A growing market: expenditures by Hispanic consumers

Spending patterns of Hispanics differ
from those of whites or blacks,
even when controlling for income,
family size, and age; the patterns also differ
among the various Hispanic cultures

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The U.S. Hispanic population has increased rapidly in recent years, rising from 6 percent of the population in 1980 to 10 percent in 1995. Projections from the Bureau of the Census indicate that the trend will continue for the next several years, with even their "lowest series" projecting that Hispanics will account for 11 percent of the population in 2000 and 12 percent in 2005.[1] With this growth, consumer spending among Hispanics has become an increasingly important segment of the economy. Data from the Consumer Expenditure Interview Survey (henceforth, "Interview survey") show that Hispanics accounted for less than 5 percent of total consumer spending in 1989 and more than 6 percent in 1994. Given the census projections, the Hispanic share of spending should continue to increase in the coming years.

The term "Hispanic" encompasses persons from many different cultural backgrounds. According to the Interview survey, Hispanics in the United States come from a wide range of geographic areas: Mexico (62 percent), Central or South America (14 percent), Puerto Rico (12 percent), Cuba (5 percent), other areas (8 percent). Given this variety, cultural differences may exist within the larger group that are worth exploring. Such inquiry would be particularly important to those attempting to understand spending patterns in local communities. For example, if the local Hispanic population comprises largely Cuban-Americans and they have different spending patterns than Mexican-Americans (who make

up the majority of Hispanics nationwide), then applying the overall Hispanic average to the local community may not provide the insight required to understand local conditions.

This study has two purposes. The first is to examine spending patterns of Hispanics and other groups. Does ethnicity play an important role in expenditure decisions, or are factors such as income, age, and family size dominant? To answer this question, Hispanics are compared with non-Hispanic whites and non-Hispanic blacks. The second purpose is to explore spending patterns *within* the Hispanic community to see if there are major differences by geographic origin. For each purpose, Interview survey data are analyzed in three ways. First, general demographic characteristics (such as age, income, and family size) are compared. Second, expenditure levels and budget allocation (expenditure shares) are examined. Third, regressions are used to study how characteristics are related to expenditures for each of the groups of interest.

Recent literature

In recent years, the role of ethnicity—particularly Hispanic ethnicity—in determining consumer behavior has been recognized in a number of studies. For example, some authors, while not specifically focusing on ethnicity, have at least included it as an independent variable in their analyses.[2] Other studies have included only data from Hispanic families in general,[3] or from one

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specific ethnic subgroup, such as those of Mexican descent.[4] Still other studies attempt to compare Hispanics with non-Hispanics,[5] sometimes using detailed breakdowns of Hispanic ethnicity[6] or specific ethnic subgroups.[7]

These studies examine the Hispanic "market" from different perspectives. Some, for example, are conventional studies of expenditure patterns,[8] while others look at the role of attitudes in the Hispanic market. Scott Koslow and others, for example, examine how Spanish-speaking Hispanics react to advertising and whether they prefer advertisements in Spanish or English. Cynthia Webster examines the role of ethnicity in the decisionmaking process of Hispanic married couples. And, in an especially interesting study of acculturation, Lisa Peñaloza personally observed the behavior of Mexican immigrant families, attempting to answer the question, "How do Mexican immigrants learn to buy products in the United States?"[9]

Additionally, José Medina and others compare attitudes about money for persons from Mexican-American and Anglo-American backgrounds. Respondents are questioned about their perceptions of the power and prestige of money (for example, "I tend to judge people by their money rather than their deeds" or "I behave as if money were the ultimate symbol of success"); retention and time factors ("I put money aside on a regular basis for the future"); distrust or anxiety ("It bothers me when I discover I could have gotten something for less elsewhere"); and quality ("I am willing to spend more to get the very best").[10] Finally, Peter Cattan describes the characteristics of various subgroups of Hispanics (Mexican, Puerto Rican, Cuban, Central or South American, and other Spanish) in the work force. His study investigates differences in both demographics (such as age and education) and labor force statistics (participation, growth rates, and unemployment) between these groups and non-Hispanics.[11]

