung and Yu, 1996) computed using both the two stage procedure (HP) developed by Heckman (1979) and the Type II Tobit or sample selection model (SS) described by Amemiya (1985). As in previous studies, various socioeconomic variables were used to investigate the possible influence of these factors on consumer expenditure patterns. Fan and Zuiker (1998) pointed out that although it can be expected that Hispanic households share many common cultural characteristics, there is also evidence of considerable diversity within this ethnic group. Thus, differences among the different groups of the Hispanic community were examined.

Empirical Models

The mathematical formulation of the equations is similar to Holcomb, Park and Capps (1995), with the variables described in Chapter 2. Then, for each food group (TF, FAH and FAFH), the models can be written as:

Double-logarithmic model:

$$\text{LnExpenditure} = \alpha_0 + \alpha_1\text{LnINCWK} + \alpha_2\text{LnHHSIZE} + \alpha_3\text{LnAGE} + \alpha_4\text{S\_FEM} + \alpha_5\text{O\_MEX} + \alpha_6\text{O\_PRI} + \alpha_7\text{O\_CUB} + \alpha_8\text{R\_NEAST} + \alpha_9\text{R\_MWEST} + \alpha_{10}\text{R\_SOUTH} + \alpha_{11}\text{U\_MSAINC} + \alpha_{12}\text{U\_MSAOUT} + \alpha_{13}\text{G\_ELEM} + \alpha_{14}\text{G\_HIGH} + \alpha_{15}\text{G\_COLL} + \alpha_{16}\text{G\_GRAD} + \alpha_{17}\text{F\_STAMP} + \alpha_{18}\text{T\_OWNER} + \alpha_{19}\text{W\_YES} + \alpha_{20}\text{Y\_95} + \alpha_{21}\text{Y\_96}$$

Semi-logarithmic model:

$$\text{Expenditure} = \beta_0 + \beta_1\text{LnINCWK} + \beta_2\text{LnHHSIZE} + \beta_3\text{LnAGE} + \beta_4\text{S\_FEM} + \beta_5\text{O\_MEX} + \beta_6\text{O\_PRI} + \beta_7\text{O\_CUB} + \beta_8\text{R\_NEAST} + \beta_9\text{R\_MWEST} + \beta_{10}\text{R\_SOUTH} + \beta_{11}\text{U\_MSAINC} + \beta_{12}\text{U\_MSAOUT} + \beta_{13}\text{G\_ELEM} + \beta_{14}\text{G\_HIGH} + \beta_{15}\text{G\_COLL} + \beta_{16}\text{G\_GRAD} + \beta_{17}\text{F\_STAMP} + \beta_{18}\text{T\_OWNER} + \beta_{19}\text{W\_YES} + \beta_{20}\text{Y\_95} + \beta_{21}\text{Y\_96}$$

Quadratic model:

$$\text{Expenditure} = \delta_0 + \delta_1\text{INCWK} + \delta_2\text{HHSIZE} + \delta_3\text{AGE} + \delta_4\text{INCWK}^2 + \delta_5\text{HHSIZE}^2 + \delta_6\text{AGE}^2 + \delta_7\text{INCWKxHHSIZE} + \delta_8\text{INCWKxAGE} + \delta_9\text{AGExHHSIZE} + \delta_{10}\text{INCWKxAGExHHSIZE} + \delta_{11}\text{S\_FEM} + \delta_{12}\text{O\_MEX} + \delta_{13}\text{O\_PRI} + \delta_{14}\text{O\_CUB} + \delta_{15}\text{R\_NEAST} + \delta_{16}\text{R\_MWEST} + \delta_{17}\text{R\_SOUTH} + \delta_{18}\text{U\_MSAINC} + \delta_{19}\text{U\_MSAOUT} + \delta_{20}\text{G\_ELEM} + \delta_{21}\text{G\_HIGH} + \delta_{22}\text{G\_COLL} + \delta_{23}\text{G\_GRAD} + \delta_{24}\text{F\_STAMP} + \delta_{25}\text{T\_OWNER} + \delta_{26}\text{W\_YES} + \delta_{27}\text{Y\_95} + \delta_{28}\text{Y\_96}$$

Working-Leser model:

$$\text{ValueShare} = \gamma_0 + \gamma_1\text{LnINCWK} + \gamma_2\text{LnHHSIZE} + \gamma_3\text{LnAGE} + \gamma_4\text{S\_FEM} + \gamma_5\text{O\_MEX} + \gamma_6\text{O\_PRI} + \gamma_7\text{O\_CUB} + \gamma_8\text{R\_NEAST} + \gamma_9\text{R\_MWEST} + \gamma_{10}\text{R\_SOUTH} + \gamma_{11}\text{U\_MSAINC} + \gamma_{12}\text{U\_MSAOUT} + \gamma_{13}\text{G\_ELEM} + \gamma_{14}\text{G\_HIGH} + \gamma_{15}\text{G\_COLL} + \gamma_{16}\text{G\_GRAD} + \gamma_{17}\text{F\_STAMP} + \gamma_{18}\text{T\_OWNER} + \gamma_{19}\text{W\_YES} + \gamma_{20}\text{Y\_95} + \gamma_{21}\text{Y\_96}$$

The prefix Ln stands for the natural logarithm of the variable. The dependent variables were specified as expenditures on TF, FAH and FAFH, respectively. In the case of FAFH, the estimated inverse Mills ratio was added as a regressor for the two-step Heckman procedure.

Results and Discussion

The estimated regression coefficients for the three food categories using the double-logarithmic (DL) model are presented in Table IV.1; estimations using the semi-logarithmic (SL) model are presented in Table IV.2. The same information for the quadratic model (QM) is provided in Table IV.3, and finally, the estimations using the Working-Leser model (WL) are reported in Table IV.4. In the case of FAFH, which was always modeled as a two-stage decision process, the estimated parameters presented in these tables correspond to the level equation defined in (3.25). The estimated set of elasticities is presented in Table IV.5 at the end of the chapter.

Performance of the Empirical Models

The DL, SL, and WL models performed reasonably well in terms of providing statistically significant coefficient estimates for all three food groups. The estimated coefficients for the logarithm of weekly income (LINCWK) were statistically significant at the 1% level for all food groups in all models, except when FAFH was estimated by the SS method in the WL model. However, even in this case, weekly income appeared to have an important effect at the consumer decision stage, since its coefficient was significant at the 1% in the probit equation. In these three models, income was statistically significant at the 1% in the decision equation, regardless to the estimation procedure utilized.

The estimated parameters for the other key variable, logarithm of household size (LHHSIZE), were significant at the 1% significance level for TF and FAH, with these models. For FAFH, household size appeared to have the same significant effect in the probit equation estimated independently of the level equation (TP and HP methods). This coefficient was also significant using the SS method in the DL model.

Concerning the signs of the estimated parameters for LINCW and LHHSIZE, they were all positive, as expected, with the DL and SL models. The WL model, where the dependent variable represents expenditure shares, provided coefficients for the logarithm of weekly income with a negative sign, as expected.

On the other hand, the QM model had the weakest performance., the coefficients for both weekly income (INCWK) and its squared term ($INCWK^2$) were statistically significant at the 1% level, only in the case of FAFH using the SS method. As with the other models, income appeared to have a decisive effect in the participation decision to spend money on food eaten away from home.

A word of caution should be noted with respect to the estimation procedures used for the FAFH models. Even when the presence of selectivity bias could not be confirmed from the significance of the coefficient associated with the inverse Mills ratio included in the level regression of the HP procedure, the statistical significance of the correlation coefficient rho (ρ) from the SS method suggests this possibility, at least for the DL models. As pointed out by Davidson and MacKinnon (1993), the SS method provides, in this case, more efficient estimates.

Total food (TF)

Analyzing the results from the perspective of the food categories, across models, we observe that income and household size both had significant effects on the expenditures for TF, with the exception noted of the QM model, where the estimated parameters were not significantly different from zero. This effect was positive in all cases for LHHSIZE. In the case of LINCWK, it was positive for DL and SL, and negative for WL, as expected, since the dependent variable in the case of the WL model was budget share rather than expenditures in total food. The coefficient for age of the household head was significant at 5% level when using the DL and the WL model.

The effect of the urbanization status of the household in TF expenditures in all the four models, including QM is remarkable. The two binary variables accounting for dwellings located in the MSA[3] area, inside the central city (U_MSAINC) and outside central city (U_MSAOUT) showed significant and positive effects. U_MSAINC was significant at the 1% level in all cases, while U_MSAOUT was significant at the 5% level for LM, QM, and WL, and at the 1% level for DL. The participation in the Food Stamp program (F_STAMP), however, showed a statistically significant effect in the QM model. The coefficient for G_GRAD was negative and significantly different from zero at 10% level, in the case of the SL and QM models, whereas in the latter, the coefficient for O_PRICAN was also negative and statistically significant at 10% level. The remaining variables were insignificantly different from zero in all cases.

Food eaten at home (FAH)

The variables accounting for the logarithm of weekly income (LINCWK) and logarithm of household size (LHHSIZE) were found to be positive and statistically different from zero at the 1% significance level for the DL and SL models. Again, for the WL model, where the dependent variable represents the budget share of the expenditures in FAH, the effect was positive for household size and negative for income, as expected.

Both dummy variables representing the urbanization status of the household also had positive and significant effect on FAH expenditures at the 1% level for all four models. Moderate negative effects (5% significance level) were also detected in some of the variables representing the educational level of the household head. Coefficient estimates of the variables G_HIGH, G_COLL and G_GRAD appeared significant in the

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[3] MSA – Metropolitan Statistical Area

DL, SL, and QM models. The G_HIGH variable was also found to be statistically significant in the WL model.

Food eaten away from home (FAFH)

When FAFH was estimated using either DL or SL, the coefficient of logarithm of weekly income (LINCWK) was positive and statistically significant at the 1% level with all the estimation methods (TP, HP, and SS). Using the WL model, LINCWK showed negative and significant parameter estimates at the 1% level. As noted before, income (INCWK) and its squared term ($INCWK^2$) were also found to have a significant effect on FAFH at the 1% in the QM model estimated using SS method. In the QM model, the coefficient associated with the squared age of the household head (AGE^2) was significantly different from zero at the 1% level, when estimated by the SS model. On the other hand, household size did not show significant effects on FAFH expenditures, with any of the models and estimation methods.

Examining the effects of household characteristics included as binary variables, we notice that the sex of the household head had a negative effect on expenditures in FAFH. The coefficient of S_FEM was significant with SL and WL models for all methods, for DL with the SS method, and for QM model with TP and SS methods. We also observe an important negative association between households receiving Food Stamps and expenditures in the FAFH category. The F_STAMP coefficients were statistically significant using the three estimation methods in the DL and the QM models, and using TP and HP in the SL and WL models. Finally, the variable describing the tenure status of the dwelling (T_OWNER) showed a significant and negative effect at the 5% level in both the QM and WL models, when estimated using the SS method. All the other socioeconomic variables included in the models did not show any statistically significant effect, or only for some specific model and estimation procedure.

Income and Household Size elasticities

Table IV.5 presents the income and household elasticities that were computed at the sample means, except for the double-logarithmic model. In general, all the estimated income elasticities are less than one for all food categories, confirming that Engel's law holds with regard to Hispanic consumers in the U.S. Income elasticity for total food (TF) showed similar estimated values for all the models (between 0.28 and 0.34). The same occurred with food eaten at home (FAH) although with smaller magnitudes (between 0.20 and 0.27). As expected, elasticity estimates were larger for FAFH than for TF and FAH. However, there were important differences among the models depending on the method used. For the DL, SL, and QM models, the HP method produced slightly higher income elasticities (0.53, 0.79, and 0.78, respectively) than the TP method (0.51, 0.64, and 0.75, in the same order). The opposite is true for the WL model, which produced an income elasticity of 0.22 using the HP method, as compared to an income elasticity of 0.38 for the TP method. On the other hand, the SS procedure yielded the largest magnitudes of the income elasticities for FAFH, ranging from 0.69 with the DL model to 1.04 with both the SL and WL models.

The value of the household size elasticity ranged between 0.32 and 0.39 over the different models for TF. The FAH category gave the higher magnitudes, ranging from 0.39 to 0.47. FAFH observed the smaller magnitudes, independent of the model and estimation procedure. The point estimates of household size elasticities ranged from –0.18 to 0.13 for FAFH.

With respect to the confidence intervals for the income and household size elasticities, it is clear that the size of the range depends on which model was used to derive the elasticities. Thus, the DL model produced the narrowest ranges whereas the widest ranges were obtained for the elasticities derived from the QM model.

Implications

Engel's law was verified for Hispanic households in the U.S., despite the functional form utilized. As Holcomb, Park and Capps (1995, p. 4) noted, the Working-Leser form provides a direct verification of Engel's law through the parameter estimates for the logarithm of income. As expected, share expenditures for total food decrease with higher incomes. The negative sign of the statistically significant estimated parameters of the logarithm of weekly income completely agree with this formulation. The other observation is that large households have a higher budget share for food than smaller households, at the same level of total expenditure (Deaton and Muellbauer, 1980, p. 193). The observed results confirm this assessment, since the coefficients for the logarithm of household size are positive and statitstically significant.

The complete verification of Engel's law resides in the observation of the magnitude of the income elasticities. Holcomb, Park and Capps (1995) explicitly showed that if Engel's law holds for a certain commodity, then the income elasticity for that commodity must be less than one. However, the confirmation of Engel's law for total food by no means implies that it must hold for specific commodities or food categories. In the case of TF and FAH, all the income elasticities were consistently less than one. It means the household expenditures on food are very inelastic with respect to variations in income, especially for food that is consumed at home. In their study, Holcomb, Park, and

Capps (1995) estimated the budget share for total food in the U.S. population as 15.3%, where 9.5% correspond to food eaten at home, and the remaining 5.8% corresponds to food eaten away from home.

In contrast, the results obtained in this research suggest that Hispanic households devote a much higher proportion of their budget to total food, 29.4%. However, the proportion spent in food away from home is smaller, only a 3.6%. Most of their expenditures in total food correspond to food eaten at home (25.8%). By comparison, the average American household spends only about 15.3% of their income on food.

Despite of these findings, it seems that Engel's law also holds for FAFH, although the magnitudes of the income elasticities estimated from the SS method were almost unity. This is a plausible result, considering the low proportion of FAFH in the budget of many Hispanic families, especially those with lower incomes. It seems reasonable that the elasticity of FAFH is unitary elastic or even behaves as a luxury good. Fan and Lewis (1999) found similar behavior of African American households with respect to FAFH. They reported that income elasticity of FAFH for African Americans households was estimated to be about unity. In every case, it is clear that the FAFH is more sensitive to variations in income than TF and FAH. These differences in food expenditure shares are consistent with the differences in the magnitudes of the estimated elasticities. The elasticity measures for TF and FAH found here are in general smaller than those estimated by Holcomb, Park, and Capps (1995) for the entire U.S. population, whereas the magnitudes for FAFH are larger.

The effects of the household size, on the other hand, appear to be more important for TF, and particularly for FAH, than for FAFH. The magnitudes of the household size elasticities for FAFH were never greater than 0.13. With regard to socioeconomic characteristics, the results reveal an important effect related to urbanization status. Households located in the metropolitan statistical area spent more money on total food, and particularly on food eaten at home, than households located outside this area. Among them, those households located inside the central city area showed the highest response. In addition, no important differences were found among Hispanic households living in the Midwestern, Western, Southern or Northeastern region of the country.

Another important result is the observation that households that Food Stamp receipting households spend less money on food eaten away from home. This is not a surprising result due to the association of this characteristic with lower incomes. No statistical significance was found for coefficients associated with households participating in the WIC program.

Although there were important variations in some of the confidence intervals for the income and household elasticities derived from the different models, it appears that the Engel's law is a very robust assessment, regardless of national origins and other socioeconomic characteristics of the Hispanic consumers. Since the elasticities were estimated at the means of the data, the important variability observed in income distribution and size of households explain part of these wide ranges. Nevertheless, the consistency among the results obtained with the different empirical models and estimation procedures utilized in this study, allow us to report some important findings about the food expenditure patterns of the Hispanic population in the U.S. as discussed in the preceding section.

Table IV.1. Parameter Estimates for DL Model of Hispanic Food Consumption, 1994-96.

Dep. Var.	TF	FAH	FAFH		
Indep. Var.	HLS	HLS	TP	HP	SS
Constant	2.99653*** (0.345459)	3.13478*** (0.350919)	-0.157361 (0.696131)	-0.231153 (0.786420)	-0.675726 (0.883755)
LINCWK	0.293291*** (0.031937)	0.212074*** (0.032746)	0.509444*** (0.068590)	0.533190*** (0.158412)	0.693359*** (0.102819)
LHHSIZE	0.393217*** (0.045500)	0.474103*** (0.047525)	0.132255 (0.101313)	0.122232 (0.107991)	0.066997 (0.105867)
LAGE	-0.134167** (0.061129)	-0.103577 (0.064079)	-0.096695 (0.133525)	-0.118409 (0.205095)	-0.237529 (0.155135)
S_FEM	-0.032838 (0.038980)	0.005865 (0.039626)	-0.131298 (0.083430)	-0.139156 (0.094212)	-0.185642** (0.090342)
O_MEX	-0.014250 (0.041971)	0.012512 (0.042035)	-0.011799 (0.089745)	-0.020281 (0.099196)	-0.065081 (0.096596)
O_PRICAN	-0.075867 (0.065879)	-0.082439 (0.073681)	-0.017976 (0.139731)	-0.019757 (0.140395)	-0.008867 (0.157790)
O_CUBAN	-0.117815 (0.150634)	-0.150822 (0.137197)	-0.401806 (0.395055)	-0.408441 (0.401926)	-0.441475* (0.268055)
R_NEAST	0.039197 (0.063412)	0.084243 (0.067445)	-0.060923 (0.151814)	-0.081212 (0.188674)	-0.240421 (0.165583)
R_MWEST	-0.050224 (0.066971)	-0.027266 (0.068439)	-0.247215 (0.171805)	-0.251223 (0.176331)	-0.301248* (0.164486)
R_SOUTH	-0.071154 (0.044992)	-0.057177 (0.044367)	0.075188 (0.097000)	0.063972 (0.113963)	-0.002933 (0.106100)
U_MSAINC	0.166466*** (0.058220)	0.172908*** (0.059074)	0.172790 (0.118296)	0.170933 (0.119981)	0.168921 (0.128605)
U_MSAOUT	0.145894*** (0.054491)	0.164580*** (0.055039)	0.081273 (0.116415)	0.078140 (0.119124)	0.069054 (0.120217)
G_ELEM	-0.160147 (0.157166)	-0.217233 (0.154464)	-	-	-0.264737 (0.474729)
G_HIGH	-0.223633 (0.157468)	-0.312323** (0.154825)	-	-	-0.116274 (0.472987)
G_COLL	-0.200510 (0.160752)	-0.277841* (0.158142)	-	-	-0.182609 (0.477699)
G_GRAD	-0.259914 (0.173540)	-0.380655** (0.176645)	-	-	-0.304386 (0.494921)
F_STAMP	-0.019474 (0.048005)	0.014572 (0.048544)	-0.263210* (0.115651)	-0.262890** (0.115590)	-0.271018** (0.115508)
T_OWNER	-0.019088 (0.047190)	-0.007638 (0.047102)	-0.048658 (0.098659)	-0.047139 (0.099503)	-0.041882 (0.094698)
W_YES	-0.055712 (0.049196)	-0.065371 (0.050440)	-0.086374 (0.117876)	-0.089374 (0.120341)	-0.094816 (0.111579)
Y_95	0.009136 (0.041592)	-0.003407 (0.042568)	0.043397 (0.098957)	0.042662 (0.099509)	0.037149 (0.093126)
Y_96	0.021448 (0.044358)	0.037194 (0.044364)	0.08176 (0.097754)	0.084580 (0.097685)	0.099354 (0.098084)
I. Mills R.	-	-	-	0.081080 (0.510342)	-
SIGMA	-	-	-	-	0.913001*** (0.078888)
RHO	-	-	-	-	0.684519*** (0.194611)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table IV.2. Parameter Estimates for SL Model of Hispanic Food Consumption, 1994-96

Dep. Var.	TF	FAH	FAFH		
Indep. Var.	HLS	HLS	TP	HP	SS
Constant	-98.1045***	-48.9464	-50.5936***	-58.2609***	-56.9698***
	(33.4885)	(28.8324)	(18.3032)	(21.0339)	(18.4171)
LINCWK	29.4669***	17.8508***	11.0606***	13.5279***	17.9318***
	(3.46406)	(2.88239)	(2.01414)	(4.96367)	(1.66257)
LHHSIZE	33.3244***	34.7207***	1.46460	0.423157	-3.04107
	(4.66295)	(3.80420)	(2.46937)	(2.93631)	(2.66070)
LAGE	0.240854	1.10407	2.08254	-0.173632	-5.91158
	(5.73979)	(4.88083)	(3.35658)	(6.15973)	(3.53122)
S_FEM	-0.186205	3.66399	-4.04433*	-4.86089**	-5.40208**
	(3.95216)	(3.26884)	(2.33776)	(2.40633)	(2.48556)
O_MEX	0.142529	1.84342	-1.24750	-2.12888	-3.71157
	(4.50454)	(3.68571)	(2.25958)	(2.76524)	(2.63324)
O_PRICAN	-10.2472	-7.51261	-4.53485	-4.71996	-3.68385
	(6.57633)	(5.88289)	(3.22866)	(3.27548)	(4.36923)
O_CUBAN	-5.42513	-9.83978	7.13406	6.44458	2.94376
	(17.0495)	(10.0819)	(22.9839)	(23.6092)	(7.41444)
R_NEAST	4.47336	8.61453	0.415835	-1.69218	-7.01426*
	(6.92582)	(5.84069)	(4.64957)	(5.56652)	(4.05743)
R_MWEST	-6.02138	-3.04035	-2.65682	-3.07325	-4.14364
	(6.72572)	(5.60198)	(3.55695)	(3.60797)	(4.55201)
R_SOUTH	-4.88013	-2.83944	-0.270733	-1.43616	-3.75549
	(4.88013)	(3.81873)	(3.66221)	(4.00415)	(2.86522)
U_MSAINC	16.4004***	14.7898***	2.31920	2.12631	1.37168
	(5.66257)	(4.67568)	(3.30444)	(3.30990)	(3.37488)
U_MSAOUT	11.7789**	11.8744***	1.33135	1.00583	0.091261
	(5.24177)	(4.20955)	(3.24777)	(3.33304)	(3.17239)
G_ELEM	-11.8545	-15.2124	-	-	-7.64232
	(11.1650)	(11.3001)			(5.78692)
G_HIGH	-15.9817	-22.2824**	-	-	-5.99996
	(11.1311)	(11.2260)			(5.14655)
G_COLL	-15.8633	-21.9669*	-	-	-6.70192
	(11.7318)	(11.5698)			(6.24615)
G_GRAD	-23.8707*	-28.9928**	-	-	-7.26879
	(13.6828)	(13.1358)			(7.43051)
F_STAMP	-5.98773	-3.61236	-4.52586**	-4.49260**	-0.791588
	(4.40306)	(3.8126)	(2.27233)	(2.28043)	(1.88886)
T_OWNER	-2.12568	-1.38384	-2.17498	-2.01719	-0.649796
	(4.92029)	(4.09798)	(3.30180)	(3.39944)	(1.01880)
W_YES	-1.29239	-1.38197	0.289220	-0.022406	-0.065624
	(5.28703)	(4.66486)	(2.94539)	(3.00479)	(0.397700)
Y_95	3.19293	1.83435	0.826127	0.749770	-1.30399***
	(4.29693)	(3.57212)	(2.99404)	(3.02889)	(0.215915)
Y_96	4.64450	4.56936	0.448308	0.490249	-0.367728***
	(4.79652)	(3.92541)	(3.00509)	(2.99866)	(0.085377)
I. Mills R.	-	-	-	8.42456	-
				(15.0938)	
SIGMA	-	-	-	-	27.4934
					($\approx$ 0.00000)
RHO	-	-	-	-	$\approx$1.0000
					($\approx$ 0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table IV.3. Parameter Estimates for QM of Hispanic Food Consumption, 1994-96

Dep. Var.	TF	FAH	FAFH		
Indep. Var.	HLS	HLS	TP	HP	SS
Constant	77.8756*** (37.1574)	81.5121** (33.5579)	10.9423 (17.0918)	10.4004 (16.4485	20.5486 (19.9752)
INCWK	0.002370 (058668)	-0.033833 (0.051840)	0.061177 (0.035635)	0.061889* (0.033912)	0.071499*** (0.022661)
HHSIZE	4.54633 (11.4942)	5.94277 (10.9299)	-4.99976 (6.08851)	-5.15986 (6.88270)	-1.28489 (3.58786)
AGE	-0.384264 (0.816310)	-0.955601 (0.727700)	0.437352 (0.468601)	0.440972 (0.460696)	-0.559116 (0.359367)
$INCWK^2$	-0.00016 (0.000012)	-0.000006 (0.000010)	-0.000011** (0.000006)	-0.000011 (0.000010)	-0.000014*** (0.000005)
$HHSIZE^2$	-0.801420 (0.801219)	-0.900244 (0.651876)	0.720216 (0.468756)	0.720319 (0.472353)	0.163052 (0.177160)
AGE^2	-0.005260 (0.006052)	0.000650 (0.005410)	-0.003930 (0.004048)	-0.004182 (0.005027)	0.005078** (0.002062)
IN×HS	0.020366 (0.017357)	0.019771 (0.017200)	-0.008543 (0.010807)	-0.008272 (0.012235)	-0.006161 (0.008163)
IN×AG	0.001156 (0.001225)	0.001338 (0.001046)	-0.000861 (0.000804)	-0.000833 (0.000978)	-0.000653 (0.000495)
AG×HS	0.197119 (0.187921)	0.233306 (0.181649)	-0.027251 (0.108272)	-0.026127 (0.112327)	0.004132 (0.062860)
IN×AG×HS	-0.000244 (0.000399)	-0.000313 (0.000382)	0.000289 (0.0002693)	0.000283 (0.000296)	0.000166 (0.000188)
S_FEM	-1.95529 (3.94005)	2.07738 (3.30562)	-4.42965* (2.32731)	-4.57800 (3.08522)	-6.37598** (2.49219)
O_MEX	-0.409697 (4.48632)	1.39225 (3.71774)	-0.816431 (2.30806)	-0.993977 (3.28104)	-3.68655 (2.62946)
O_PRICAN	-12.3620* (6.59303)	-9.27179 (5.92490)	-4.92685 (3.21951)	-4.95193 (3.17232)	-4.67499 (4.34943)
O_CUBAN	-5.78259 (17.0459)	-9.76679 (9.22496)	6.68530 (23.5943)	6.57785 (23.8195)	3.89288 (7.46720)
R_NEAST	6.24426 (7.04833)	10.2086* (5.81584)	-0.043785 (4.80438)	-0.513884 (8.46269)	-8.48012** (4.11705)
R_MWEST	-4.80586 (6.49546)	-2.01331 (5.52814)	-2.72043 (3.58274)	-2.81362 (3.86447)	-4.75183 (4.57925)
R_SOUTH	-4.38293 (4.97802)	-2.35465 (3.84028)	0.099050 (3.76272)	-0.158012 (5.22449)	-4.46829 (2.86204)
U_MSAINC	15.5339*** (6.00386)	13.7989*** (4.94778)	1.83213 (3.44699)	1.84892 (3.45680)	2.91105 (3.37068)
U_MSAOUT	12.2366** (5.24928)	12.0671*** (4.21604)	1.03078 (3.26838)	0.994440 (3.30057)	1.97653 (3.17401)
G_ELEM	-12.2366 (13.4573)	-15.8051 (12.6791)	-	-	-8.16216 (16.1422)
G_HIGH	-18.0540 (13.4818)	-23.4945* (12.7067)	-	-	-4.493036 (16.1328)
G_COLL	-19.3029 (14.0549)	-23.6083* (13.0699)	-	-	-4.66916 (16.1667)
G_GRAD	-28.2029* (15.9691)	-31.2392** (14.5704)	-	-	-7.99310 (16.2845)
F_STAMP	-10.0800** (4.38006)	-6.67033* (3.74067)	-5.26857** (2.19493)	-5.29456** (2.22286)	-3.89110*** (1.43198)
T_OWNER	-3.34224 (4.98116)	-2.00353 (4.17390)	-1.84838 (3.29045)	-1.82179 (3.38842)	-0.730217*** (0.249615)

Table IV.3. Continued

W_YES	-1.46550 (5.17027)	-2.23805 (4.64397)	0.849099 (2.84343)	0.804916 (2.92583)	-0.927213 (1.39067)
Y_95	3.08398 (4.33306)	1.82760 (3.58714)	0.534487 (3.19043)	0.527159 (3.19038)	-0.033036 (0.924791)
Y_96	5.63259 (4.75297)	5.24185 (3.91220)	0.930670 (2.9531)	0.932169 (2.96323)	0.583760 (0.773030)
I. Mills R.	-	-	-	1.76381 (22.4240)	-
SIGMA	-	-	-	-	27.6261 (≈ 0.00000)
RHO	-	-	-	-	≈1.0000 (≈ 0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table IV.4 - Parameter Estimates for WL of Hispanic Food Consumption, 1994-96.

Dep. Var.	TF	FAH	FAFH		
Indep. Var.	HLS	HLS	TP	HP	SS
Constant	1.53889*** (0.110571)	1.44200*** (0.106341)	0.196302*** (0.042162)	0.214233*** (0.048732)	0.050553 (0.053830)
LINCWK	-0.194369*** (0.010736)	-0.188764*** (0.010469)	-0.022273*** (0.004038)	-0.028043*** (0.009521)	0.001319 (0.003710)
LHHSIZE	0.099565*** (0.013734)	0.101756*** (0.012156)	-0.001657 (0.006386)	0.000779 (0.006196)	-0.004978 (0.005599)
LAGE	-0.042573** (0.018118)	-0.032714* (0.016856)	-0.001701 (0.008232)	0.003575 (0.012859)	0.000945 (0.006415)
S_FEM	0.002712 (0.011201)	0.013626 (0.009977)	-0.010462** (0.005109)	-0.008552* (0.004570)	-0.012197** (0.005336)
O_MEX	-0.006761 (0.012395)	-0.000488 (0.011406)	-0.003710 (0.004501)	-0.001648 (0.005219)	-0.008072 (0.005642)
O_PRICAN	-0.006102 (0.020450)	-0.000482 (0.019448)	-0.006596 (0.007736)	-0.006163 (0.007880)	-0.006549 (0.009256)
O_CUBAN	-0.001589 (0.039388)	-0.011271 (0.027490)	0.020021 (0.043705)	0.021634 (0.044696)	0.005305 (0.015880)
R_NEAST	0.007170 (0.018598)	0.014484 (0.016760)	0.003365 (0.010041)	0.008295 (0.010311)	-0.012762 (0.008714)
R_MWEST	-0.011595 (0.021060)	-0.002911 (0.019591)	-0.010719 (0.007077)	-0.009745 (0.007092)	-0.013572 (0.009772)
R_SOUTH	-0.021718* (0.012325)	-0.018986* (0.010730)	0.001679 (0.006925)	0.004401 (0.007128)	-0.005909 (0.006091)
U_MSAINC	0.049123*** (0.017145)	0.047305*** (0.016007)	0.006843 (0.007003)	0.007294 (0.007019)	0.004240 (0.007242)
U_MSAOUT	0.033315** (0.014960)	0.030261** (0.013572)	0.007687 (0.006828)	0.008448 (0.006804)	0.004342 (0.006800)
G_ELEM	-0.057904 (0.057919)	-0.076182 (0.056162)	-	-	-0.018044 (0.034669)
G_HIGH	-0.073343 (0.057638)	-0.098239* (0.055771)	-	-	-0.012289 (0.035094)
G_COLL	-0.050440 (0.058337)	-0.071146 (0.056481)	-	-	-0.013950 (0.034858)
G_GRAD	-0.049032 (0.060204)	-0.072005 (0.057887)	-	-	-0.015191 (0.035093)
F_STAMP	0.001988 (0.017530)	0.013127 (0.016266)	-0.015867** (0.007229)	-0.015944** (0.007217)	-0.002732 (0.004462)
T_OWNER	0.002967 (0.013355)	0.009229 (0.012059)	-0.005034 (0.006776)	-0.005403 (0.006970)	-0.003742*** (0.001023)
W_YES	-0.012384 (0.017585)	-0.012583 (0.016457)	0.002229 (0.007374)	0.002957 (0.007444)	-0.002441 (0.004189)
Y_95	0.006033 (0.012426)	0.002019 (0.011474)	0.002966 (0.006183)	0.003145 (0.006278)	-0.007155*** (0.001908)
Y_96	0.009192 (0.013226)	0.006505 (0.011922)	0.004047 (0.005550)	0.003949 (0.005529)	0.000527 (0.001888)
I. Mills R.	-	-	-	-0.019701 (0.032675)	-
SIGMA	-	-	-	-	0.059388 (≈ 0.00000)
RHO	-	-	-	-	≈1.0000 (≈ 0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table IV.5. Income and Household Elasticities at the Mean for Hispanic Consumers, 1994-96

TF	FAH	FAFH		
OLS	OLS	TP	HP	SS
		Double Logarithmic Model		
Income Elasticities				
0.29329***	0.21207***	0.50944***	0.533319***	0.69336***
(0.24075~0.34583)	(0.15821~0.26594)	(0.39661~0.62227)	(0.27260~0.79378)	(0.52422~0.86250)
Household Size				
0.39322***	0.47410***	0.13226	0.12223	0.066997
(0.31837~0.46806)	(0.39592~0.55228)	(-0.03441~0.29892)	(-0.05541~0.29988)	(-0.10715~0.24115)
		Semi Logarithmic Model		
Income Elasticities				
0.27844***	0.20134***	0.64417***	0.78787***	1.04435***
(0.02660~0.53028)	(0.02212~0.38057)	(-0.91234~2.20068)	(-1.16012~2.73585)	(-1.46472~3.55342)
Household Size				
0.31489***	0.39162***	0.08529	0.02465	-0.17711
(0.02738~0.60239)	(0.05150~0.73174)	(-0.22743~0.39802)	(-0.26281~0.31210)	(-0.67240~0.31818)
		Quadratic Model		
Income Elasticities				
0.31250	0.20889	0.74490	0.78211*	0.97986***
(-0.57758~1.20257)	(-0.73755~1.15532)	(-3.02001~4.50981)	(-3.33254~4.89676)	(-2.27389~4.2336)
Household Size				
0.37664	0.46744	-0.00852	-0.02457	0.03453
(-0.59065~1.34394)	(-0.64120~1.57608)	(-3.31675~3.29970)	(-3.66946~3.62032)	(-2.11253~2.18159)
		Working-Leser Model		
Income Elasticities				
0.33878***	0.26870***	0.37843***	0.21740***	1.03682***
(-0.49251~1.17007)	(-0.65838~1.19577)	(-1.21873~1.97559)	(-1.83155~2.26636)	(0.83283~1.24081)
Household Size				
0.33871***	0.39422***	-0.04623	0.02174	-0.13892
(-0.09863~0.77604)	(-0.11580~0.90493)	(-0.37952~0.28707)	(-0.28579~0.32926)	(-0.58635~0.30851)

Note: Numbers in parenthesis represent the lower and upper bounds of the confidence intervals of the elasticity estimates, respectively, at the 90% level of confidence.
Asteriscs indicate point elasticities constructed from coefficient estimates statistically significant at: *** - 1% level; ** - 5% level; * - 10% level, for a 2-tail t-test.

CHAPTER V

FOOD DEMAND ELASTICITIES OF THE U.S. HISPANIC POPULATION

Objectives

The primary objective of this chapter was to analyze the demand for food among 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 demographic and socioeconomic characteristics of the Hispanic population influences a household's food demand. A third objective was to determine if differences in national origin among groups in the Hispanic community influence food demand patterns as hypothesized. Different functional forms were used to estimate income and household size elasticities. Confidence intervals for the elasticities were computed and results compared with previous studies.

Methodology

Engel curves were estimated for the nine food groups using different functional forms from the literature. The corresponding income and household size elasticities were computed and presented with their respective confidence intervals. Three different functional forms were assumed in this study to represent Engel curves: linear (LM), double-logarithmic (DL), and semi-logarithmic (SL) models. Most households reported zero consumption for at least one specific food group in the sampled time period. This fact suggests that one should be suspicious about a potential selectivity bias problem. If this is the case, the models cannot be estimated by Ordinary Least Squares (OLS) because the estimated parameters will be biased. To account for this potential problem, all the models for each food group were estimated using a two-part method (TP) and a sample selectivity (SS) method (Leung and Yu, 1996). The latter was computed using both the two stage procedure (HP) developed by Heckman (1979), and the Type II Tobit or sample selection model (SS) described by Amemiya (1985). A total of nine models were estimated.

All the models were tested for the presence of heteroscedasticity. When necessary, 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). As in previous studies, various socioeconomic variables were used to investigate the possible influences of these factors on consumer expenditure patterns. Fan and Zuiker (1998) pointed out that although it can be expected that Hispanic households share many common cultural characteristics, there is also evidence of considerable diversity within this ethnic group. Thus, differences among origin groups of the Hispanic community were examined.

Empirical Models

The data set was constructed with information provided from Hispanic households participating in each of the three years of the USDA's 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII94-96). The data set included information from households in the 50 states. Only households of Hispanic origin that participated in the 1994-96 two-day survey and provided information about food consumption were selected for analysis. 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. The remaining variables were defined as in chapter II.