Although the current article is written in the tradition of those comparing Hispanics with non-Hispanics,[12] issues raised in other articles are worth discussing as well. In particular, what level of ethnicity matters, at least for Hispanics? Cynthia Webster argues that Hispanics can be treated as a homogenous group. Although the term "Hispanic" encompasses individuals from three distinct regions (Mexico, Central or South America, and the Caribbean), representing more than 20 separate nationalities—some with radically different political systems—Webster believes that Hispanics share more similarities as a cultural group than differences. These similarities include shared frustrations, aspirations, and attitudes, beliefs, and behaviors. In this article, the term "Hispanic" is used, even though the data were collected for a specific subset of Hispanics—namely, Mexican-Americans, by far the most common single group, accounting for more than 60 percent of all U.S. Hispanics.[13]

Similarly, Jessie X. Fan and Virginia Solis Zuiker acknowledge that in the United States, Hispanic "heritage … is rich and diverse," but that "Hispanic groups tend to share similarities in terms of values, beliefs, and attitudes, culture, and self-perception" that can "distinguish the Hispanic population from other ethnic and consumer groups."[14] Also, Janet Wagner and Horatio Soberon-Ferrer examine the issue and evidently conclude that Hispanics are sufficiently homogenous to use as one of the ethnic groups in their analysis (along with Afro-American, European, and "other").[15]

On the other hand, as noted earlier, some studies focus either on one specific subgroup (such as those of Mexican descent[16]) or break down the ethnicity in some detail. Koslow and others provide an interesting example in which the level of ethnic identity is used as a variable in their models exploring reactions to advertising. The data on the respondent's self-identified ethnicity were transformed into a three-level scale such that subjects identifying themselves as a non-United States ethnic (for example, "Mexican") were coded at the low level, while those identifying completely with the United States (for example, "American") were coded at the high level of the scale; those identifying themselves as some mixture of the two (Mexican-American, Hispanic, Chicano, Latino) were coded at the intermediate level.[17] And, as already noted, Cattan breaks the Hispanic group into several subgroups similar to those used in the Interview survey and finds many important differences among them.[18]

Given the dichotomy in the literature, therefore, it seems reasonable to pursue a dual approach here. First, Hispanics as a group can be compared with other groups (white and black) to look for major differences in expenditure patterns. Then, the hypothesis of homogeneity can be specifically tested by comparing Hispanics of different geographic origins with those of Mexican origin, the largest subgroup of Hispanics. In addition, this article contributes to the current literature in other ways as well. First, the data are much more recent than those used by Wagner and Soberon-Ferrer or Fan and Zuiker in their articles.[19] Even if spending patterns among Hispanics have changed little over time, their increasing share of the population will affect aggregate consumer spending. Also, more observations of Hispanics in the data set allows greater ability to find statistically significant differences that were previously unrecognized. Another contribution is the increased precision with which the regressions are specified. In this study, Box-Cox transformations are used on the dependent and income variables to minimize heteroscedasticity.

The data

The Consumer Expenditure Survey data presented in this article are from all families interviewed between January 1994 and December 1995. The Interview component collects data quarterly from about 6,000 consumer units on a rotating-

panel basis. Families selected to participate in the survey may do so for up to five consecutive quarters. Data collected in the first interview are not included in the survey, but are used as a reference to compare responses in the subsequent interview. Each quarter, approximately 20 percent of the sample is rotated out of the survey and a new 20 percent is sampled. Data collected in each quarter are considered independent so that the estimates are not contingent on the responses of families participating in the survey for all five quarters. Although it is designed primarily to measure expenditures for relatively large purchases and expenses that occur on a regular basis, the Interview survey covers about 95 percent of all expenditures.[20] It also gathers information on demographic characteristics, including each respondent's age, education, ethnicity, and occupation, as well as each family's income, composition, and region of residence.

The Interview survey collects information on both the race and ethnic origin of each member of the family. However, for simplicity, families in this study are described as Hispanic, white (non-Hispanic), or black (non-Hispanic), based on the characteristics of the reference person alone.[21] Because Hispanic is an ethnic classification, all families whose reference person is reported as Hispanic are so classified, regardless of race.[22] Families whose reference person's ethnicity is reported to be non-Hispanic[23] are classified as white or black, depending on the race of the reference person. Families of other races whose reference person is not identified as Hispanic are omitted from the sample because they are too heterogeneous to constitute a single group on their own (such as "other").[24] The sample, which includes only white, black, and Hispanic families as defined earlier, is then weighted to reflect the population, representing over 99 million families.[25]

Demographic characteristics

Table 1 shows data on selected characteristics of families by ethnic origin. Hispanics, on average, report slightly higher incomes before taxes ($27,112) than blacks ($25,275), but considerably lower incomes than whites ($38,770).[26] This is particularly interesting considering that Hispanic families have more earners (1.5), on average, than either white (1.3) or black families (1.2). They also have larger families, on average, than whites or blacks, including both more adults and children. The average Hispanic family has 2.1 adults and 1.3 children. For whites, the comparable figures are 1.8 and 0.6, respectively; and for blacks, they are 1.8 and 1.0, respectively.[27] The adults in Hispanic families also tend to be younger than in other families. This is reflected both in the average age of the reference person and in the number of persons in the family who are over age 64. White families, for example, have twice as many persons over age 64 (0.34), on average, as Hispanics (0.17); black families also have more

older persons than Hispanic families (0.23).

Although about the same proportions of Hispanics and blacks are homeowners (42 percent versus 43 percent), Hispanics are less likely to own their homes *outright*—that is, without a mortgage—than blacks (14 percent versus 18 percent). Hispanics also are much less likely than whites to own their homes without a mortgage: 69 percent of white families own their own homes, and 27 percent do so without a mortgage.

Fewer than 1 in 50 Hispanic families live in rural areas, compared with 1 in 6 white families and 1 in 16 black families. Hispanics make up the largest share of the immigrant population, and a greater proportion of the Hispanic population is made up of immigrants than other populations.[28] Immigrant families often settle in urban areas because of the availability of jobs, transportation, housing, and other factors.

Family composition is another interesting characteristic to compare by ethnicity. Hispanic consumer units are less likely than non-Hispanic consumer units to consist of a single person, but they are far more likely to include children of the reference person (and spouse, if the reference person is married). Such families account for nearly half of Hispanic consumer units (46 percent), compared with about one-third of non-Hispanics. Additionally, when "conventional" couples are considered (that is, married couples only or married couples with their own children only), more than three-fourths of Hispanic married couples have children, compared with more than half of white married couples and less than two-thirds of black married couples.

Hispanic families, on average, also are less educated than either white or black families. In only 29 percent of Hispanic families is there a reference person who attended college, compared with 36 percent of black families and 51 percent of white families. Also, only one-fourth of Hispanic families have a reference person who has attained at least a high school diploma, compared with about one-third of black and white families. Finally, 45 percent of Hispanic families have a reference person who did not complete high school, compared with 30 percent of black families and 17 percent of white families.

Expenditures analysis

Aggregate expenditures and shares. Given the demographic differences across groups, it is reasonable to expect differences in spending patterns as well. Table 2 shows how aggregate spending in the economy differs by ethnicity—that is, it shows which group accounts for the most and which group accounts for the least expenditures on a particular good or service in the U.S. economy. The table shows that, in total, Hispanics spent about $194 billion per year in 1994–95, while black families spent $247 billion, and white families spent $2.6 trillion over the period.[29] By themselves, however, these numbers provide little insight other than the potential size of

the consumer market for each group. Given that white families represent 81 percent of all consumer units, one would expect them to account for a comparably large share of the total dollars spent. Therefore, examining the *share* of aggregate spending held by each of the groups provides a more meaningful comparison.

The aggregate share of spending accounted for by each group is calculated in a straightforward fashion: the total spending for each of the groups is divided by the total spending for all consumer units. As table 2 also shows, the aggregate share of spending for Hispanic families is 6.4 percent, although they account for 7.8 percent of all consumer units. There are only two categories of expenditures for which Hispanic families spent more than their population share in the 1994–95 economy: food at home (8.9 percent), and public transportation less trips (16.2 percent). For other goods, aggregate shares range from 2.4 percent (other lodging) to 7.5 percent (shelter and utilities).