The mathematical formulation of the linear (LM), double-logarithmic (DL, and semi-logarithmic (SL) equations is specified as follows:

Linear model:

$$Q_i = \alpha_0 + \alpha_1 INCWK + \alpha_2 HHSIZE + \alpha_3 AGE + \alpha_4 S\_FEM + \alpha_5 O\_MEX + \alpha_6 O\_PRI + \alpha_7 O\_CUB + \alpha_8 R\_NEAST + \alpha_9 R\_MWEST + \alpha_{10} R\_SOUTH + \alpha_{11} U\_MSAINC + \alpha_{12} U\_MSAOUT + \alpha_{13} G\_ELEM + \alpha_{14} G\_HIGH + \alpha_{15} G\_COLL + \alpha_{16} G\_GRAD + \alpha_{17} T\_OWNER + \alpha_{18} FSTAMP + \alpha_{19} WIC + \alpha_{20} Y\_95 + \alpha_{20} Y\_96$$

Double-logarithmic model:

$$LnQ_i = \beta_0 + \beta_1 LnINCWK + \beta_2 LnHHSIZE + \beta_3 LnAGE + \beta_4 S\_FEM + \beta_5 O\_MEX + \beta_6 O\_PRI + \beta_7 O\_CUB + \beta_8 R\_NEAST + \beta_9 R\_MWEST + \beta_{10} R\_SOUTH + \beta_{11} U\_MSAINC + \beta_{12} U\_MSAOUT + \beta_{13} G\_ELEM + \beta_{14} G\_HIGH + \beta_{15} G\_COLL + \beta_{16} G\_GRAD + \beta_{17} T\_OWNER + \beta_{18} FS\_RCV12 + \beta_{19} WIC + \beta_{20} Y\_95 + \beta_{20} Y\_96$$

Semi-logarithmic model:

$$Q_i = \delta_0 + \delta_1 LnINCWK + \delta_2 LnHHSIZE + \delta_3 LnAGE + \delta_4 S\_FEM + \delta_5 O\_MEX + \delta_6 O\_PRI + \delta_7 O\_CUB + \delta_8 R\_NEAST + \delta_9 R\_MWEST + \delta_{10} R\_SOUTH + \delta_{11} U\_MSAINC + \delta_{12} U\_MSAOUT + \delta_{13} G\_ELEM + \delta_{14} G\_HIGH + \delta_{15} G\_COLL + \delta_{16} G\_GRAD + \delta_{17} T\_OWNER + \delta_{18} FS\_RCV12 + \delta_{19} WIC + \delta_{20} Y\_95 + \delta_{20} Y\_96$$

Q_i is quantity consumed of the ith food group (grains; vegetables; fruits; milk; meat; legumes; fats; sugar; beverages) or subgroup (beef; pork; chicken). The prefix Ln stands for the natural logarithm of the variable. For the two-step Heckman procedure, the estimated inverse Mills ratio was added as a regressor in all models.

Results and Discussion

The estimated regression coefficients utilized in the construction of the income and household elasticities are presented in Tables V.1 to V.12. In general, the regression coefficients of household size were estimated with more precision than the estimated income coefficients for most of the food groups. However, the precision of estimated regression coefficients is not sufficient for obtaining similar precision of elasticity estimates (Dorfman, Kling and Sexton, 1990).

Performance of the Empirical Models

In general, I found statistical evidence of selectivity bias associated with the specific functional form used in the estimation of demand for almost all food groups. For instance, the coefficient of the inverse Mills ratio used as a regressor in the Heckman's two-step procedure was statistically significant for grains, fruits, and milk, in all models. For vegetables and chicken, this coefficient was significant with the linear model, for beef with the SL model, and for beverages with both the LM and DL models. Then, in all these cases, estimation using the HP method is preferred to the simple TP model. On the other hand, the correlation coefficient ρ (rho) obtained with the SS model was statistically different from zero when using the double logarithmic model for beef, pork, chicken, legumes, and total sugar. Under this circumstance, the SS method provides more efficient estimates than the HP procedure (Davidson and MacKinnon, 1993). In all the other cases, the estimated correlation coefficient was slightly less than one and the corresponding residual covariance matrix was nearly singular. As discussed in Chapter III, This near-singularity occurs when the probit equation strongly dominates the likelihood function, and consequantly, the interpretation of the results is not clear.

The advantages and disadvantages of each functional form were discussed in Chapter III. In general, the LM slightly underperformed the DL and the SL models in terms of fitting the data. Nevertheless, when a variable appeared to be statistically significant, it was consistently significant in most circumstances, regardless of the model and econometric method employed in the estimation.

Total Grains

Both income and household size showed a significant effect in the demand for total grains. However the household size effect was remarkably important for all models and estimation methods, except when the LM and SL models where estimated using the SS method. As noted before, the presence of selectivity bias for this food category with all the models. The LM model performed poorly as compared to the DL and SL models.

The urban status of the dwellings showed an important effect in the demand for grains. Households located in the metropolitan statistical area, and in particular in suburban areas (U_MSAOUT) reported the highest consumptive response of grains. Hispanic households living in the Northeast (R_NEAST) appeared to consume more total grains than households living in other regions, but this effect was more apparent for the DL model.

Concerning the characteristics of the household head, all models were consistent, indicating a significant and positive effect in grain consumption when the household head attended college (G_COLL). Also, the coefficient associated with the age of the household head (AGE) showed a positive and statistically significant effect, when both DL and SL models were estimated with the HP method. No differences attributed to national origin were found in any model. Also, the participation in Food Stamp or WIC programs did not appear to impact the demand for grains.

Total Vegetables

Household size was the most important characteristic explaining the demand for total vegetables in both the participation and level equations. The regression coefficient associated with the size of the household was almost always significant at the 1% level. Weekly income showed a positive effect in the level equation with both the LM and SL at the 5% significance using the SS procedure, and at 10% significance level with the TP and HP models.

Differences in national origin were found in the analysis of total vegetables. Households of Cuban origin (O_CUB) showed the highest consumption levels of vegetables, whereas Puerto Ricans (O_PRI) showed the lowest levels. In addition, households living in the Northeast region (R_NEAST) showed higher consumption levels of vegetables than households in the West. The regression coefficient associated with this variable was significantly different from zero at the 1% level in the DL model estimated with all three methods, whereas it was significant at least at the 10% level with the remaining models. The coefficients of the binary variables accounting for households located in the South (R_SOUTH) and the Midwest (R_MWEST) showed statistical significance at 5% level, but only with some models and estimation methods. The effect of the urban status was different from what was observed for grains. In this case, a negative relationship between the demand for vegetables and location inside the MSA area (U_MSAINC) was reported, although it was not statistically significant for all the models and estimation procedures.

Total Fruits

Again, household size appear to be positively correlated with the consumption of fruits, according to the estimated coefficients of all models. Geographic region and location appeared to have some effect on the demand for total fruits. The coefficient of the variable U_MSAOUT (suburban area) was positive and statistically significant in most cases. The coefficient corresponding to the Northeast region (R_MWEST) was positive and significantly different from zero, particularly for the DL model.

Total Milk

Several variables appear to be important in order to explain the consumption of dairy products. As expected, the effect of household size was statistically significant at the 1% level for all the models and estimation procedures. The age of the household head also showed a very important effect, although in the opposite direction. In addition, the coefficients of F_STAMP and W_YES were positive and significantly different from zero, suggesting an important association between participation in the Food Stamp and WIC programs and the demand for milk products. Finally, the location of the household inside the metropolitan statistical area was positively related to higher consumption of milk products. Both U_MSAINC and U_MSAOUT were positive and statistically significant at the 5% level in all models. Concerning national origin, Puerto Ricans appear to consume less dairy products than other groups, *ceteris paribus*.

Total Meat, Beef, Pork and Chicken

When meat was analyzed as an aggregate category, only the variable accounting for the size of the household showed a clear effect for all models. A positive association was also found with the level of education of the household head, but only when the DL model was estimated using the SS method. The result was almost the same for beef, where the only important variable was household size. Weekly income showed some effect with the DL model. However, a very different picture arose when pork and chicken were analyzed separately. In those cases, the size of the household lost some importance relative to other household characteristics. All the categories describing the education level of the household head showed an important negative relationship with pork and chicken consumption.

Hispanic households living in the Northeast, Midwest and in the South reported lower levels of pork and chicken consumption than households living in the West region. Concerning their national origin, Puerto Rican households (O_PRI) showed the highest level of consumption for both food subcategories, while Mexicans and Cubans showed the lowest levels.

On the other hand, although households receiving food stamps consumed less pork, this effect is not very clear in the case of chicken. Moreover, when the participation in the WIC program had positive effect on pork consumption, its impact on chicken and also in total meat was negative. The same effect was observed when the household head was a woman (S_FEM).

Legumes, Nuts, and Seeds

Household size was once again the most important variable in terms of statistical significance in the determination of legumes, nuts, and seeds consumption. Large households consumed more legumes, nuts, and seeds. Weekly income was also an important determinant but only in the decision equation. Another important factor was the home tenure status, which showed a negative relationship with the amount consumed in this food category.

With respect to national origin of the household members, both Cuban and Mexican households consumed more legumes than households of other Hispanic origins, especially with the DL model. On the other hand, households from the Northeast and Midwest showed less consumption for this food category, regardless of their national origin.

Total Fats

The consumption of total fats was affected by several household characteristics. Weekly income appeared to have a significant effect, especially at the decision stage. A strong positive relationship was found between consumption of fats and the level of education of the household head, independent of the models and econometric procedures. Other characteristics that showed a positive effect were R_NEAST, O_MEX, S_FEM, and F_STAMP. On the other hand, households of Cuban origin showed a lower consumption of total fats, as well as households living in the Midwest (R_MWEST), the South (R_SOUTH), and participants of the WIC program (W_YES).

Total Sugar

Once again, household size was by far the most important variable explaining the consumption for this food category. Some other characteristics showed a moderately significant and positive (G_ELEM, G_HIGH, G_COLL, and F_STAMP) or negative (O_PRI and U_MSAINC) effect.

Total Beverages

For this category, both income and household size showed important positive effects. However, the variables associated with household size showed the strongest relationship. The other two important variables were the urban status and the level of education. The coefficients associated with both U_MSAINC and U_MSAOUT were negative and statistically different from zero at the 1% level in most cases. In contrast, the coefficients of the dummy variables accounting for education of the household head (G_ELEM, G_HIGH, G_COLL, and G_GRAD) were positive and statistically significant at the 1% level in most cases.

Income and Household Size Elasticities

The estimated income elasticities are presented in Table V.13. For each food category, the elasticities computed from the three different estimation methods (TP, HP, and SS), along with their corresponding confidence intervals at the 90% level, for each model (LM, DL, and SL), are presented. We can see that, in general, when the model was estimated using the HP, the computed elasticities were consistently higher in absolute value than with the other two methods, TP and SS, which provided closer 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 the consumer's behavior.

As a general result, we can observe that demand for all nine major food groups was very inelastic in terms of income, with elasticity point estimates smaller than 0.5 in absolute value. Some exceptions were found with grains (1.04 with DL model; 0.64 with SL model), vegetables (-1.44 with LM model; 0.77 with SL model), fats (0.80 with DL model; 0.81 with SL model), sugar (-0.51 with LM model), and beverages (0.57 with LM; 0.84 with DL model). In all these cases, the model was estimated using the HP method.

On average, total fats was the food category that appeared to be more responsive with respect to income changes. The point estimates of its income elasticity were positive, ranging from 0.20 to 0.81 (with the only exception of -0.07 when the DL model was estimated with the SS method, and -0.26 with the LM model estimated by HP method). Total fats category was followed by sugar, beverages and vegetables, all of which observed similar behavior. Total sugar showed positive point estimates, ranging from 0.05 to 0.51 through the different models and estimation methods. Beverages showed only positive values ranging from 0.10 to 0.84, and total vegetables showed all positive magnitudes, ranging from 0.07 to 0.77 (except for the LM model estimated by HP method, which yielded 1.44).

In terms of responsiveness to income levels, total grains category showed positive income elasticity magnitudes ranging from 0.05 to 0.64, with a unit elasticity estimate only in the case of DL model estimated by the HP procedure. The most income inelastic food categories were fruits, milk, and meat. Although meat coefficients were, in general, positive, zero was included in the 90% confidence interval in all cases, suggesting that the effect of changes in income for these three broad food groups was insignificant.

However, when the three most important components of the meat category were analyzed separately, the responsiveness to income changes increased considerably, particularly for pork, which showed point estimates ranging from 0.16 to 1.35, in absolute value, although the estimated value for the linear model estimated by the HP method reached 12.5. Beef continued to show a moderately elastic behavior, with point estimates going from 0.06 to 1.60. Chicken was the meat subcategory that appeared to be less responsive with respect to income, with values going from 0.01 to 1.30, in absolute value.

When analyzing the estimated household size elasticities presented in Table V.14, we observe similar patterns in the data as those found with the income elasticities. Most of the time, estimates coming from the HP regressions were higher, in absolute value, than those obtained from TP and SS, which in general provided more comparable results. From these results, we can conclude that the household size component seemed to have a greater effect on demand for particular food groups than income. Household size elasticities were in general positive and greater than income elasticities, although some exceptions occurred. Total fats showed a negative point estimate for household size elasticity with the LM model estimated by HP method, with the DL model estimated by SS, and with the SL model estimated by both the HP and SS procedures. Also, negative values were reported for total grains with all the models, for legumes with the LM model, and for total sugar with the DL model, when the HP method was used.

Setting aside extremely low or high values that were too far from the median value, total sugar appeared as the most elastic food category with respect to household size, with point estimates ranging from 0.78 to 1.05. The second most sensitive food category in terms of response to size of the household was milk, with point estimates going from 0.63 to 1.04. Legumes, nuts, and seeds showed an important response to household size, with elasticity values ranging from 0.11 to 1.25. Total grains followed with a range of household elasticities going from 0.52 to 0.62.

Vegetables, meat and beverages appeared to have a moderate responsiveness with respect to household size. The values for vegetables ranged from 0.34 to 0.55, if we do not consider some extreme values. In the same way, meat ranged from 0.12 to 0.65, beverages went from 0.28 to 0.70, and total fruits showed values from 0.13 to 0.72. Total fats was the most inelastic category with respect to household size, with values ranging normally from –0.11 to 0.27.

Analyzing the meat subcategories, we observe that while TP and SS regressions provided elasticity values showing moderate to elastic household size elasticities, the figures estimated from HP regressions were generally higher for the three subcategories, especially for beef, and in a less degree for pork. These two subgroups consistently showed the highest response due to household size. The demand for chicken with respect to household size appeared to be the least elastic one among the three.

Implications

There are some limitations in this study. The lack of information about expenditures on specific food groups prevents us from making inferences about budget shares among the food groups. Thus, we limited our demand analysis to physical quantities consumed. On the average, the demand for particular 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 confidence intervals for the elasticities show that these are not precise estimates. In some extreme cases, the confidence intervals range from negative values (inferior goods) to positive values greater than one (luxury goods). One possible explanation for these results is that even the subgroups beef, pork, and chicken represent broad categories with different quality characteristics which are lost when estimated as aggregate commodities.

The national origin of the Hispanic household was important in explaining the demand for some specific food groups. Families of Puerto Rican origin consumed lower quantities of vegetables and dairy products compared to households of other Hispanic origin. Cuban and Mexican households consumed greater quantities of legumes, nuts, and seeds, and less pork than other groups. In addition, Mexicans reported the highest consumption of total fats, whereas Cubans reported the lowest demand for this category. Cubans also showed the highest consumption level of vegetables.

Both the location of the household with respect to the metropolitan statistical area (MSA) and the geographic region illustrated an important effect in the composition of the diet. Hispanic families living inside the MSA reported having more grains, fruits, milk, pork and chicken in their diet, and a lower proportion of vegetables, fats and beverages. Households living in the Northeast region of the U.S. showed the highest consumption of vegetables, milk products, and total fats, *ceteris paribus*. Hispanic households living in the Midwest, on the other hand, reported the highest level of demand for fruits.

The educational level of the household head should also be regarded as an important factor determining the demand for food. Educational level influences the composition of the diet as households become more aware of healthy eating habits. Government income transfers received by households (Food Stamp or WIC programs) may also have some significant influence in the demand for specific food groups, such as milk, fats, sugar, and meats, especially pork. A recent study carried out by Wilde, McNamara and Ranney (1999) for the whole U.S. population suggested that household participation in Food Stamp and WIC programs affect the demand for meats, sugar, and total fats. This study, although not conclusive, provided some evidence that supports this claim for Hispanic consumers. In particular, the consumption of pork, dairy products and fruits appear to be higher for households receiving benefits from the WIC program. Total fats, beverages, and chicken consumption were also affected by participation in the WIC program, but the effect appears to be negative. On the other hand, households receiving food stamps seem to consume more milk, fats, sugar, and less pork.

In conclusion, although in general the demand for broad food groups appears to be relatively inelastic with respect to income, the situation may be quite different when more disaggregated food categories are considered. In particular, food processors and retailers should pay attention to some socioeconomic and demographic characteristics of the households in this marketing area when targeting Hispanic consumers with their products.