Black families account for 11.3 percent of all consumer units, yet only for public transportation less trips (28.4 percent) and personal care (14.6 percent) does their aggregate expenditure share exceed their population share. Otherwise, black aggregate shares range from 4.1 percent (other lodging) to 10.6 percent (food at home). For whites, the reverse is true. Accounting for 81 percent of the population, whites spend more than their share on everything except public transpor-tatation (54.4 percent), personal care (79.3 percent), and food at home (80.5 percent). Whites account for the largest share of aggregate spending spending other lodging (93.6 percent).

Expenditure shares. Given that Hispanic families have lower average incomes than white families, it is not surprising that their aggregate expenditure shares for most goods and services are less than their population share. Even when comparing average annual expenditures of families from the three groups, white families spend more—at the statistically significant level—than Hispanic families for nearly every good and service measured. A more insightful method of analyzing the data is to compare the proportions of total expenditures allocated to specific categories by the different groups.

Table 1. Characteristics of consumer units by race and Hispanic origin of reference person, 1994–95

Characteristics	Total	Hispanic	White	Black
Sample size	38,821	2,940	31,258	4,623
Consumer units represented:				
Number	99,462,243	7,791,811	80,426,699	11,243,733
Percent	100.0	7.8	80.9	11.3
Income before taxes (Complete income reporters only)	$36,372	$27,112	$38,770	$25,275
Age of reference person	48.0	41.0	49.0	45.6
Average number in consumer unit:				
Persons under 18 years	.7	1.3	.6	1.0
Persons 65 years and older	.3	.2	.3	.2
Earners	1.3	1.5	1.3	1.2
Vehicles	1.9	1.6	2.1	1.2
Automobiles	1.2	1.1	1.2	1.0
Other vehicles	.7	.5	.9	.2
Housing characteristics:				
Rooms (excluding bedrooms)	5.7	4.8	5.2	5.2
Bedrooms	2.7	2.4	2.5	2.5
Bathrooms	1.4	1.3	1.2	1.2
Half-baths	.3	.1	.2	.2
Percent distribution				
Housing tenure:				
Homeowner	64.1	42.1	69.3	42.6
With mortgage	37.1	28.0	42.3	25.0
Without mortgage	27.0	14.1	27.0	17.6
Renter	35.9	57.9	30.7	57.4
Race of reference person:				
White	88.4	95.6	100.0	.0
Black	11.6	3.3	.0	100.0
Other	.1	1.1	.0	.0
Education of reference person:				
Some high school or less	20.9	45.0	17.2	30.3
High school graduate	31.8	26.1	32.0	33.7
College graduate	23.7	10.3	26.6	12.3
Family composition:				
Single person	28.3	15.8	29.8	26.4
Husband and wife only	21.8	10.9	24.5	10.3
Husband and wife, own children only	27.0	34.1	27.6	18.0
Single parent	6.7	11.9	4.7	17.2
Other families	16.2	27.3	13.5	28.2
Region				
Northeast	20.2	16.7	21.1	16.0
Midwest	25.6	7.1	27.7	23.2
South	34.3	35.6	31.6	52.3
West	20.0	40.7	19.6	8.4
Degree of urbanization:				
Urban	85.5	98.3	83.2	93.8
Rural	14.5	1.7	16.8	6.2
Working status of reference person:				
Wage or salary earner	65.0	72.1	64.8	61.9
Self-employed	6.0	3.8	6.7	2.9
Retired	18.4	8.6	19.8	15.0
Other not working	10.6	15.5	8.7	20.3

Table 2. Aggregate expenditures and shares of expenditures, by race and Hispanic origin, 1994–95

Expenditure category	Expenditures [billions of dollars]				Expenditure shares [in percent]		
	Total	Hispanic	White	Black	Hispanic	White	Black
Number of consumer units	99,462,243	7,791,811	80,426,699	11,243,733	7.8	80.9	11.3
Total expenditures	$3,016.6	$194.1	$2,575.7	$246.8	6.4	85.4	8.2
Food at home	330.6	29.3	266.3	34.9	8.9	80.5	10.6
Housing (less trips)	900.6	64.9	753.7	82.1	7.2	83.7	9.1
Shelter and utilities	747	56.2	619	71.7	7.5	82.9	9.6
Other housing	153.7	8.6	134.6	10.4	5.6	87.6	6.8
Apparel and services	130.8	9.7	107.6	13.5	7.4	82.3	10.3
Transportation (less trips)	553.6	36.1	472.4	45.1	6.5	85.3	8.2
Private..	548.2	35.2	469.5	43.6	6.4	85.6	7.9
Public (less trips)	5.5	.9	3.0	1.6	16.2	54.4	28.4
Health care	165.4	7.5	147.7	10.1	4.6	89.3	6.1
Health insurance	83.7	3.7	74.1	5.9	4.5	88.4	7.1
Medical services	54.1	3.0	48.8	2.3	5.5	90.2	4.3
Prescription drugs	20.9	.6	18.8	1.5	2.9	90.1	7.2
Medical supplies	6.7	.2	6.0	.4	3.3	90.5	6.1
Recreation and related expenditures	359.6	17.3	321.9	20.4	4.8	89.5	5.7
Food away from home	122.4	7.0	108.3	7.2	5.7	88.4	5.9
Entertainment	151.0	7.3	134.4	9.3	4.8	89.0	6.1
Reading	16.3	.6	14.9	.9	3.6	91.2	5.2
Transportation (on trips)	30.1	1.5	27.3	1.4	4.9	90.5	4.6
Other lodging	39.7	1.0	37.2	1.6	2.4	93.6	4.1
Other	576.1	29.3	506.0	40.8	5.1	87.8	7.1
Alcohol	26.3	1.4	23.4	1.5	5.4	89.1	5.5
Tobacco and smoking supplies	26.5	1.1	23.2	2.2	4.3	87.5	8.2
Education	41.1	2.2	36.0	2.9	5.2	87.7	7.0
Personal care	26.5	1.6	21.0	3.9	6.1	79.3	14.6
Cash contributions	95.2	3.3	86.0	5.9	3.5	90.3	6.2
Personal Insurance	293.3	15.7	257.2	20.4	5.3	87.7	6.9
Miscellaneous	67.4	4.0	59.3	4.2	5.9	87.9	6.2

In other words, how do Hispanic, white, and black families differ in terms of what they choose to purchase? Table 3 shows that the average Hispanic family spends 15 cents out of every dollar on food at home, while the average white family spends only two-thirds of that amount—10 cents out of every dollar.

Given different incomes among the groups, what can we expect to learn from expenditure share analysis? Based on Engel's proposition of 1857, economists have certain theoretical expectations of what the shares will look like.[30] A civil servant living in Prussia, Engel found that as incomes increased, the proportion of that income spent on food decreased; he also found that regardless of income, the share of income allocated to apparel and housing was fairly stable. Although Engel studied shares of income, and the results in table 3 are for shares of total expenditures, Engel's proposition still provides useful guidance, given subsequent development of economic theory. Exactly 100 years later, in 1957, Milton Friedman developed his "permanent income hypothesis," stating that families do not make expenditure decisions based solely on current earnings, but also on expectations of future earnings.[31] Many recent studies using data from the Consumer Expen-

diture Survey have used total expenditures as a proxy for "permanent" income, following Friedman's hypothesis.[32]