Table V.1. Grains: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	-113.337 (223.034)	848.182 (658.929)	-106.560 (254.909)	4.00640*** (0.790799)	0.916016 (1.32945)	3.99260*** (0.696735)	-840.869* (490.764)	-2146.36*** (756.789)	-810.561* (454.534)
(L)INCWK	0.064270 (0.088292)	0.156222* (0.094834)	0.060220 (0.079423)	0.091713 (0.069026)	1.03855*** (0.323989)	0.090978 (0.067870)	37.7673 (53.3543)	437.747** (171.356)	35.4760 (44.0775)
(L)HHSIZE	136.768*** (28.1091)	-7.67659 (102.528)	138.280*** (20.3120)	0.525528*** (0.093625)	-1.62204** (0.727296)	0.521542*** (0.092613)	404.831*** (60.0000)	-502.383 (405.546)	408.236*** (60.1663)
(L)AGE	0.796597 (1.91067)	-0.228453 (1.97673)	0.745091 (1.85829)	0.081804 (0.134780)	2.01232*** (0.662534)	0.090047 (0.123194)	144.983 (90.4314)	960.505** (386.439)	141.443* (80.4463)
S_FEM	35.7290 (57.0308)	57.4741 (52.8696)	36.9018 (51.3976)	0.118098 (0.081727)	0.139226* (0.080696)	0.105552 (0.079650)	66.7476 (57.9671)	75.6727 (57.1912)	67.5940 (51.9074)
O_MEX	9.11403 (53.4679)	11.9309 (53.5791)	14.8004 (57.0873)	0.059905 (0.089350)	0.070659 (0.088416)	0.050525 (0.073211)	21.2566 (53.0794)	25.7997 (52.7718)	28.1843 (56.8011)
O_PRI	-30.4588 (88.4324)	-38.1726 (88.0525)	-23.2471 (89.4559)	0.039161 (0.135589)	0.017510 (0.136181)	0.018263 (0.137685)	-31.2971 (88.9039)	-40.4433 (89.4049)	-21.5342 (89.3122)
O_CUB	108.422 (165.537)	119.005 (162.217)	116.226 (155.071)	0.240447 (0.180068)	0.275562 (0.170812)	0.227200 (0.238257)	122.105 (165.853)	136.939 (164.921)	130.585 (154.809)
R_NEAST	167.706* (99.3989)	171.507* (100.049)	158.953 (84.5229)	0.318612** (0.124499)	0.284721** (0.124335)	0.325246*** (0.121376)	163.648* (99.0657)	149.331 (97.9935)	156.235* (84.1165)
R_MWEST	-68.2617 (75.7971)	-72.0094 (76.7462)	-65.0277 (96.1875)	-0.064771 (0.153138)	-0.093562 (0.153931)	-0.071837 (0.147412)	-74.9193 (76.6004)	-87.0817 (76.5272)	-71.4815 (95.6624)
R_SOUTH	-68.0334 (49.9530)	-69.1951 (49.5931)	-65.1480 (60.1294)	-0.056450 (0.092517)	-0.079727 (0.092811)	-0.065641 (0.090423)	-65.2086 (49.9598)	-75.0416 (50.1748)	-61.8853 (59.8276)
U_MSAINC	105.624* (62.0393)	119.667* (62.4767)	99.8591 (74.7078)	0.173200 (0.117197)	0.222615* (0.117506)	0.187223* (0.112903)	122.553** (61.3409)	144.272** (62.2586)	115.365 (74.0275)
U_MSAOUT	171.460*** (52.9011)	172.289*** (52.6944)	163.939** (68.6855)	0.234420** (0.112485)	0.245915** (0.112243)	0.238640** (0.104941)	170.115*** (53.4727)	174.971*** (53.1525)	161.904** (68.4778)
G_ELEM	94.2888 (161.479)	121.502 (162.358)	94.1584 (220.347)	0.355793 (0.440615)	0.388641 (0.423453)	0.364672 (0.338241)	120.310 (161.271)	134.187 (153.716)	121.165 (219.551)
G_HIGH	236.213 (164560)	254.703 (166.581)	232.658 (220.005)	0.584806 (0.440485)	0.612555 (0.423670)	0.597896* (0.338110)	263.280 (166.062)	275.002* (159.458)	260.085 (219.423)
G_COLL	352.774** (165.212)	379.899** (167.531)	348.231 (224.698)	0.775431* (0.443793)	0.788516* (0.426863)	0.784254** (0.343424)	380.251** (167.159)	385.778** (160.258)	375.673* (224.155)
G_GRAD	278.058 (187.683)	308.541 (190.172)	280.371 (241.754)	0.599919 (0.472582)	0.620381 (0.454535)	0.603334 (0.370421)	310.662* (187.780)	319.306* (181.245)	313.310 (240.686)
T_OWNER	-45.5861 (57.7546)	-51.5825 (57.5977)	-46.7876 (57.2562)	0.049722 (0.091377)	0.065034 (0.091769)	0.042223 (0.080765)	-61.0670 (57.5006)	-54.5989 (57.6595)	-62.9079 (57.0855)
F_STAMP	45.0980 (69.5851)	46.1756 (68.9929)	39.5846 (65.5800)	0.155912 (0.112325)	0.179175 (0.111161)	0.144656 (0.105771)	55.1292 (81.8567)	64.9564 (80.4304)	48.7397 (68.7812)
W_YES	70.8988 (94.4103)	71.6667 (93.8860)	63.3492 (69.0129)	-0.115888 (0.088416)	-0.065309 (0.130468)	-0.102075 (0.098015)	86.8738 (95.1775)	108.240 (96.8824)	79.0721 (68.7259)
Y_95	-103.700* (60.0133)	-101.334* (59.6780)	-103.245* (58.8412)	-0.254917*** (0.087441)	-0.257912*** (0.086810)	-0.251454*** (0.087218)	-102.081* (59.5236)	-103.347* (59.3587)	-101.066* (58.5674)
Y_96	-5.48445 (62.9115)	-9.24129 (63.2562)	-16.1367 (60.5381)	-0.137369 (0.096006)	-0.136214 (0.095705)	-0.143564 (0.093004)	-7.79374 (62.3718)	-7.30553 (62.2172)	-19.6238 (60.2350)
I. Mills R.	-	-59273.6* (34367.5)	-	-	-789.277** (259.875)	-	-	-333421.** (144472.)	-
SIGMA	-	-	605.787*** (16.4552)	-	-	0.930146*** (0.025223)	-	-	603.592*** (16.6924)
RHO	-	-	1.000000 (~0.00000)	-	-	1.000000 (~0.00000)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.2. Vegetables: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	172.147	3269.28**	224.193	3.17880***	0.623384	3.52411***	-76.2812	-2380.77	-16.5073
	(144.091)	(1535.19)	(138.306)	(0.844101)	(5.73497)	(0.887234)	(232.101)	(1777.84)	(231.200)
(L)INCWK	0.076095*	-0.926291*	0.082178**	0.099428	0.335741	0.072920	38.7886*	251.897	43.9440**
	(0.041274)	(0.490752)	(0.039350)	(0.080075)	(0.542640)	(0.086729)	(21.8305)	(167.151)	(22.1312)
(L)HHSIZE	42.4920***	200.183**	36.1679***	0.365190***	0.546529	0.360100***	137.226***	300.759**	124.335***
	(13.1737)	(81.0385)	(10.0588)	(0.103810)	(0.404545)	(0.124791)	(32.0267)	(131.105)	(30.9809)
(L)AGE	-0.972723	15.5594*	-1.20013	0.259212	0.217056	0.215356	-1.61336	-39.6299	-12.6744
	(967542)	(8.20201)	(0.947464)	(0.151010)	(0.176447)	(0.164192)	(45.7192)	(53.8145)	(39.8463)
S_FEM	18.8509	17.6280	-2.38742	0.058530	0.055268	0.036976	29.4932	26.5514	4.64033
	(26.9438)	(26.8235)	(23.8691)	(0.095046)	(0.095813)	(0.095306)	(27.3580)	(27.4888)	(17.0647)
O_MEX	16.7508	13.4330	13.4796	0.094914	0.093929	0.041470	19.6089	18.7211	12.1162
	(30.9601)	(30.8833)	(24.0168)	(0.115568)	(0.115805)	(0.088915)	(31.0276)	(31.0777)	(22.8138)
O_PRI	-108.058***	-108.411***	-80.3016*	-0.286438*	-0.288330*	-0.304624**	-106.155***	-107.862***	-79.4264*
	(38.4709)	(38.5091)	(46.1649)	(0.153810)	(0.153812)	(0.129945)	(38.4169)	(38.5992)	(47.0071)
O_CUB	244.344	241.528	70.7134**	0.335198	0.334242	0.318625**	252.874	252.013	72.1028**
	(201.081)	(198.805)	(35.0003)	(0.303329)	(0.304899)	(0.160818)	(199.718)	(200.214)	(28.2660)
R_NEAST	82.2189*	79.6619*	68.7631**	0.465383***	0.469381***	0.367760***	79.9573*	83.5631*	68.8342**
	(45.1731)	(45.0126)	(27.1404)	(0.148431)	(0.148227)	(0.134115)	(44.6267)	(44.7242)	(32.2064)
R_MWEST	37.4458	34.8567	47.0391	0.155826	0.155838	0.160171	36.3211	36.3322	48.6508**
	(46.9737)	(47.4707)	(35.5444)	(0.195433)	(0.195110)	(0.163710)	(47.3881)	(47.1080)	(23.7229)
R_SOUTH	26.5224	26.5165	32.3235	0.265621**	0.264157**	0.206214	27.7060	26.3859	30.0345
	(32.4909)	(32.3689)	(27.0873)	(0.108444)	(0.108895)	(0.136541)	(32.1298)	(32.3233)	(24.6560)
U_MSAINC	-15.2151	-12.5103	-45.7656	-0.200778	-0.203577	-0.213760**	-10.5642	-13.0881	-44.5684
	(36.9751)	(36.7418)	(32.0385)	(0.134585)	(0.134599)	(0.108079)	(36.8215)	(36.8068)	(29.1144)
U_MSAOUT	0.735039	-3.52257	-18.2016	-0.109236	-0.109055	-0.200505**	-2.01554	-1.85182	-17.9314
	(35.3518)	(35.2515)	(29.0043)	(0.112485)	(0.120341)	(0.100179)	(35.2671)	(35.3886)	(31.4321)
G_ELEM	-11.4071	-11.4401	-14.8266	0.050225	0.049940	0.134557	-7.76258	-8.02027	-9.25787
	(136.164)	(130.119)	(127.468)	(0.430067)	(0.430017)	(0.457211)	(134562)	(132.946)	(127.312)
G_HIGH	1.90756	-9.83884	-15.1013	0.134447	0.131376	0.234837	8.57531	5.80557	-13.4230
	(135.028)	(129.686)	(126.731)	(0.425814)	(0.426136)	(0.451842)	(133.567)	(132.119)	(126.139)
G_COLL	0.878724	-8.44389	-19.2028	0.177511	0.171565	0.279348	11.6850	6.32230	-12.9990
	(137.219)	(132.018)	(128.888)	(0.433627)	(0.434661)	(0.455312)	(135880)	(134.842)	(128.237)
G_GRAD	-42.2946	-40.4433	-41.6556	0.121776	0.111847	0.125163	-25.8323	-34.7865	-25.7594
	(144.170)	(138.979)	(129.924)	(0.471954)	(0.474713)	(0.493410)	(142.658)	(142.275)	(131.378)
T_OWNER	-3.33779	-9.42278	-11.3411	-0.037089	-0.040608	0.027132	-8.71024	-11.8844	-18.6236
	(28.1331)	(28.1240)	(26.5710)	(0.102712)	(0.103564)	(0.112969)	(27.7533)	(27.9172)	(23.4577)
F_STAMP	20.9897	40.5842	13.5374	0.208915*	0.203256*	0.231509*	26.6445	21.5410	20.2386
	(35.3869)	(37.1668)	(16.4177)	(0.113134)	(0.111882)	(0.127942)	(37.7199)	(37.6994)	(27.2646)
W_YES	-5.95093	-2.37250	-6.51921	0.023064	0.024425	0.008794	-5.36928	-4.14194	-10.6133
	(40.6122)	(40.3360)	(9.82990)	(0.133510)	(0.133556)	(0.132913)	(40.5367)	(40.4764)	(25.3008)
Y_95	-14.6303*	-11.2263	9.32242	-0.086892	-0.088595	0.013862	-13.2624	-14.7978	7.70188
	(30.3475)	(30.5910)	(30.9958)	(0.111641)	(0.112193)	(0.117131)	(29.9909)	(29.9413)	(27.0941)
Y_96	58.9854	59.6937	44.0883	0.140575	0.141003	0.178637	58.5109	58.8969	40.2094*
	(36.9854)	(36.5439)	(26.8568)	(0.114631)	(0.114625)	(0.108555)	(36.3702)	(36.3851)	(23.5830)
I. Mills R.	-	-45905.6**	-	-	13.8452	-	-	12485.7	-
		(22589.4)			(30.3539)			(9441.85)	
SIGMA	-	-	330.043***	-	-	1.17250***	-	-	328.595***
			(9.53530)			(0.038900)			(9.27312)
RHO	-	-	1.000000	-	-	1.000000	-	-	1.000000
			(~0.00000)			(~0.00000)			(~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.3. Fruits: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	508.645* (269.925)	658.023 (419.394)	400.121*** (113.095)	6.55497*** (0.735548)	5.22290*** (1.57736)	7.07270*** (0.825361)	886.987** (382.832)	363.124 (792.167)	581.478* (302.701)
(L)INCWK	-0.081409 (0.059110)	-0.127228 (0.116254)	0.003100 (0.071530)	-0.056222 (0.070848)	0.068082 (0.151008)	-0.106462 (0.079736)	-22.1888 (32.5606)	26.6966 (75.8886)	15.4447 (33.4299)
(L)HHSIZE	53.1831*** (17.2840)	30.7166 (51.6220)	84.2006** (35.8525)	0.318906*** (0.107331)	0.719105* (0.727296)	0.130801 (0.114306)	168.207*** (48.4189)	325.593 (217.996)	246.695*** (51.4621)
(L)AGE	-3.47357** (1.59062)	-2.73021 (2.24558)	-3.69614 (4.55605)	-0.204741 (0.142386)	-0.298794* (0.174965)	-0.169796 (0.149713)	-121.261 (75.0763)	-158.249* (89.9148)	-113.700* (66.5232)
S_FEM	-32.6708 (43.6476)	-28.2762 (45.0404)	-22.5271 (17.0738)	-0.059353 (0.092681)	-0.071715 (0.093218)	-0.025810 (0.084510)	-20.6736 (44.1265)	-25.5351 (44.7602)	-20.8900 (36.6288)
O_MEX	12.8825 (50.4402)	13.8447 (50.4425)	-4.15272 (24.4648)	0.001140 (0.097844)	-0.006143 (0.098248)	-0.002872 (0.093409)	18.8565 (50.7219)	15.9921 (51.0629)	-6.93222 (29.0603)
O_PRI	-43.9247 (63.8883)	-43.0437 (63.9215)	-46.7604 (80.1244)	-0.130933 (0.149059)	-0.130882 (0.149768)	-0.165407 (0.148527)	-46.6290 (64.2500)	-46.6093 (64.4251)	-56.3258 (63.8855)
O_CUB	111.392 (154.409)	114.085 (154.459)	-108.527 (98.6585)	0.009210 (0.397060)	0.002715 (0.398653)	0.063619 (0.227526)	109.304 (151.880)	106.749 (153.056)	-100.493 (98.3956)
R_NEAST	34.7552 (64.7740)	35.3235 (64.8059)	35.9323 (70.0226)	0.209646 (0.142845)	0.211987 (0.142771)	0.128785 (0.137794)	44.8425 (64.3533)	45.7633 (64.4303)	37.9757 (66.5911)
R_MWEST	50.1001 (75.9798)	51.4312 (76.2521)	46.8735*** (9.986742)	0.286746** (0.144448)	0.284847** (0.143435)	0.224199 (0.158759)	52.5727 (76.7351)	51.8259 (76.5941)	64.3986 (41.0844)
R_SOUTH	-23.9252 (50.9770)	-22.6105 (50.9629)	4.42154 (32.4410)	0.022792 (0.105845)	0.016715 (0.106113)	0.017156 (0.100134)	-18.5707 (50.8947)	-20.9607 (51.1231)	-0.801004 (33.9422)
U_MSAINC	107.328* (62.0393)	109.621** (55.5346)	47.0832 (30.1510)	0.190075 (0.123207)	0.177818 (0.123407)	0.208145* (0.118192)	107.477* (55.0924)	102.657* (62.2586)	48.3115 (49.7243)
U_MSAOUT	147.622*** (54.1133)	147.961*** (54.1771)	38.4837 (47.9192)	0.223994* (0.120322)	0.218716* (0.120489)	0.272825** (0.111959)	146.596*** (54.4445)	144.520*** (54.3586)	37.7069 (49.8929)
G_ELEM	-64.6314 (271.827)	-62.3957 (272.082)	-116.645*** (38.0147)	-0.285188 (0.382341)	-0.296640 (0.377532)	-0.130264 (0.390823)	-57.2830 (272.657)	-61.7864 (270.710)	-116.891*** (33.3774)
G_HIGH	-75.5644 (267.450)	-74.2422 (267.694)	-121.414*** (28.8314)	-0.250892 (0.378955)	-0.261037 (0.373896)	-0.156691 (0.338136)	-73.9623 (269.377)	-77.9519 (267.373)	-120.850*** (24.8089)
G_COLL	-33.3440 (268.223)	32.1909 (268.455)	-55.8450 (90.7065)	-0.112850 (0.382782)	-0.122580 (0.378326)	-0.051575 (0.393290)	-40.0494 (270.200)	-43.8757 (268.379)	-67.9840** (224.155)
G_GRAD	76.7113 (283.187)	77.7351 (283.369)	-15.8177 (101.064)	-0.016152 (0.413266)	-0.025996 (0.409418)	0.081425 (0.417484)	63.0966* (285.042)	59.2251 (283.528)	-27.0390 (88.5556)
T_OWNER	24.4164 (50.9084)	22.9132 (51.5982)	-15.1305 (21.1179)	0.081621 (0.100870)	0.081539 (0.100442)	0.047874 (0.091425)	13.5990 (52.2999)	13.5664 (52.1893)	-15.0828 (15.3729)
F_STAMP	-76.2590 (52.7231)	-75.3289 (52.7938)	-13.9076 (31.3140)	-0.038784 (0.113363)	-0.040440 (0.113260)	-0.089370 (0.113676)	-72.4189 (55.7075)	-73.0699 (55.7440)	-18.2649 (36.0411)
W_YES	144.457** (71.6545)	145.000** (71.8200)	54.5957*** (18.0462)	0.224436* (0.119935)	0.219003* (0.130468)	0.241577** (0.107518)	149.320** (71.7912)	147.183** (71.8602)	68.1081*** (26.3139)
Y_95	-49.4698 (54.2729)	-48.2541 (54.0308)	-23.4411 (24.4234)	-0.090017 (0.107265)	-0.091190 (0.107249)	-0.087246 (0.094775)	-53.1043 (54.4146)	-53.5658 (54.3965)	-25.0044 (58.5674)
Y_96	-83.1730 (55.7685)	-83.6266 (55.8181)	-24.9501 (47.8443)	-0.065746 (0.101216)	-0.063939 (0.101382)	-0.122205 (0.098441)	-85.3164 (55.6306)	-84.6058 (55.7632)	-17.4081 (29.5803)
I. Mills R.	-	-415.478 (853.414)	-	-	2.47990 (2.56884	-	-	975.273 (1263.22)	-
SIGMA	-	-	541.944*** (16.4552)	-	-	1.12657*** (0.040361)	-	-	541.988*** (17.7474)
RHO	-	-	1.000000 (~0.00000)	-	-	-0.931261*** (0.031271)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.4. Milk: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	781.255** (304.065)	535.104 (356.360)	819.375*** (285.002)	7.98781*** (0.715761)	7.73595*** (0.719999)	8.22627*** (0.807156)	1578.85*** (519.475)	1369.05*** (528.785)	1691.70*** (500.222)
(L)INCWK	-0.116983 (0.085136)	0.103756 (0.173.118)	-0.083539 (0.078372)	-0.029466 (0.078007)	0.212330 (0.152864)	-0.083789 (0.078602)	-22.2158 (45.7068)	179.212* (94.7608)	-2.08089 (46.1162)
(L)HHSIZE	169.058*** (27.4981)	206.066*** (39.5855)	168.175*** (21.5979)	0.804462*** (0.119306)	1.03699*** (0.172641)	0.757884*** (0.109158)	496.523*** (64.7789)	690.228*** (102.810)	490.649*** (62.4965)
(L)AGE	-9.03776*** (1.77707)	-17.0134*** (5.18470)	-10.2483*** (2.01875)	-0.624206*** (0.135988)	-1.16448*** (0.328645)	-0.587555*** (0.141220)	-310.741*** (84.3502)	-760.821*** (179.426)	-368.799*** (80.4463)
S_FEM	-22.7361 (55.7612)	-29.3070 (56.0084)	-15.8069 (50.8269)	0.103078 (0.089866)	0.097778 (0.089267)	0.039286 (0.092434)	5.24228 (56.2947)	0.827190 (56.0814)	4.34871 (49.3386)
O_MEX	80.6235 (59.8998)	79.3070 (59.8437)	53.4926 (56.5724)	0.013091 (0.100480)	0.006867 (0.100204)	-0.010202 (0.093636)	92.3670 (60.3723)	87.1821 (60.2052)	57.9951 (47.5587)
O_PRI	-127.544* (74.6816)	-133.201* (74.6032)	-97.1750 (98.9691)	-0.457676** (0.179065)	-0.460900** (0.178953)	-0.367851** (0.147476)	-133.670* (75.7926)	-136.356* (75.5738)	-104.874 (99.7771)
O_CUB	173.355 (198.915)	168.256 (197.507)	40.9121 (137.238)	0.120915 (0.274005)	0.113858 (0.276007)	0.051850 (0.289065)	180.298 (196.064)	174.419 (194.174)	54.2901 (135.086)
R_NEAST	32.4942 (81.2595)	34.7563 (81.2160)	33.6639 (60.3072)	0.328095** (0.131813)	0.333589** (0.132025)	0.233956 (0.150997)	42.4060 (81.7139)	46.9835 (81.4063)	45.0035 (66.2194)
R_MWEST	-106.526 (95.1944)	-111.203 (95.3606)	-73.2750 (87.9949)	-0.239658 (0.197737)	-0.247096 (0.198253)	-0.174732 (0.166069)	-111.262 (95.5817)	-117.459 (96.0409)	-67.6416 (107.128)
R_SOUTH	-107.314* (61.0200)	-113.070* (61.0357)	-65.8122 (66.3900)	-0.075067 (0.113766)	-0.090887 (0.114243)	-0.062537 (0.099598)	-102.751* (60.5228)	-155.930* (60.7279)	-63.1472 (66.8930)
U_MSAINC	142.000** (71.6544)	136.593* (71.6062)	137.245* (77.2542)	0.296020** (0.126733)	0.286934** (0.126820)	0.299903** (0.129554)	151.210** (71.4417)	143.641** (71.2300)	142.073* (74.0275)
U_MSAOUT	149.840** (70.5070)	150.185** (70.2470)	125.259 (77.7965)	0.276847** (0.121529)	0.274625** (0.121444)	0.320733*** (0.106754)	153.705** (70.3165)	151.854** (70.0568)	130.798* (78.0708)
G_ELEM	-300.640 (262.675)	-275.793 (264.764)	-299.305 (247.452)	-0.650920** (0.302817)	-0.627453** (0.294313)	-0.579317 (0.401398)	-247.736 (262.526)	-228.187 (258.074)	-246.315 (247.427)
G_HIGH	-217.348 (264.001)	-186.377 (266.897)	-258.359 (247.075)	-0.464071 (0.303152)	-0.437687 (0.294164)	-0.358076 (0.401411)	-183.177 (264.582)	161.198 (260.181)	-228.506 (247.371)
G_COLL	-113.463 (268.995)	-79.8181 (272.430)	-188.031 (248.450)	-0.343041 (0.312831)	-0.316857 (0.304984)	-0.311526 (0.410347)	-90.7391 (269.533)	-68.9267 (265.573)	-170.123 (249.144)