Even using "permanent" income (total expenditures) as a substitute for "current" income, Engel's findings appear to hold true for many categories. For example, the share for recreation and related expenditures increases with income, indicating that recreation is a *luxury* good as opposed to a *necessity* good. For housing and apparel, also, the proposition appears to hold. Housing expenditures account for 29 percent to 33 percent of each group's budget (although the gap is wider—24 percent to 29 percent for shelter and utilities alone), and the apparel share ranges from 5 percent to 6 percent of total expenditures for each group. The proposition does not hold, however, for food at home. Total expenditures of Hispanic families are significantly higher than those of blacks, yet the share allocated to food at home by Hispanic families appears to be slightly larger than the share allocated by black families. This apparent violation of Engel's proposition probably stems from the larger family sizes among Hispanics. Because their families are larger than those of the other groups, it is reasonable to expect that, given the same level of income, Hispanic families will spend a greater

| Table 3. | Average annual expenditures, expenditure shares, and t-statistics by race and Hispanic origin, 1994–95 | | | | | | | | | | | | | |

Expenditure category	Average expenditures							Expenditure share[1]						
	Billions of dollars				t-statistics (absolute values)			Percent				t-statistics (absolute values)		
	All consumer units	Hispanic	White	Black	Hispanic /white	Hispanic /black	White/ black	All con- sumer units	Hispanic	White	Black	Hispanic /white	Hispanic /black	White/ black
Total expenditures	$30,329	$24,911	$32,025	$21,951	8.23	3.18	14.62	98.3	100.0	100.0	100.0	8.23	3.20	14.62
Food at home ...	3,324	3,761	3,311	3,104	5.45	5.59	2.08	11.0	15.1	10.3	14.1	8.70	1.33	7.20
Housing (less trips)	9,055	8,325	9,371	7,298	3.15	2.90	9.28	29.9	33.4	29.3	33.2	3.16	.11	3.75
Shelter and utilities	7,510	7,216	7,697	6,375	1.67	2.70	6.71	24.8	29.0	24.0	29.0	4.15	.05	5.24
Other housing	1,545	1,110	1,674	923	6.78	2.03	12.51	5.1	4.5	5.2	4.2	2.25	.62	3.77
Apparel and services	1,315	1,246	1,338	1,198	1.50	.62	2.52	4.3	5.0	4.2	5.5	2.93	1.24	4.73
Transportation (less trips)	5,566	4,632	5,874	4,013	4.62	1.77	6.89	18.4	18.6	18.3	18.3	.25	.22	.06
Private	5,512	4,518	5,837	3,875	4.90	1.85	7.29	18.2	18.1	18.2	17.7	.09	.35	.54
Public (less trips)	55	114	37	138	5.92	1.39	8.59	.2	.5	.1	.6	6.39	2.25	9.34
Health care	1,663	966	1,837	902	15.14	1.04	18.31	5.5	3.9	5.7	4.1	7.45	.78	6.95
Health insurance	842	480	921	526	9.97	.99	12.83	2.8	1.9	2.9	2.4	5.24	2.26	3.40
Medical services	544	380	607	206	4.61	3.45	15.62	1.8	1.5	1.9	.9	1.88	2.79	8.92
Prescription drugs	210	79	234	134	13.91	3.32	6.02	.7	.3	.7	.6	9.83	3.89	1.65
Medical supplies	67	28	75	36	9.22	1.30	6.59	.2	.1	.2	.2	6.43	1.90	2.85
Recreation and related expenditures .	3,615	2,219	4,003	1,810	10.79	2.34	17.89	11.9	8.9	12.5	8.2	5.50	.89	8.19
Food away from home	1,231	894	1,346	643	6.53	3.29	14.63	4.1	3.6	4.2	2.9	2.13	1.98	5.88
Entertainment .	1,518	937	1,671	825	10.10	1.43	14.34	5.0	3.8	5.2	3.8	4.91	(2)	5.67
Reading	164	75	185	76	16.24	.18	18.25	.5	.3	.6	.3	10.06	1.51	8.99
Transportation (on trips)	303	190	339	122	6.46	2.85	12.36	1.0	.8	1.1	.6	3.26	2.01	6.99
Other lodging ..	399	123	462	144	11.93	.72	9.71	1.3	.5	1.4	.7	9.40	1.25	6.02
Other	5,262	3,762	6,291	3,625	10.67	.53	11.95	17.3	15.1	19.6	16.5	5.07	1.28	3.56
Alcohol	264	182	291	129	4.87	2.23	12.33	.9	.7	.9	.6	1.96	1.40	5.59
Tobacco and smoking supplies	266	145	288	192	7.80	2.26	6.84	.9	.6	.9	.9	7.80	2.26	6.84
Education	413	276	448	254	3.37	.38	4.16	1.4	1.1	1.4	1.2	1.50	.20	1.26
Personal care .	266	207	261	344	5.24	8.12	5.59	.9	.8	.8	1.6	.37	8.49	9.85
Cash contributions .	957	426	1,069	524	8.04	1.31	6.87	3.2	1.7	3.3	2.4	5.70	2.08	3.12
Personal Insurance	2,949	2,013	3,198	1,812	8.73	1.38	11.76	9.7	8.1	10.0	8.3	3.52	.27	3.49
Miscellaneous	678	513	737	370	3.92	2.44	11.04	2.2	2.1	2.3	1.7	1.06	1.51	4.38