G_GRAD	-212.780 (286.795)	-187.649 (288.163)	-252.968 (258.117)	-0.602350 (0.367012)	-0.587269 (0.360187)	-0.492280 (0.413582)	-198.928 (286.047)	-186.365 (282.514)	-240.715 (270.976)
T_OWNER	2.61375 (65.9671)	9.29074 (65.5765)	35.6276 (58.1003)	0.089146 (0.104600)	0.083272 (0.104502)	0.127868* (0.071447)	-12.8848 (65.2103)	-17.7778 (65.0999)	20.8597 (59.8987)
F_STAMP	113.768 (76.2260)	100.092 (77.0971)	116.367* (60.3431)	0.261776** (0.110321)	0.249857** (0.111250)	0.242112** (0.112420)	128.066 (80.9046)	118.137 (80.8169)	136.562** (67.8179)
W_YES	181.733** (91.5584)	177.214* (91.5573)	145.615** (59.2101)	0.337530*** (0.098712)	0.343824*** (0.099263)	0.292344** (0.126146)	195.876** (90.9694)	201.119** (90.9506)	156.953** (71.6758)
Y_95	-60.5182 (67.3967)	-66.5200 (67.6276)	-68.1960 (56.4971)	-0.197466** (0.100709)	-0.207144** (0.100865)	-0.206691** (0.088815)	-65.3355 (67.4328)	-73.3981 (67.3483)	-76.2403 (56.4721)
Y_96	-30.0420 (71.0784)	-32.4185 (71.1579)	-5.44492 (57.3531)	-0.139914 (0.109346)	-0.144587 (0.109249)	-0.176632* (0.097170)	-33.8436 (70.9557)	-37.7361 (70.8156)	-15.8704 (49.8848)
I. Mills R.	-	5601.33* (3319.83)	-	-	9.34725* (5.24860)	-	-	7786.74*** (2710.50)	-
SIGMA	-	-	681.675*** (17.8730)	-	-	1.11167 (~0.00000)	-	-	682.328*** (19.3579)
RHO	-	-	1.000000 (~0.00000)	-	-	1.000000 (~0.00000)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.5. Meat: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	140.764 (228.476)	1237.64* (749.354)	144.951 (176.930)	3.84349*** (0.818546)	6.19638*** (1.73415)	3.85266*** (0.775266)	-246.407 (330.718)	435.950 (720.834)	-240.826 (303.649)
(L)INCWK	0.060508 (0.055412)	-0.033652 (0.081695)	0.050100 (0.049970)	0.043270 (0.077105)	0.079842 (0.080683)	0.074747 (0.080389)	43.2303 (31.8413)	53.8364 (32.9620)	35.6105 (29.0662)
(L)HHSIZE	88.5040*** (19.4451)	20.2012 (49.5841)	89.3058*** (14.0462)	0.484435*** (0.105312)	0.121917 (0.267891)	0.433014*** (0.110391)	250.213*** (40.8124)	145.080 (108.664)	259.233*** (42.4425)
(L)AGE	-0.490013 (1.13404)	-8.83717 (5.49222)	-0.384448 (1.29116)	0.134630 (0.142083)	-0.349515 (0.349578)	0.121707 (0.147108)	36.1167 (51.3251)	-104.289 (142.649)	45.8519*** (54.4760)
S_FEM	-25.6957 (36.4278)	-17.1240 (35.1937)	-14.5264 (33.8202)	-0.056336 (0.086710)	-0.051028 (0.086836)	-0.048271 (0.094609)	-8.00328 (36.7210)	-6.46410 (36.4132)	0.862986 (31.0231)
O_MEX	33.6818 (38.4246)	33.2129 (38.3794)	20.3075 (38.9871)	0.020316 (0.098897)	0.015652 (0.098815)	0.060615 (0.103853)	39.7787 (38.4628)	38.4259 (38.4151)	26.2160 (38.0600)
O_PRI	-10.7222 (50.8432)	-7.40953 (51.4209)	-27.7429 (56.8242)	-0.098584 (0.161466)	-0.095360 (0.162055)	-0.050476 (0.160120)	10.6372 (51.0260)	-9.70209 (51.2241)	-25.8057 (44.5005)
O_CUB	140.831 (113.587)	133.968 (113.568)	95.9456 (77.5593)	0.169727 (0.275576)	0.160262 (0.278924)	0.152021 (0.282730)	148.189 (112.532)	145.444 (112.953)	100.812* (53.2117)
R_NEAST	69.8252 (59.5777)	69.9632 (60.5746)	46.0392 (53.8094)	0.190746 (0.149241)	0.192836 (0.150067)	0.174693 (0.154206)	67.8873 (59.9893)	68.4936 (60.3316)	48.2637 (39.6400)
R_MWEST	-39.9944 (49.1187)	-39.6198 (49.8517)	-39.1763 (66.5027)	-0.004647 (0.166531)	-0.013694 (0.166029)	-0.067066 (0.176201)	-44.3265 (49.2749)	-46.9502 (49.2308)	-44.2045 (66.1444)
R_SOUTH	18.0747 (40.5622)	16.6543 (40.8119)	7.58947 (40.2869)	0.078223 (0.108499)	0.077212 (0.108510)	0.046843 (0.109242)	20.0031 (39.9763)	19.7097 (40.0165)	7.05283 (35.3866)
U_MSAINC	-61.9258 (48.3304)	-56.8548 (48.6909)	-48.3410 (49.3751)	-0.140259 (0.129457)	-0.134805 (0.128968)	-0.102204 (0.136310)	-52.8852 (48.0106)	-51.3036 (47.8925)	-37.4455 (48.7556)
U_MSAOUT	-34.9289 (43.4545)	-33.9201 (43.3803)	-19.2149 (42.6351)	-0.134869 (0.120833)	-0.132690 (0.120510)	-0.122457 (0.125377)	-36.7518 (43.7111)	-36.1286 (43.6068)	-17.1803 (40.6439)
G_ELEM	86.5495 (219.113)	83.0846 (217.736)	69.9863 (152.703)	0.649062 (0.497931)	0.658060 (0.496176)	0.576443*** (0.204541)	102.565 (219.750)	105.174 (220.357)	85.3492 (152.671)
G_HIGH	58.1186 (216.126)	52.9720 (214.903)	45.9863 (152.926)	0.735164 (0.494075)	0.729742 (0.491999)	0.633620*** (0.234941)	68.6073 (217.074)	67.0349 (217.559)	59.7831 (152.063)
G_COLL	47.9695 (216.515)	42.5878 (215.237)	41.5863 (154.270)	0.735233 (0.500039)	0.730665 (0.497875)	0.644220*** (0.227782)	57.3639 (218.013)	56.0390 (218.479)	52.0636 (154.619)
G_GRAD	-0.500525 (223.787)	-4.85062 (222.759)	-0.123006 (167.096)	0.547772 (0.526950)	0.539269 (0.525679)	0.440268 (0.296017)	10.8141 (224.735)	8.34806 (225.409)	13.9927 (166.292)
T_OWNER	-54.9820 (39.9563)	-56.7191 (40.2574)	-54.2023 (37.0778)	-0.152382 (0.103507)	-0.155296 (0.103434)	-0.151736 (0.104814)	-63.3512 (40.5033)	-64.1963 (40.6074)	-63.9792** (31.3857)
F_STAMP	17.9694 (50.7030)	18.2710 (50.8987)	10.9883 (32.4897)	0.037721 (0.129332)	0.043084 (0.129676)	0.078370 (0.118631)	34.1814 (55.4302)	35.7364 (55.5241)	25.5176 (46.3782)
W_YES	-53.1100 (57.2994)	-47.1412 (57.3066)	-58.6329 (47.1987)	-0.296236** (0.140639)	-0.293035** (0.140610)	-0.237405* (0.125260)	-42.1541 (59.2078)	-41.2257** (59.0878)	-50.5698 (46.8355)
Y_95	-31.2012 (39.4102)	-30.3652 (39.3109)	-24.1469 (39.4191)	-0.036767 (0.104208)	-0.041317 (0.104666)	-0.071812 (0.107250)	-29.4010 (39.5199)	-30.7206 (39.5763)	-23.2882 (39.2313)
Y_96	25.0651 (46.0567)	21.5252 (45.9531)	14.5800 (34.5994)	-0.006078 (0.109957)	-0.000177 (0.109683)	-0.045047 (0.107401)	23.6196 (46.0143)	21.8057 (45.9798)	12.0276 (33.2288)
I. Mills R.	-	-15468.4* (9386.02)	-	-	-13.6552* (8.07230)	-	-	-3960.12 (3161.54)	-
SIGMA	-	-	421474*** (11.8987)	-	-	1.10211*** (0.029927)	-	-	420.536*** (11.8707)
RHO	-	-	1.000000 (~0.00000)	-	-	1.000000 (~0.00000)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.6. Legumes, Nuts, and Seeds: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	13.1421 (118.070)	288.339 (258.982)	35.7397 (53.1715)	1.90837* (0.996018)	2.54406** (1.16941)	1.60113 (1.06210)	-194.793 (186.591)	-134.700 (240.094)	202.273 (167.838)
(L)INCWK	-0.001553 (0.031963)	0.084225 (0.076195)	-0.048596 (0.031880)	0.047241 (0.101693)	-0.140577 (0.204885)	0.145999 (0.104824)	18.1420 (17.4159)	0.387283 (43.6641)	-17.0202 (17.1810)
(L)HHSIZE	47.0037*** (9.71522)	-9.28434 (46.3446)	61.9508*** (9.12563)	0.557806*** (0.121650)	1.24668** (0.267891)	0.240847 (0.150383)	139.049*** (26.3343)	202.278 (139.111)	189.445*** (30.2475)
(L)AGE	-0.112676 (0.740453)	2.59208 (2.31427)	-1.76021** (0.862617)	0.326629* (0.171787)	0.037527 (0.323699)	0.487084** (0.196453)	24.5005 (35.2449)	-2.82867 (71.6438)	-44.5924 (36.3381)
S_FEM	-6.23885 (25.9831)	-0.962698 (26.4310)	2.02843 (9.78845)	0.012429 (0.112278)	0.002243 (0.112798)	0.034315 (0.109265)	4.51661 (26.4030)	3.55375 (26.7516)	3.46648 (6.49657)
O_MEX	38.5071 (28.5124)	39.1518 (28.5877)	11.1363 (13.6345)	0.325408** (0.130432)	0.323571** (0.130381)	0.300246** (0.117468)	41.3802 (28.4442)	41.2066 (28.5064)	7.57542 (18.6845)
O_PRI	36.8858 (37.3741)	34.2450 (36.9203)	0.132152 (21.4752)	-0.028247 (0.228149)	-0.022915 (0.227781)	0.001423 (0.208886)	38.6241 (37.1345)	39.1282 (37.0741)	-3.14534 (32.7995)
O_CUB	228.641* (118.776)	232.324** (117.827)	60.7811 (60.3135)	0.757726** (0.365417)	0.744370** (0.369086)	0.619191* (0.318068)	224.843 (117.595)	223.580* (117.342)	53.8285 (59.8567)
R_NEAST	-81.3368** (36.1476)	-82.4772** (36.2653)	-8.05132 (35.1453)	0.018392 (0.192154)	0.032239 (0.193974)	-0.143988 (0.185780)	-82.0983** (36.1601)	-80.7893** (36.3058)	-6.55583 (38.9977)
R_MWEST	-57.0735 (49.4273)	-57.8414 (49.2884)	-9.49891 (16.8513)	-0.529762** (0.250296)	-0.517945** (0.249914)	-0.456068** (0.199810)	-59.6721 (49.0484)	-58.5551 (49.0259)	-7.39171 (9.37286)
R_SOUTH	15.6760 (30.2238)	16.3293 (30.1774)	5.70961 (11.3298)	0.245496* (0.132900)	0.250705* (0.133116)	0.178114 (0.124442)	18.9664 (30.0338)	19.4589 (30.0245)	8.09779 (9.40701)
U_MSAINC	21.4241 (33.8692)	26.6978 (33.3457)	3.13114 (10.2907)	0.069872 (0.163314)	0.047813 (0.162785)	0.140877 (0.153151)	24.4178 (33.6330)	22.3325 (33.2791)	-1.35730 (18.2850)
U_MSAOUT	-2.65208 (31.1546)	-2.88103 (31.0756)	0.570746 (7.65947)	-0.097015 (0.148091)	-0.101062 (0.147769)	-0.016061 (0.147012)	-6.20081 (31.0665)	-6.58331 (30.9907)	-0.184731 (20.8897)
G_ELEM	38.0445 (110.540)	40.5915 (109.428)	-2.52230 (3.27596)	0.614994 (0.474900)	0.596302 (0.479751)	0.499650 (0.417812)	46.2447 (108.038)	44.4777 (108.501)	-2.16841 (125.7657)
G_HIGH	73.6451 (109.688)	75.7475 (108.622)	1.76139 (7.19126)	0.655167 (0.472189)	0.640843 (0.476849)	0.584190 (0.419323)	77.1745 (107.301)	75.8204 (107735)	1.15206 (24.2437)
G_COLL	56.6389 (112.576)	59.8704 (111.588)	-2.87451 (20.3708)	0.492866 (0.488977)	0.482565 (0.493516)	0.456030 (0.427515)	55.0217 (110.497)	54.0479 (110.941)	-4.94423 (22.3407)
G_GRAD	44.9314 (116.954)	47.0050 (115.950)	-21.3619 (52.0804)	0.546146 (0.539465)	0.542817 (0.543928)	0.502545 (0.461953)	40.2584 (114.937)	39.9438 (115.429)	-33.2512 (57.0117)
T_OWNER	-68.7154** (29.7489)	-70.9282** (30.0556)	-11.3223 (23.3370)	-0.268253** (0.127924)	-0.267652** (0.127974)	-0.311446*** (0.115504)	-78.8508*** (30.3184)	-78.7940*** (30.3449)	-13.8263 (9.83528)
F_STAMP	-20.4348 (33.4866)	-19.0785 (33.3485)	-13.8173 (15.7959)	0.011810 (0.147760)	0.002594 (0.148361)	0.032591 (0.143411)	-8.32917 (35.2093)	-9.20042 (35.2093)	-6.17879 (21.7411)
W_YES	57.2119 (39.4781)	58.8572 (39.5071)	16.0193 (9.64248)	0.152439 (0.154436)	0.141293 (0.155117)	0.167535 (0.138928)	63.3066 (39.6607)	62.2530 (39.8680)	19.2653 (17.0201)
Y_95	-29.7234 (27.1594)	-28.4431 (26.9085)	-8.80134 (16.5932)	-0.178500 (0.135785)	-0.178842 (0.135686)	-0.162881 (0.122544)	-29.5020 (26.9538)	-29.5344 (26.9578)	-5.47457 (17.6911)
Y_96	43.1853 (31.5529)	42.4009 (31.6230)	11.5926 (8.85287)	0.187467 (0.128399)	0.190235 (0.128302)	0.172493 (0.123700)	41.5797 (31.5996)	41.5797 (31.5996)	10.6424 (12.1297)
I. Mills R.	-	-770.015 (602.490)	-	-	2.59068 (2.39072)	-	-	244.900 (507.978)	-
SIGMA	-	-	293.071 (~0.00000)	-	-	1.46254*** (0.057414)	-	-	293.305*** (10.6086)
RHO	-	-	1.000000 (~0.00000)	-	-	-0.925930*** (0.026287)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.7. Fats: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	3.60284 (7.30182)	42.2389 (75.5566)	2.39603 (5.63907)	-0.726762 (1.21812)	-9.01640 (12.8411)	2.53342** (1.02024)	-30.6871 (18.9429)	-157.275 (244.130)	-55.2273*** (16.8342)
(L)INCWK	0.006883* (0.004087)	-0.008769 (0.031292)	0.014506*** (0.003440)	0.197308* (0.100484)	0.799357 (0.938646)	-0.072949 (0.101554)	4.76796** (2.07771)	13.9616 (18.1170)	7.83446*** (1.82987)
(L)HHSIZE	1.51923 (1.07197)	3.55024 (3.98971)	-0.174843 (0.985760)	0.201449 (0.141166)	-0.126048 (0.532902)	0.251060 (0.157712)	3.15236 (3.00142)	-1.84873 (10.2756)	-0.569780 (2.67892)
(L)AGE	0.017548 (0.077387)	-0.124787 (0.286595)	0.058716 (0.085117)	0.262292 (0.187834)	0.980984 (1.12714)	-0.140947 (0.213150)	3.04355 (3.60244)	14.0184 (21.1970)	5.48740 (3.63735)
S_FEM	2.24492 (2.46340)	2.24842 (2.46043)	0.637095*** (0.045869)	0.123235 (0.118735)	0.123658 (0.118932)	0.097465*** (0.030111)	2.51740 (2.51450)	2.52387 (2.51806)	0.692298 (0.809908)
O_MEX	0.016957 (2.68404)	0.067505 (2.67583)	0.607912 (1.27151)	0.010997 (0.132732)	0.009352 (0.132692)	0.079189*** (0.026237)	0.262587 (2.66769)	0.237469 (2.66592)	0.136370 (0.190001)
O_PRI	-7.36944 (4.65090)	-7.15795 (4.70246)	-2.07522 (1.96371)	-0.287436 (0.215351)	-0.289454 (0.215406)	-0.108735 (0.113158)	-6.83984 (4.65504)	-6.87065 (4.66810)	-1.48096 (2.22145)
O_CUB	-11.6014* (6.46896)	-11.5907* (6.39926)	-2.62990*** (0.423136)	-0.295380 (0.354791)	-0.293874 (0.353804)	-0.312678*** (0.070099)	-11.7559* (6.35124)	-11.7330* (6.35446)	-1.28093 (59.8567)
R_NEAST	7.93727* (4.32192)	7.77684* (36.2653)	3.05945*** (0.110968)	0.537692*** (0.183284)	0.546762*** (0.184834)	0.208739*** (0.005515)	7.80784* (4.22395)	7.94635* (4.28349)	1.99516 (2.56499)
R_MWEST	-3.33248 (4.63921)	-3.38271 (4.74001)	-1.81903 (1.14515)	-0.017233 (0.237071)	-0.016588 (0.236132)	-0.398362*** (0.093630)	-3.25720 (4.65797)	-3.24735 (4.65325)	-1.21678 (1.34900)
R_SOUTH	-1.81477 (2.79226)	-1.89424 (2.80553)	-0.608876** (274605)	0.058653 (0.141956)	0.063911 (0.142525)	-0.053283* (0.027865)	-1.63049 (2.76745)	-1.55020 (2.79261)	-0.374870 (0.861032)
U_MSAINC	-1.69899 (3.57805)	-1.52406 (3.58885)	-2.02619** (0.910459)	-0.122223 (0.170064)	-0.137111 (0.172352)	0.074267** (0.037955)	-1.56749 (3.53730)	-1.79483 (3.58646)	-1.66393 (1.11782)
U_MSAOUT	3.98212 (3.19174)	3.87749 (3.19498)	-0.951477** (0.411791)	0.057111 (0.153547)	0.057857 (0.153894)	0.087792*** (0.013794)	3.52199 (3.19832)	-3.53339 (3.20120)	-0.857420 (1.39057)
G_ELEM	10.0286** (4.62869)	10.1310** (4.54213)	2.22589** (1.10837)	0.820414 (0.707482)	0.816917 (0.718045)	1.39649*** (0.150009)	10.2112** (4.32853)	10.1578** (4.43553)	2.81620*** (0.424892)
G_HIGH	14.6983*** (4.60600)	14.5540*** (4.50364)	2.72322*** (0.600471)	0.943284 (0.699778)	0.934031 (0.711412)	1.65738*** (0.134352)	14.6212*** (4.28065)	14.4799*** (4.40363)	2.87221 (1.75676)
G_COLL	15.9847*** (5.19041)	15.7221*** (5.12337)	3.67699** (1.43057)	1.09051 (0.703941)	1.07662 (0.716337)	1.79248*** (0.080033)	15.7606*** (4.87432)	15.5484*** (5.00786)	3.45725 (2.64199)
G_GRAD	27.1993*** (8.24746)	27.0469*** (8.17354)	5.94992*** (1.20323)	1.45871** (0.737345)	1.43638* (0.750759)	1.99269*** (0.088937)	27.2428*** (7.89916)	26.9018*** (8.03110)	5.54727*** (1.56866)
T_OWNER	-1.51608 (2.80628)	-1.69280 (2.79903)	-0.948072*** (0.273700)	-0.106059 (0.135314)	-0.115853 (0.137634)	0.126268*** (0.026530)	-1.94667*** (2.77232)	-2.09623 (2.81147)	-0.372583 (0.664163)
F_STAMP	0.013028 (2.84143)	0.575831 (3.03947)	-1.15842 (1.46437)	0.092347 (0.164166)	0.077498 (0.167378)	0.285203** (0.128934)	1.49229 (3.03851)	1.26553 (3.03583)	-0.635114 (1.57702)
W_YES	-5.79472** (2.86998)	-5.53472* (2.92748)	-2.11497*** (0.404089)	-0.210355 (0.167317)	-0.216232 (0.167123)	-0.337188*** (0.125232)	-5.22663* (2.81410)	-5.31683* (2.80788)	-1.11633*** (0.314925)
Y_95	-8.02577*** (2.76680)	-8.03395*** (2.76504)	-2.05216*** (0.691070)	-0.227002* (0.136882)	-0.227680* (0.136842)	-0.630133*** (0.035084)	-7.89517*** (2.76464)	-7.90553*** (2.76442)	-2.09418** (0.911620)
Y_96	0.066171 (3.13951)	0.118740 (3.14752)	-0.966839*** (0.147759)	0.073339 (0.148749)	0.074110 (0.148989)	-0.175212*** (0.028770)	0.065290 (3.13093)	0.077070 (3.13467)	-0.890270 (1.04627)
I. Mills R.	-	-66.6694 (128.695)	-	-	5.21443 (8.14607)	-	-	79.6277 (151.086)	-
SIGMA	-	-	29.2397*** (1.03794)	-	-	1.71659*** (0.063756)	-	-	29.2378 (~0.00000)
RHO	-	-	1.000000 (~0.00000)	-	-	-1.000000 (~0.00000)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.8. Sugar: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	-3.77593 (23.3306)	637.742 (409.790)	-24.0093 (46.2905)	1.70586 (1.16291)	34.2014** (16.7376)	3.14498** (1.41103)	-64.3855 (65.3198)	955.526 (826.874)	-110.993 (68.1305)
(L)INCWK	0.013427 (0.012262)	-0.045096 (0.037052)	0.013444 (0.009128)	0.105574 (0.112717)	-0.263908 (0.214861)	0.124497 (0.124908)	9.15739 (7.79524)	-2.43926 (9.99288)	5.73283 (5.07573)
(L)HHSIZE	15.5242*** (3.84919)	12.9361*** (3.94306)	12.7614*** (2.65198)	0.881322*** (0.156409)	-0.007229 (0.486613)	0.775150*** (0.180487)	39.7427*** (9.09039)	11.8544 (25.5445)	36.2587*** (8.30124)
(L)AGE	-0.188927 (0.225486)	-4.76654 (0.2.93163)	0.182323 (0.241429)	-0.066460 (0.226779)	-5.48877** (2.79218)	-0.427467* (0.243684)	1.66319 (10.4126)	-168.523 (140.676)	17.8972 (10.9774)
S_FEM	0.089191 (7.55117)	1.09539 (7.72900)	0.146926 (3.27962)	0.020156 (0.138005)	0.034533 (0.139030)	-0.054894 (0.127544)	2.80970 (7.78997)	3.26094 (7.86340)	0.984263 (5.30220)
O_MEX	4.64522 (8.19793)	4.94527 (8.19601)	-0.107580 (2.42873)	0.026962 (0.154883)	0.019021 (0.154469)	0.053444 (0.137893)	5.74924 (8.25423)	5.50002 (8.23651)	0.569691 (3.52768)
O_PRI	-18.1449* (9.38254)	-18.2881* (4.70246)	-3.46017** (1.52975)	-0.133818 (0.249919)	-0.122270 (0.249956)	-0.272457 (0.223945)	-17.4154* (9.50420)	-17.0529* (9.52558)	-3.51035 (10.4754)
O_CUB	4.27721 (26.6578)	2.975534 (26.2553)	1.13198 (4.32455)	0.058052 (0.380652)	0.035010 (0.374718)	0.017780 (0.353128)	4.74099 (25.9804)	4.01780 (25.8911)	0.605144 (5.99900)
R_NEAST	19.6377* (11.6726)	18.7780 (11.7527)	1.42455 (4.29239)	0.310077 (0.240781)	0.289675 (0. 241375)	0.421520* (0.215570)	18.6817 (11.7621)	18.0414 (11.8335)	1.76859 (4.45707)
R_MWEST	9.95510 (11.0450)	10.1463 (10.9968)	1.96991 (2.20210)	0.160921 (0.252302)	0.158920 (0.249086)	0.151065 (0.215630)	8.64338 (10.9828)	8.58058 (10.8726)	2.19575 (6.61630)
R_SOUTH	9.30417 (9.49797)	9.09243 (9.53912)	0.918477 (2.48139)	0.021344 (0.162815)	0.015666 (0.163213)	0.144164 (0.147536)	9.55092 (9.57166)	9.37270 (9.60024)	1.33625 (4.75791)
U_MSAINC	-16.9292 (10.6731)	-15.0300 (11.1174)	-1.28491 (2.05050)	-0.414744** (0.197350)	-0.369457 (0.199415)	-0.327610* (0.181634)	-14.8302 (10.7168)	-13.4088 (10.9519)	-1.81030 (4.89381)
U_MSAOUT	-2.09841 (10.0989)	-1.27820 (10.3459)	-1.31907 (3.52128)	-0.255403 (0.177448)	-0.228309 (0.179127)	-0.154837 (0.167875)	-1.28871 (10.1053)	-0.438327 (10.2582)	-1.26643 (4.67182)
G_ELEM	22.8713** (9.93183)	16.2587 (11.9136)	5.98441 (43.6137)	0.276902 (0.406682)	0.145785 (0.362042)	0.784303 (0.784128)	26.8298*** (10.3351)	22.7145** (10.8455)	8.65108 (43.6112)
G_HIGH	19.7022* (10.6462)	13.8988 (12.0086)	5.34078 (43.5943)	0.356772 (0.409955)	0.218806 (0.365226)	0.777220 (0.784275)	22.5495** (11.4272)	18.2193 (12.3332)	8.52398 (43.7039)
G_COLL	27.9923** (12.5076)	21.3276 (13.9688)	5.36329 (43.6533)	0.553863 (0.431959)	0.386474 (0.391104)	0.959962 (0.791591)	30.1439** (13.2195)	24.8902* (14.4235)	8.72387 (43.8510)
G_GRAD	25.8942*** (22.6661)	18.7070 (24.1864)	8.30335 (43.6176)	0.511493 (0.485935)	0.325278 (0.456457)	0.910920 (0.815597)	28.1451 (22.8575)	22.3005 (24.5004)	12.1350 (44.0402)
T_OWNER	-4.72107 (9.58425)	-5.02515 (9.59375)	0.200864 (0.285994)	0.130723 (0.166337)	0.139321 (0.166318)	0.006373 (0.146827)	-5.45827 (9.64270)	-5.18843 (9.59730)	1.05365 (5.49147)
F_STAMP	13.8192 (10.1309)	14.0417 (10.1771)	1.43958 (3.61619)	0.269525 (0.187243)	0.267598 (0.187607)	0.341058** (0.165026)	16.8338 (11.4513)	16.7733 (11.4757)	1.70664 (6.50965)
W_YES	-10.8713 (10.3874)	-8.76691 (10.7397)	-1.42439 (4.54613)	-0.187492 (0.184731)	-0.160550 (0.188274)	-0.169592 (0.161605)	-7.97488 (10.7610)	-7.12927 (10.9363)	-1.37825 (6.99914)
Y_95	-12.7178 (7.95223)	-12.7983 (7.96331)	-2.19662*** (0.592537)	-0.327885** (0.165189)	-0.319413* (0.165618)	-0.294569** (0.140409)	-12.9398 (8.00516)	-12.6739 (8.00905)	-2.26183 (5.29988)
Y_96	-8.71127 (9.250018)	-9.03899 (9.23599)	-0.524267 (0.366513)	-0.140802 (0.155386)	-0.153160 (0.155132)	-0.190172 (0.149810)	-9.56618 (9.21997)	-9.95405 (9.19108)	-1.30419 (5.47146)
I. Mills R.	-	-1170.84 (760.304)	-	-	-26.9929* (14.0294)	-	-	-847.204 (693.381)	-
SIGMA	-	-	86.1640 (~0.00000)	-	-	1.79645*** (0.078042)	-	-	86.2594 (~0.00000)
RHO	-	-	1.000000 (~0.00000)	-	-	-0.947851*** (0.027516)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.9. Beverages: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	-218.721 (360.921)	8859.22** (3881.70)	-416.258 (605.252)	3.36084*** (0.863531)	16.0192*** (5.45423)	3.62013*** (0.787624)	-2352.03** (996.699)	6554.07 (6334.37)	-2582.60** (68.1305)
(L)INCWK	0.306538 (0.200874)	1.60342*** (0.599352)	0.286780* (0.171337)	0.160111* (0.091189)	0.843977*** (0.302228)	0.145281* (0.078306)	198.206* (106.901)	679.355** (345.363)	167.022* (98.5917)
(L)HHSIZE	268.433*** (55.3049)	322.352*** (57.9729)	236.827*** (46.0103)	0.534148*** (0.122777)	0.275909* (0.149354)	0.563699*** (0.117874)	799.267*** (127.117)	597.577*** (176.042)	724.395*** (142.962)
(L)AGE	2.21117 (3.67648)	-76.0373** (33.4545)	2.88668 (4.18948)	0.313794** (0.158365)	-2.83208** (1.34878)	0.251850 (0.162359)	318.291* (170.325)	-1895.06 (1539.86)	372.376** (187.937)
S_FEM	-25.0933 (126.318)	-1.56616 (127.089)	-1.89313 (85.5511)	0.035446 (0.109394)	0.036001 (0.108701)	0.061230 (0.073438)	38.1996 (128.100)	38.5899 (127.901)	39.0632 (105.207)
O_MEX	1.62549 (128.658)	5.73716 (127.490)	-77.6326 (76.2864)	-0.005449 (0.106757)	-0.012902 (0.105614)	0.016676 (0.090943)	20.9175 (126.784)	15.6741 (126.607)	-86.3234 (94.6552)
O_PRI	-162.251 (201.903)	-159.137 (200.925)	-133.408 (113.887)	-0.043125 (0.182600)	-0.037785 (0.182233)	0.252145** (0.127486)	-155.285 (200.962)	-151.528 (201.004)	-189.026 (137.458)
O_CUB	-256.968 (257.076)	-257.047 (255.176)	-222.883 (376.962)	-0.013645 (0.259581)	-0.024566 (0.263890)	0.078636 (0.092983)	-229.673 (254.900)	-237.357 (254.745)	-210.011 (374.497)
R_NEAST	-63.6824 (171.592)	-71.7540 (170459)	-66.2010 (146.553)	-0.019550 (0.159672)	-0.018454 (0. 159139)	-0.210940* (0.215570)	-73.8064 (168.899)	-73.0354 (168.947)	-106.916 (160.909)
R_MWEST	32.0427 (218.633)	57.0545 (218.903)	-23.5931 (139.655)	0.039217 (0.191716)	0.059030 (0.192214)	0.136827 (0.139529)	24.8827 (219.699)	38.8223 (220.560)	-21.1165 (148.680)
R_SOUTH	-100.503 (136.748)	-90.9508 (136.091)	31.9124 (81.2575)	-0.168847 (0.123129)	-0.150714 (0.122339)	-0.179822* (0.094752)	-93.1943 (135.800)	-80.4367 (136.229)	-5.13379 (97.9164)
U_MSAINC	-477.501*** (183.310)	-449.862** (180.888)	-93.3229 (98.6240)	-0.395241*** (0.149522)	-0.383596*** (0.147477)	-0.270927** (0.111679)	-446.024** (180.980)	-437.831** (179.613)	-14.7726 (126.153)
U_MSAOUT	-466.959*** (173.795)	-463.062*** (172.529)	-144.621 (90.9510)	-0.394320*** (0.139311)	-0.392548*** (0.138079)	-0.386146*** (0.088344)	-477.739*** (176.082)	-476.492*** (173.009)	-120.291* (66.9972)
G_ELEM	1030.70*** (181.606)	940.015*** (240.908)	977.333* (525.156)	1.17405*** (0.260391)	1.11796*** (0.305377)	1.24967*** (0.190950)	1064.20*** (182.298)	1024.73*** (214.395)	990.547* (521.416)
G_HIGH	1185.13*** (186.238)	1080.42*** (245.966)	1030.66** (525.855)	1.23177*** (0.255344)	1.14988*** (0.300020)	1.39278*** (0.208539)	1214.49*** (187.757)	1156.88*** (222.032)	1067.49** (523.680)
G_COLL	1187.76*** (202.765)	1071.36*** (255.702)	951.416* (524.593)	1.31678*** (0.272491)	1.21834*** (0.314469)	1.40227*** (0.224962)	1217.38*** (202.598)	1148.11*** (231.610)	968.880* (527.018)
G_GRAD	1295.31*** (369.173)	1185.90*** (398.736)	1016.70* (551.896)	1.20576*** (0.335830)	1.11277*** (0.373449)	1.59087*** (0.264684)	1338.00*** (354.920)	1272.57*** (374.056)	1080.88** (541.639)
T_OWNER	-145.703 (143.891)	-157.323 (144.561)	-75.7320 (91.6912)	-0.099947 (0.123008)	-0.090054 (0.122954)	-0.043480 (0.074003)	-189.602 (146.919)	-182.642 (145851)	-88.0214 (65.2919)
F_STAMP	-26.5251 (155.902)	-17.3584 (155.666)	0.658202 (114.547)	-0.005109 (0.156484)	0.006316 (0.157004)	-0.108723 (0.091808)	24.2144 (164.617)	32.2523 (165.001)	53.5677 (129.794)
W_YES	-239.111 (189.378)	-211.116 (189.366)	-218.815** (4.54613)	-0.256751* (0.184731)	-0.262734* (0.149206)	-0.141623 (0.104434)	-208.874 (191.704)	-213.083 (193.548)	-187.192* (105.609)
Y_95	-41.6209 (130.075)	-23.6157 (131.156)	-45.9006 (72.3561)	-0.095253 (0.116973)	-0.082029 (0.116537)	-0.198365* (0.107928)	-35.9518 (129.071)	-26.6480 (130.570)	-41.7435 (67.3468)
Y_96	362.695** (146.136)	368.063** (146.631)	177.438 (109.104)	0.194982 (0.120873)	0.202267* (0.155132)	0.130070 (0.092620)	358.436** (145.015)	363.562** (145.884)	175.495 (115.405)
I. Mills R.	-	-47187.5** (20803.5)	-	-	-35.1647** (15.1432)	-	-	-24740.9 (17595.4)	-
SIGMA	-	-	1459.73 (~0.00000)	-	-	1.25997 (~0.00000)	-	-	1449.00*** (40.4852)
RHO	-	-	1.000000 (~0.00000)	-	-	-1.000000 (~0.00000)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.10. Beef: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	46.8189	-3592.11	-38.7494	3.97486***	-24.8058	5.81335***	14.0989	-5789.22**	-156.859*
	(54.9813)	(3095.39)	(37.8974)	(1.10964)	(21.3805)	(1.24020)	(124.113)	(2735.79)	(93.2325)
(L)INCWK	0.026413	0.130326	0.017217	0.055273	0.460717	0.064339	15.8303	97.5839**	11.8562
	(0.021366)	(0.096449)	(0.018438)	(0.111312)	(0.324463)	(0.119749)	(11.1867)	(42.3979)	(9.57597)
(L)HHSIZE	17.4309***	224.936	21.3218***	0.236374	4.813.81	-0.115956	42.8443**	965.837**	76.0756***
	(6.38161)	(178.310)	(5.39892)	(0.151553)	(3.39090)	(0.177875)	(16.8131)	(434.047)	(17.2478)
(L)AGE	-0.520423	0.876049	-0.101168	-0.090672	1.91885	-0.273010	-18.0663	387.133*	14.0007
	(0.441411)	(1.33311)	(0.510761)	(0.213616)	(1.53077)	(0.238419)	(20.4808)	(192.451)	(21.1776)
S_FEM	-5.19393	-9.10636	1.01251	-0.081749	-0.108552	-0.074721	-3.40711	-8.81173	0.132988
	(14.4952)	(15.2037)	(6.07849)	(0.126178)	(0.127256)	(0.118816)	(14.7499)	(14.9771)	(3.54908)
O_MEX	14.0225	14.2813	-0.300923	-0.014284	-0.013410	0.090200	14.5132	14.6894	-0.221178
	(15.5265)	(15.4700)	(6.55655)	(0.141428)	(0.140155)	(0.122399)	(15.6227)	(15.3252)	(7.09971)
O_PRI	8.56951	8.64137	-2.91151	0.180938	0.185998	0.070556	6.24089	7.26112	-3.03520
	(22.6725)	(22.5610)	(21.5711)	(0.196414)	(0.197780)	(0.218440)	(22.6320)	(22.8051)	(15.9609)
O_CUB	53.9509	50.2796	15.9046	0.432980	0.400572	0.387292	53.1460	46.6112	28.8856
	(36.4704)	(38.5934)	(17.0732)	(0.315615)	(0.334983)	(0.304711)	(36.1908)	(39.9380)	(22.9697)
R_NEAST	40.2540*	38.9314*	8.68148	0.257740	0.272785	0.300101	39.4219*	38.8260*	9.35843
	(23.2103)	(22.8286)	(10.7330)	(0.190031)	(0. 187796)	(0.185981)	(23.4453)	(22.6313)	(10.7096)
R_MWEST	8.17636	7.08781	6.49854	0.198376	0.192282	0.129582	7.95504	7.93609	14.0370
	(19.0232)	(18.8671)	(24.1355)	(0.198370)	(0.196558)	(0.217245)	(19.7529)	(19.4438)	(17.4489)
R_SOUTH	11.1816	10.1776	-3.63282	0.038760	0.034555	0.087069	11.7543	10.9063	-4.02403
	(17.2505)	(17.1070)	(7.42214)	(0.123129)	(0.155284)	(0.125534)	(17.0942)	(16.7033)	(7.22632)
U_MSAINC	-26.0096	-27.7617*	-8.05848	-0.261596	-0.291800	-0.249893	-22.5317	-28.6220*	-12.6503
	(183.310)	(16.5961)	(10.9549)	(0.177556)	(0.179195)	(0.152355)	(17.1068)	(16.6949)	(12.0183)
U_MSAOUT	9.71134	9.30125	0.396372	0.136095	0.124620	0.069116	10.9278	8.61386	-0.060409
	(16.2845)	(16.2612)	(2.97867)	(0.158757)	(0.158945)	(0.141494)	(16.4773)	(16.3348)	(9.43177)
G_ELEM	11.9108	9.91887	-24.9751	-0.034684	-0.069625	0.173096	13.8305	6.78490	-36.8087**
	(31.3825)	(30.9673)	(26.2878)	(0.453902)	(0.438808)	(0.446561)	(31.4464)	(28.1281)	(17.1381)
G_HIGH	21.0364	21.5586	-17.9682	0.054745	0.035880	0.241328	21.4347	17.6307	-27.3483**
	(32.6639)	(32.2016)	(24.2819)	(0.455569)	(0.441003)	(0.448515)	(33.2109)	(29.8820)	(12.6815)
G_COLL	-5.12442	-4.34511	-13.8723	0.010248	0.003132	0.034877	-5.77298	-7.20791	-20.2999
	(31.8821)	(31.5140)	(22.3125)	(0.458077)	(0.443043)	(0.458684)	(32.4031)	(29.1643)	(13.8338)
G_GRAD	-15.0274	-13.4863	-10.3614	-0.153057	-0.161619	-0.031134	-14.1370	-15.8635	-18.6252
	(38.6377)	(38.3208)	(23.7248)	(0.542336)	(0.527348)	(0.499306)	(39.0164)	(35.6638)	(18.0587)
T_OWNER	6.18615	6.14946	-2.68753	0.073979	0.063958	0.044018	7.50747	5.48684	-5.99714
	(13.3267)	(13.4209)	(7.94844)	(0.138666)	(0.139093)	(0.129624)	(13.3763)	(13.3737)	(11.0594)
F_STAMP	-6.60690	-7.38787	5.57155	0.078382	0.075435	0.040441	-1.36686	-1.96109	10.6900
	(16.1346)	(16.0795)	(12.1766)	(0.159185)	(0.158974)	(0.158900)	(16.5553)	(16.4596)	(13.8844)
W_YES	-6.28861	-6.49436	-0.522901	-0.024142	-0.046188	-0.033787	-3.81735	-8.26283	-7.68966
	(17.9629)	(18.0641)	(18.0036)	(0.156096)	(0.156719)	(0.151537)	(18.1510)	(18.3099)	(11.0380)
Y_95	-11.0003	-11.4621	-3.42730	-0.152807	-0.161923	-0.127654	-10.5061	-12.3441	-2.99794
	(14.7807)	(14.6755)	(8.67221)	(0.141373)	(0.139456)	(0.135471)	(15.0204)	(14.6050)	(7.77611)
Y_96	-4.86124	-3.22089	-6.59558	-0.107328	-0.100746	-0.088120	-4.45314	-3.12602	-5.08801
	(15.2298)	(14.9775)	(5.24719)	(0.152165)	(0.151085)	(0.132139)	(15.2084)	(15.0510)	(6.98460)
I. Mills R.	-	3980.95	-	-	19.8022	-	-	3992.91**	-
		(3369.82)			(14.5505)			(1853.90)	
SIGMA	-	-	153.588	-	-	1.52662***	-	-	152.688***
			(~0.00000)			(0.090293)			(6.18301)
RHO	-	-	1.000000	-	-	-0.934203***	-	-	1.000000
			(~0.00000)			(0.024523)			(~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.11. Pork: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	104.122** (40.2133)	-3927.60 (7386.59)	81.8435*** (27.6848)	4.30311*** (1.55545)	-146.516 (177.995)	6.88781*** (2.15051)	150.546* (79.9121)	-700.851 (7969.90)	21.4169 (72.6893)
(L)INCWK	-0.018723 (0.016279)	0.457465 (0.874690)	0.010104 (0.013533)	-0.325730** (0.153544)	6.21678 (7.71837)	-0.413558** (0.169171)	-11.7146 (8.30753)	25.2189 (348.609)	3.03272 (7.08812)
(L)HHSIZE	5.36737 (4.05030)	19.7748 (26.2413)	4.25562 (5.02646)	0.543808** (0.234579)	5.87034 (6.29569)	0.425296 (0.287754)	25.2654** (11.2691)	55.3345 (279.790)	18.3180 (11.8355)
(L)AGE	-0.312276 (0.365359)	-2.32954 (3.75831)	0.027030 (0.419424)	0.284103 (0.277794)	2.89013 (3.09026)	0.166397 (0.348409)	-2.79171 (16.2701)	11.9197 (133.306)	10.0920 (15.6569)
S_FEM	-15.8523 (11.5932)	-15.8573 (11.6077)	-3.54717 (4.70073)	-0.217522 (0.204887)	-0.214613 (0.204307)	-0.193330 (0.186951)	-14.0291 (11.3440)	-14.0126 (11.3964)	-2.62980*** (0.025518)
O_MEX	0.172146 (15.3732)	0.266390 (15.4274)	-1.26213 (2.05591)	0.013473 (0.220318)	0.006254 (0.222875)	-0.001170 (0.187702)	0.966664 (15.6724)	0.925912 (15.8679)	-0.380914*** (0.026807)
O_PRI	-3.95963 (14.3361)	-4.26606 (14.1855)	6.20455 (11.6791)	0.132366 (0.250223)	0.124326 (0.246699)	0.045327 (0.310966)	-5.27216 (14.1482)	-5.31755 (14.1937)	5.52730*** (0.039512)
O_CUB	12.2416 (21.5704)	10.1558 (21.0298)	-3.18798 (4.09393)	0.411753 (0.615983)	0.368701 (0.611493)	0.387260 (0.532412)	11.6126 (20.8088)	11.3696 (21.0356)	-1.80938*** (0.021987)
R_NEAST	14.1918 (17.9392)	13.9990 (17.7524)	-1.51052 (8.88382)	0.144262 (0.320570)	0.167530 (0. 318456)	0.234627 (0.368645)	16.2563 (17.6647)	16.3876 (17.8237)	-1.02558*** (0.036041)
R_MWEST	2.27223 (16.7960)	1.88507 (16.7758)	-2.47116 (6.25312)	-0.026887 (0.341218)	-0.016703 (0.335860)	0.076092 (0.323832)	1.93594 (16.7639)	1.99342 (16.7377)	-1.13378*** (0.030164)
R_SOUTH	-4.94195 (11.1463)	-5.19046 (11.2298)	-1.54118 (6.22421)	-0.330659 (0.224815)	-0.322611 (0.226725)	-0.253349 (0.205962)	-5.32836 (11.2979)	-5.28293 (11.3753)	-1.14155*** (0.029828)
U_MSAINC	32.9862* (18.8181)	32.4958* (18.7180)	2.76829 (5.19536)	0.660326** (0.257514)	0.643298** (0.260819)	0.648134** (0.254045)	32.1736* (18.6830)	32.0774* (18.6045)	5.25864*** (0.029897)
U_MSAOUT	10.5167 (15.7741)	11.1123 (16.0900)	3.38137 (5.98195)	0.398115 (0.254323)	0.400615 (0.254422)	0.357767 (0.234560)	10.9192 (15.7785)	10.9333 (15.8785)	7.19648*** (0.027625)
G_ELEM	-52.9990 (33.0275)	-56.3314 (34.8007)	-151.831*** (6.49702)	-0.672783 (0.416301)	-0.617908 (0.411571)	-0.499962 (1.17157)	-52.2222 (33.6250)	-51.9124 (33.3966)	-149.917*** (0.141871)
G_HIGH	-64.5542** (29.2880)	-66.9368** (30.3038)	-151.149*** (10.0179)	-0.817350** (0.409968)	-0.781067* (0.403811)	-0.676628 (1.16887)	-61.3853** (29.8894)	-61.1804** (29.6010)	-150.106*** (0.148933)
G_COLL	-59.4843* (34.4712)	-61.9289* (35.9716)	-150.133*** (9.91301)	-0.555522 (0.438066)	-0.528426 (0.433333)	-0.463589 (1.17978)	-55.4580 (34.6981)	-55.3050 (34.2839)	-145.810*** (0.196958)
G_GRAD	-73.1318 (49.8260)	-75.3072 (50.3393)	-151.324*** (8.57729)	-1.68489** (0.695480)	-1.65486** (0.694929)	-1.42891 (1.22396)	-68.5570 (50.4135)	-68.3875 (50.2218)	-150.783*** (.155669)
T_OWNER	5.04497 (11.6832)	5.33549 (11.8794)	-5.18024 (6.47505)	-0.048935 (0.191841)	-0.055666 (0.189422)	0.035978 (0.200116)	2.47201 (11.8186)	2.43402 (11.7646)	-4.83287*** (0.039684)
F_STAMP	-15.2558 (15.7695)	-16.5043 (15.4560)	-3.08531 (3.36821)	-0.540600** (0.236841)	-0.574159** (0.242897)	-0.508893* (0.261686)	-18.6151 (14.7900)	-18.8045 (14.7885)	-4.65897*** (0.034213)
W_YES	23.4825 (21.9829)	23.2083 (22.1092)	0.513546 (11.9003)	0.188091 (0.287410)	0.188560 (0.285874)	0.240033 (0.259581)	23.5709 (21.9447)	23.5736 (21.9988)	5.33767*** (0.041653)
Y_95	17.2376 (14.1479)	16.9363 (14.2899)	-4.09769 (7015133)	-0.003695 (0.232999)	-0.023048 (0.237659)	0.106311 (0.205741)	16.8509 (13.8148)	16.7416 (14.2438)	-4.47172*** (0.025384)
Y_96	7.86841 (13.1262)	7.68056 (13.1776)	2.72402 (6.87497)	0.182906 (0.200077)	0.183375 (0.201637)	0.162591 (0.205652)	8.42038 (13.1286)	8.42302 (13.1680)	4.57313*** (0.034402)
I. Mills R.	-	3395.70 (6222.82)	-	-	85.8293 (101.369)	-	-	484.519 (4542.55)	-
SIGMA	-	-	106.467 (~0.00000)	-	-	1.77229*** (0.243782)	-	-	106.052 (~0.00000)
RHO	-	-	1.000000 (~0.00000)	-	-	-0.880197*** (0.075685)	-	-	1.000000 (~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.12. Chicken: Parameter Estimates of Hispanic Food Consumption, 1994-96.

Dep. Var.	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model (SL)		
Indep. Var.	TP	HP	SS	TP	HP	SS	TP	HP	SS
Constant	44.3806	1293.86**	-41.3359	3.36496***	-1.36468	4.07494***	-34.9094	446.201	-94.8875
	(64.1019)	(654.557)	(25.5824)	(0.949183)	(7.23283)	(1.02940)	(105.244)	(731.438)	(84.7838)
(L)INCWK	0.033828	0.152751**	0.003057	0.071027	-0.198232	0.114901	14.1551	41.5447	-0.823604
	(0.025328)	(0.071397)	(0.015933)	(0.090862)	(0.430340)	(0.099590)	(11.0580)	(44.4900)	(8.44868)
(L)HHSIZE	11.4061***	-89.0493*	18.6852***	0.222969*	1.50346	0.034033	36.7880***	-93.4666	60.7965***
	(4.14902)	(52.0188)	(4.55794)	(0.115252)	(1.98611)	(0.150066)	(12.8712)	(201.158)	(13.8034)
(L)AGE	-0.183494	-0.978881*	0.166497	-0.005154	0.355977	-0.058250	-0.974184	-37.7093	18.1188
	(0.419933)	(0.518631)	(0.425048)	(0.173349)	(0.565130)	(0.186226)	(18.6234)	(56.9944)	(18.3194)
S_FEM	11.4796	15.3588	5.28239***	0.168643	0.162880	0.161646	13.4648	14.0510	5.18761***
	(12.0262)	(12.6466)	(0.024122)	(0.109485)	(0.110126)	(0.105589)	(12.2047)	(12.3538)	(0.163513)
O_MEX	9.52547	9.96061	-3.17052***	0.011503	0.012012	0.020259	8.85399	8.80214	-4.46539***
	(15.5426)	(15.4877)	(0.024710)	(0.122305)	(0.122323)	(0.115540)	(15.2468)	(15.2537)	(0.210039)
O_PRI	-21.9738	-22.8851	3.38120***	-0.079027	-0.077820	-0.113368	-23.2263	-23.3490	3.24567***
	(18.2827)	(18.4922)	(0.089189)	(0.174246)	(0.174563)	(0.179190)	(18.1334)	(18.1760)	(0.083760)
O_CUB	77.9446	76.7691	26.9664***	0.548930	0.564200	0.541760	75.9302	74.3770	27.5947***
	(72.5611)	(71.0812)	(0.068523)	(0.372559)	(0.377268)	(0.350689)	(71.8019)	(71.4502)	(0.083691)
R_NEAST	51.1775**	51.9911**	-5.75017***	0.372374*	0.374488*	0.383242**	49.6723**	49.4573**	-2.58590***
	(22.1355)	(22.3768)	(0.070683)	(0.195886)	(0. 195234)	(0.174353)	(21.9552)	(22.0333)	(0.114338)
R_MWEST	-15.7903	-14.8596	-5.95657***	-0.094914	-0.091618	-0.101700	-14.6393	-14.9746	-6.37104***
	(16.1245)	(16.5136)	(0.047274)	(0.183532)	(0.183592)	(0.192797)	(16.0789)	(16.2371)	(0.127553)
R_SOUTH	22.0181	22.1398	1.19651***	-0.206279	0.210289	0.191993	20.3452	19.9374	1.81819***
	(18.2934)	(18.1942)	(0.027184)	(0.132470)	(0.132374)	(0.121729)	(17.5404)	(17.5710)	(0.041238)
U_MSAINC	10.7971	14.5271	5.77372***	0.150044	0.138570	0.159528	14.6069	15.7742	5.63813***
	(18.3713)	(18.9062)	(0.036228)	(0.168657)	(0.170795)	(0.157547)	(18.5730)	(18.9787)	(0.100385)
U_MSAOUT	3.34951	4.50403	1.88143***	0.086513	0.081267	0.082123	5.14897	5.68264	2.96516***
	(15.7089)	(15.6829)	(0.024836)	(0.148055)	(0.147760)	(0.144504)	(15.5871)	(15.6992)	(0.067707)
G_ELEM	-3.45874	-1.91346	-12.3052***	0.016700	0.002412	0.016350	-2.10018	-0.646796	-13.6041***
	(57.8045)	(54.9964)	(0.055146)	(0.579705)	(0.578819)	(0.459170)	(58.1955)	(58.4030)	(0.103327)
G_HIGH	-13.7678	-13.2498	-7.85017***	-0.038684	-0.047355	-0.041168	-12.1712	-11.2892	-10.8711***
	(56.6335)	(53.8299)	(0.055174)	(0.570677)	(0.569411)	(0.456855)	(56.8369)	(56.9537)	(0.112671)
G_COLL	-9.69156	-6.94151	-13.3572***	-0.067164	-0.076801	-0.038967	-4.92387	-3.94365	-16.1561***
	(357.6628)	(54.8774)	(0.046845)	(0.576144)	(0.575230)	(0.464157)	(57.4968)	(57.6258)	(0.116235)
G_GRAD	-1.05933	4.02555	-15.5686***	0.075968	0.054414	0.117668	-4.72637	6.91889	-14.6071***
	(59.7286)	(57.2452)	(0.068421)	(0.616466)	(0.617795)	(0.500443)	(59.9313)	(60.3475)	(.467727)
T_OWNER	8.03147	7.28808	0.362101***	0.080830	0.080765	0.080069	8.55245	8.55911	-1.31579***
	(13.4951)	(13.4873)	(0.027231)	(0.113670)	(0.113799)	(0.112209)	(13.3896)	(13.3965)	(0.206336)
F_STAMP	4.27095	3.82119	0.382939***	0.095760	0.095011	0.106070	-1.73062	5.23202	-3.63508***
	(15.8643)	(15.8570)	(0.084548)	(0.142684)	(0.142579)	(0.137272)	(13.5479)	(16.0696)	(0.389103)
W_YES	-5.88733	-3.95463	-2.28959***	-0.183309	-0.190708	-0.166237	0.403614	-4.76531	-3.11286***
	(17.1884)	(17.2769)	(0.029834)	(0.156887)	(0.157971)	(0.137098)	(15.5343)	(17.3156)	(0.055438)
Y_95	-2.72395	-3.00014	-1.82092***	0.015004	0.018731	-0.004399	5.15588	-2.10973	-2.12758***
	(13.5446)	(13.5467)	(0.032810)	(0.121177)	(0.121309)	(0.117861)	(16.0602)	(13.6466)	(0.226540)
Y_96	0.860231	-0.766481	-4.27129***	0.029933	0.034745	0.011339	-5.51803	-0.085796	-5.23621***
	(15.6726)	(15.7167)	(0.033595)	(0.133925)	(0.134895)	(0.124685)	(17.1861)	(15.5914)	(0.508868)
I. Mills R.	-	-1328.91*	-	-	5.08418	-	-	-517.175	-
		(705.386)			(7.80562)			(794.081)	
SIGMA	-	-	141.785	-	-	1.08288***	-	-	141.355
			(~0.00000)			(0.136766)			(~0.00000)
RHO	-	-	1.000000	-	-	-0.732674***	-	-	1.000000
			(~0.00000)			(0.174303)			(~0.00000)

Note: Std. errors in parenthesis. Significance of 2-tail t-test: *** - 1% level; ** - 5% level; * - 10% level.

Table V.13. Income Elasticity at the Mean for Hispanic Consumers, 1994-96.

	Linear Model (LM)			Double Logarithmic-Model (DL)			Semi-Logarithmic Model		
Food Group	TP	HP	SS	TP	HP	SS	TP	HP	SS
Grain	0.04757 -0.0829 ~ 0.1780	0.11562* -0.0978 ~ 0.3291	0.04457 -0.0743 ~ 0.1635	0.09171 -0.0218 ~ 0.2053	1.03855*** 0.5056 ~ 1.5715	0.09098 -0.0207 ~ 0.2062	0.05485 -0.0985 ~ 0.2082	0.63575** -0.4330 ~ 1.7045	0.05152 -0.0807 ~ 0.1838
Vegetables	0.11846* -0.1050 ~ 0.3419	-1.44204* -4.1483 ~ 1.2642	0.12793** -0.1074 ~ 0.3632	0.09943 -0.0323 ~ 0.2312	0.33574 -0.5569 ~ 1.2284	0.07292 -0.0698 ~ 0.2160	0.11850* -0.1070 ~ 0.3440	0.76955 -0.7607 ~ 2.2998	0.13425** -0.1151 ~ 0.3836
Fruits	-0.09009 -0.2880 ~ 0.1078	-0.14079 -0.4757 ~ 0.1941	0.00343 -0.1269 ~ 0.1338	-0.05622 -0.1728 ~ 0.0603	0.06808 -0.1803 ~ 0.3165	-0.10606 -0.2376 ~ 0.0247	-0.04818 -0.1945 ~ 0.0982	0.05797 -0.2334 ~ 0.3494	0.03354 -0.1009 ~ 0.1680
Milk	-0.07664 -0.2293 ~ 0.0760	0.06797 -0.1477 ~ 0.2837	-0.05473 -0.1761 ~ 0.0666	-0.02947 -0.1578 ~ 0.0989	0.21233 -0.0391 ~ 0.4638	-0.08379 -0.2131 ~ 0.0455	-0.02856 -0.1354 ~ 0.0783	0.23039 -0.1876 ~ 0.6484	-0.00268 -0.1003 ~ 0.0949
Meat	0.07274 -0.0924 ~ 0.2379	-0.04046 -0.2160 ~ 0.1351	0.06023 -0.0820 ~ 0.2025	0.04327 -0.0836 ~ 0.1701	0.07984 -0.0529 ~ 0.2126	0.07475 -0.0575 ~ 0.2070	0.10199 -0.1109 ~ 0.3148	0.12701 -0.1239 ~ 0.3779	0.08401 -0.0979 ~ 0.2660
- Beef	0.21973 -0.4558 ~ 0.8953	1.08417 -2.1978 ~ 4.3661	0.14323 -0.3271 ~ 0.6136	0.05527 -0.1278 ~ 0.2384	0.40072 -0.0730 ~ 0.9945	0.06434 -0.1327 ~ 0.2613	0.25843 -0.5183 ~ 1.0351	1.59305** -2.9666 ~ 6.1527	0.19355 -0.4013 ~ 0.7884
- Pork	-0.50977 -2.8656 ~ 1.8461	12.45509 -54.854 ~ 79.765	0.27510 -1.0773 ~ 1.6275	-0.32573** -0.5783 ~ -0.0732	6.21678 -6.4799 ~ 18.914	-0.41356** -0.6918 ~ -0.1353	-0.62589 -3.4717 ~ 2.2199	1.34741 -29.859 ~ 32.554	0.16203 -0.7841 ~ 1.1082
- Chicken	0.28685 -0.5542 ~ 1.1279	1.29528** -2.2922 ~ 4.8827	0.02592 -0.2068 ~ 0.2586	0.07103 -0.0784 ~ 0.2205	-0.19823 -0.9061 ~ 0.5097	0.11490 -0.0489 ~ 0.2787	0.23555 -0.4605 ~ 0.9316	0.69132 -1.5148 ~ 2.8974	-0.0137 -0.2478 ~ 0.2204
Legumes	-0.00463 -0.1619 ~ 0.1527	0.25122 -0.4937 ~ 0.9961	-0.14495 -0.5482 ~ 0.2583	0.04724 -0.1200 ~ 0.2145	-0.14058 -0.4776 ~ 0.1965	0.14600 -0.0264 ~ 0.3184	0.10619 -0.2136 ~ 0.4260	0.00227 -0.4182 ~ 0.4227	-0.09962 -0.4040 ~ 0.2047
Fats	0.20346* -0.3003 ~ 0.7072	-0.25920 -1.8910 ~ 1.3726	0.42878*** -0.5609 ~ 1.4185	0.19731* 0.0320 ~ 0.3626	0.79936 -0.7447 ~ 2.3434	-0.07295 -0.2400 ~ 0.0941	0.27657** -0.3831 ~ 0.9363	0.80986 -1.7166 ~ 3.3363	0.45444*** -0.5940 ~ 1.5029
Sugar	0.15125 -0.3241 ~ 0.6266	-0.50799 -2.0695 ~ 1.0535	0.15144 -0.2996 ~ 0.6025	0.10557 -0.0799 ~ 0.2910	-0.26391 -0.6174 ~ 0.0895	0.12450 -0.0810 ~ 0.3300	0.20243 -0.4242 ~ 0.8291	-0.05392 -0.4466 ~ 0.3388	0.12673 -0.2688 ~ 0.5223
Beverages	0.10980 -0.1083 ~ 0.3279	0.57436 -0.4470 ~ 1.5957	0.10273 -0.0962 ~ 0.3017	0.16011 0.0101 ~ 3101	0.84398 0.3468 ~ 1.3411	0.14528 0.0165 ~ 0.9961	0.13933 -0.1240 ~ 0.4026	0.47755 -0.4138 ~ 1.3689	0.11741 -0.1093 ~ 0.3441

Note: The small numbers represent the lower and upper bounds of the confidence intervals of the elasticity estimates, respectively, at the 90% level of confidence.

Asteriscs indicate point elasticities constructed from coefficient estimates statistically significant at: *** - 1% level; ** - 5% level; * - 10% level, for a 2-tail t-test.

Table V.14. Household Size Elasticity at the Mean for Hispanic Consumers, 1994-96.

	Linear Model (LM)			Double-Logarithmic Model (DL)			Semi-Logarithmic Model		
	TP	HP	SS	TP	HP	SS	TP	HP	SS
Grain	0.61030*** -03596 ~ 1.5802	-0.03426 -0.7887 ~ 0.3291	0.61705*** -0.3526 ~ 1.5867	0.52553*** 0.3715 ~ 0.6795	-1.62204** -2.8184 ~ -0.4256	0.52154*** 0.3692 ~ 0.6739	0.58794*** -0.3362 ~ 1.5121	-0.72962 -2.2204 ~ 0.7611	0.59289*** -0.3389 ~ 1.5247
Vegetables	0.39886*** -0.2946 ~ 1.0923	1.87907** -1.4854 ~ 5.2436	0.33950*** -0.2458 ~ 0.9248	0.36519*** 0.1944 ~ 0.5360	0.54653 -0.1190 ~ 1.2120	0.36010*** 0.1548 ~ 0.5654	0.41923*** -0.2959 ~ 1.1344	0.91882** -0.7444 ~ 2.5820	0.37985*** -0.2704 ~ 1.0301
Fruits	0.35484*** -0.3263 ~ 0.1078	0.20494 -0.4761 ~ 0.8860	0.56180** -0.5461 ~ 1.6697	0.31891*** -0.1424 ~ 0.4955	0.71911** -0.0042 ~ 1.4341	0.13080 -0.2376 ~ 0.0247	0.36526*** -0.3300 ~ 1.0605	0.70703 -0.8113 ~ 2.2254	0.53570*** -0.4689 ~ 0.5403
Milk	0.66778*** -0.4104 ~ 1.7460	0.81396*** -0.5073 ~ 2.1352	0.66429*** -0.4027 ~ 1.7313	0.80446*** 0.6082 ~ 1.0007	1.03699*** 0.7530 ~ 1.3210	0.7579*** 0.5783 ~ 0.9375	0.63832*** -0.3872 ~ 1.6639	0.88734*** -0.5421 ~ 2.3168	0.63077*** -0.3822 ~ 1.6437
Meat	0.64153*** -0.4729 ~ 1.7560	0.14643 -0.4950 ~ 0.7879	0.64734*** -0.4653 ~ 1.7599	0.48443*** 0.3112 ~ 0.6577	0.12192 -0.3188 ~ 0.5626	0.43301*** 0.2514 ~ 0.6146	0.59028*** -0.4251 ~ 1.6057	0.34226 -0.3761 ~ 1.0606	0.61156*** -0.4405 ~ 1.6637
- Beef	0.87432*** -1.6055 ~ 3.3541	11.28262 -23.276 ~ 45.841	1.06949*** -1.9279 ~ 4.669	0.23637 -0.0129 ~ 0.2384	4.81381 -0.7642 ~ 10.392	-0.11596 -0.4086 ~ 0.1767	0.69943*** -1.2910 ~ 2.6898	15.76719** -29.460 ~ 60.995	1.24193*** -2.2312 ~ 4.7150
- Pork	0.88112 -3.1426 ~ 4.9048	3.24629 -12.683 ~ 19.175	0.69861 -2.6582 ~ 4.0554	0.54381** 0.1579 ~ 0.9297	5.87034 -4.4861 ~ 16.227	0.42530 -0.0481 ~ 0.8987	1.34990** -4.6644 ~ 2.2199	2.95644 -24.856 ~ 30.768	0.97870 -3.4463 ~ 5.4037
- Chicken	0.58318*** -1.0073 ~ 2.1736	-4.55300* -17.433 ~ 8.3273	0.95331*** -1.6120 ~ 3.5187	0.22297* 0.0334 ~ 0.4126	1.50346 -1.7637 ~ 4.7706	0.03403 -0.2128 ~ 0.2787	0.61217*** -1.0543 ~ 2.2787	-1.55533 -8.4435 ~ 5.3328	0.01168*** -1.7066 ~ 3.7299
Legumes	0.84534*** -1.3415 ~ 3.0322	-0.16698 -1.6034 ~ 1.2694	0.11416*** -1.7558 ~ 3.9841	0.57781*** -0.3777 ~ 0.7779	1.24668** 0.2051 ~ 2.2883	0.24085 -0.0065 ~ 0.4882	0.81389*** -1.2887 ~ 2.9164	1.18399 -2.1346 ~ 4.5026	1.10888*** -1.7497 ~ 3.9674
Fats	0.27077 -0.4208 ~ 0.9623	0.63275 -1.2221 ~ 2.4876	-0.03116 -0.3287 ~ 0.2664	0.20145 -0.0308 ~ 0.4337	-0.12605 -1.0027 ~ 0.7506	0.25106 -0.0084 ~ 0.5105	0.18286 -0.3222 ~ 0.6879	-0.10724 -1.1176 ~ 0.9032	-0.03305 -0.2995 ~ 0.2334
Sugar	1.05442*** -1.8881 ~ 3.9970	0.87864*** -1.5867 ~ 3.3440	0.86677*** -1.5444 ~ 3.2780	0.88132*** 0.6240 ~ 1.1386	-0.00723 -0.8077 ~ 0.7933	0.77515*** 0.4783 ~ 1.0721	0.87854*** -1.5693 ~ 3.3264	0.26205 -0.9153 ~ 1.4394	0.80153*** -1.4317 ~ 3.0348
Beverages	0.5798*** -0.4074 ~ 1.5669	0.69623*** -0.4836 ~ 1.8761	0.51151*** -0.3575 ~ 1.3805	0.53415*** 0.3322 ~ 0.7361	0.27591* 0.0302 ~ 0.5216	0.56370*** 0.3698 ~ 0.7576	0.54778*** -0.3780 ~ 1.4736	0.42006*** -0.3098 ~ 1.1499	0.50921*** -0.3564 ~ 1.3748

Note: The small numbers represent the lower and upper bounds of the confidence intervals of the elasticity estimates, respectively, at the 90% level of confidence.

Asteriscs indicate point elasticities constructed from coefficient estimates statistically significant at: *** - 1% level; ** - 5% level; * - 10% level, for a 2-tail t-test.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

Hispanics are the fastest growing ethnic community in the United States. Mexicans represent about 60% of the Latin American emigration, and today, about 30 million persons of Hispanic origin live in the U.S. By 2010, the Hispanic or Latino population is expected to comprise 15.5% of the U.S. population, and by 2020, more than one in five children will be of Hispanic origin, according to U.S. Census Bureau population projections.

The analysis of three years of food consumption and expenditure patterns of the Hispanic population in the U.S. provided a good insight into their consumption behavior. Corporations and businesses should recognize the emergent Hispanic communities as a major sector of the U.S. economy. Latinos' buying power has also been growing very rapidly during the last ten years, which is estimated in 1999 to be about $350 billion nationwide. Income growth combined with high birthrates and larger household size are important factors in the leading growth market for food in the US.

The expenditure and consumption behavior with respect to food groups was analyzed primarily through the estimation of Engel curves. For this reason, this research was limited to the analysis of demand patterns only with respect to income and some other demographic and socioeconomic characteristics. Researchers agree, and it was pointed out in this research, that this is a limitation we must face when the available data base does not contain observations on price variations, as in the case of the cross-sectional data used in this thesis.

Food consumption and expenditure patterns for the Hispanic population in the United States were analyzed using information provided in the USDA's 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII94-96). Two separate but complementary studies were carried out. In the first study, food expenditure patterns of Hispanic households were examined for two broad food categories: food eaten at home (FAH) and food eaten away from home (FAFH), and for total food (TF). Engel curves were estimated using four functional forms: double-logarithmic, semi-logarithmic, quadratic and the Working-Leser model. The confidence intervals constructed for the income and household size elasticities showed great variations due to differences in model specification and estimation procedures.

The response to changes in income by Hispanic consumers for both TF and FAH was moderately inelastic, as indicated by the estimated income elasticities. Income elasticities of the FAH category ranged from 0.20 to 0.27, which were lower than TF category (0.28 to 0.34). On the other hand, the income elasticities for FAFH appeared to vary from moderate to unitary elastic (0.50 to 1.04). The income elasticity for TF and FAH estimated in this research are, in general, smaller than those reported in the literature for the entire U.S. population, whereas the magnitudes for FAFH are higher. Food eaten away from home may be close to a luxury item for the Hispanic population.

On the other hand, the effect of the household size was more important for TF and particularly for FAH, than for FAFH. The household size elasticities for FAH reported the highest magnitudes ranging from 0.39 to 0.47, while the estimated elasticities for FAFH were lower, -0.18 to 0.13. Elasticities of TF ranged from 0.32 to 0.39.

According to the results obtained in this research, Hispanic households devote a much higher proportion of their budget to total food (29.4%) when compared to the average American household, but the proportion spent in food eaten away from home is smaller (3.6%).

In the second part of this study, income and household size elasticities were estimated using the same Hispanic household data sample. The nine food groups considered in this analysis were grains, vegetables, fruits, milk, meat, legumes, fats, sugars, and beverages. Three meat subgroups were also considered: beef, pork and chicken. In this case, three different functional forms were used to estimate income and household size elasticities: the direct linear model, the double-logarithmic model, and the semi-logarithmic model. Confidence intervals for the elasticities were computed and results compared with previous studies.

Household size seemed to be relatively more important than income in influencing consumer's demand for broad food categories. Differences in demographic and socioeconomic characteristics of Hispanic households also played an important role in the demand for some particular food categories. These characteristics included residential locations, ethnic origin, education and participation in income transfer programs.

The wide ranges found in the confidence intervals of the income and household size elasticities suggest that the estimated magnitudes should be taken with caution. As in most studies, the elasticities were estimated at the means of the data. It is possible that part of these wide ranges could be explained by the important variability found among the households of this data set, in terms of income distribution and household size. Nevertheless, the consistency observed among the results obtained with the different empirical models and estimation procedures utilized in this study allow us to draw some important conclusions about the food expenditure patterns of the Hispanic population in the U.S.

Conclusions

First, the results of this research indicate that Engel's law is a very robust assessment of the demand for food among the Hispanic community living in the United States. Poorer households devote a higher proportion of their total income to food than richer households. Moreover, the share of total expenditures on food is higher for large households than for small households, at the same level of total expenditure. Although this behavior is consistent with what has been observed for the aggregate U.S. population, expenditure shares on total food, food eaten at home, and food eaten away from home showed large differences.

When compared to the average American household, Hispanics spent a much higher proportion of their budget on total food, and particularly on food eaten at home. Indeed, the proportion devoted to food away from home was very small. On the other hand, for Hispanics, the size of the household appeared to have more weight in the expenditure level on the food eaten at home than on the food eaten away from home.

When analyzing specific food categories, the lack of information about individual commodity expenditures prevented making inferences about budget shares among the food groups. The analysis was, in this case, limited to physical quantities consumed. On the average, the demand for particular food groups appears to be relatively inelastic with respect to income, and moderately to unitary elastic with respect to household size. These results suggest that Engel's Law holds for individual food categories with regard to

Hispanic consumers in the U.S., especially because these food categories are still relatively broad commodity classifications that could be disaggregated into quality-based products or dishes with a richer data base than the one used here. These differences in quality can make them behave as different products, and, for instance, substitutions from low to high-quality products could occur inside specific subgroups such as beef or pork. The relatively low magnitudes of the income elasticities found for beef can be hiding this substitution among beef products, making the whole beef category appear as income inelastic, when in fact the response would be higher for individual cuts of meat.

The results of this research, although not conclusive, showed some evidence that government income transfer payments received by Hispanic households (Food Stamp or WIC programs) may also have some significant influence in the demand for specific food groups, such as milk, fats, sugar, and meats, especially pork. In particular, the consumption of pork, dairy products and fruits appear to be higher for households receiving benefits from the WIC program. Total fats, beverages, and chicken consumption were also affected by participation in the WIC program, but the effect appears to be negative. On the other hand, households receiving Food Stamps seem to consume more milk, fats, and sugar, and less pork.

Finally, food producers and retailers should regard the differences in demographic and socioeconomic characteristics of the Hispanic households when targeting the Hispanic community with their food products. These differences can affect consumer preferences for some food commodities. For instance, Hispanic consumers of Puerto Rican origin consumed lower quantities of vegetables and dairy products compared to households of other Hispanic origin. In contrast, Cuban and Mexican households consumed more legumes, nuts, and seeds, and less pork than other groups. Cubans also showed the highest level of response for vegetables, and while Mexicans reported the highest response of total fats, Cubans reported the lowest response for this category.

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APPENDIX

DISK CONTENT

The floppy disk accompanying this thesis contains the complete set of results of the econometric estimations performed in the research, a summary of which is presented in chapters IV and V, respectively. It is is formatted as an 1.44 Mb High-Density IBM-PC disk and it can be accessed by any PC IBM-compatible computer, using MS-DOS or Windows 3.X/95/98/NT operating systems, or a Macintosh computer capable to read PC-formatted floppy disks, running Apple System Software 7.5 or later.

There are two files in the disk. The file called README.TXT, is an ASCII file that describes the content of the disk. It can be read with any text editor. The other file, APPENDIX.PDF, is a Portable Document File (PDF), and contains the information regarding the econometric results referred above. This file can be read with Acrobat Reader 3.0 or later.