[1] Detail for expenditure shares may not sum to exactly 100 percent due to rounding.
[2] Value is less than 0.01.

proportion on food at home than either black or white families.

Regression analysis

In addition to income and family size, other characteristics—such as the age and educational attainment level of the reference person—also may influence the allocation of the total family budget. Because many of these characteristics vary with ethnic origin, regression analysis is critical to understanding how these factors are related. Using such analysis, the relationships of expenditures to other variables across ethnic groups can be studied while holding other factors constant. In other words, how might a change in income affect the spending patterns of the average Hispanic, white, or black family when all else (such as age or family size) is equal? In this study, the ordinary least squares regression technique is used.

Description of variables. Regression techniques are used to analyze the following major expenditure categories: food at home, shelter and utilities, apparel and services, transportation (less trips), and recreation and related expenditures. These categories—used as the dependent variables here—are chosen for several reasons. First, they constitute a significant share of the average consumer's expenditures (the minimum is apparel, at about 4 percent for white families). Second, they are chosen for "saliency"—that is, most consumers are expected to incur expenditures for these items with some regularity. Third, each category, though it may contain several different kinds of goods and services (especially recreation and related expenditures), is sufficiently homogeneous that the regression results are meaningful.[33]

In addition to these dependent variables, several independent variables are used, most of which are common to all regressions. The independent variables include the following: total expenditures, age (and age squared) of reference person, number of adults (and number squared), number of children (and number squared), and dummy variables describing the reference person's family type (single person, husband and wife only, single parent, or other family), region of residence (Northeast, Midwest, or West), degree of urbanization (rural), education (less than a high school diploma, some college, or college degree), and working status (self-employed, retired, or not working for reasons other than retirement). The "omitted" categories for these dummy variables include the following: husband and wife with children (family type), South (region of residence), urban (degree of urbanization), high school graduate (education), and wage and salary earner (working status). These variables are omitted, as is traditional when dummy variables are employed, to avoid perfect multicollinearity.

In addition, some of the regressions include independent variables not used in the other regressions. For example, the housing regression contains dummy variables describing housing tenure (owned with no mortgage or renter; owned with a mortgage is omitted) and size of dwelling (number of rooms, bedrooms, bathrooms, and half-baths).[34] The regressions for transportation and recreation and related expenditures also contain variables describing the number of automobiles and other vehicles owned by the consumer unit. These variables are selectively included because, in each case, they will clearly affect expenditures for the dependent variable under study but do not necessarily directly affect other expenditures. The number of bedrooms, for example, will affect housing expenditures, but not those for food at home.

Finally, for both theoretical and empirical reasons, total expenditures are included as a proxy for permanent income. The theoretical reasons were explained earlier (see "expenditure shares" section above), but there are empirical reasons as well. For example, because permanent income incorporates expectations of future earnings, there may be less variability in the relationship between expenditures and permanent income than expenditures and current income.[35] Furthermore, current income is not necessarily fully reported by all families, even by so-called complete reporters. Removing incomplete reporters reduces sample size, and not even in a random fashion, because incomplete reporters are not randomly distributed throughout the Interview survey sample.[36]

Model specification. The goal of the regressions is to obtain parameter estimates that can be used to calculate the marginal propensity to consume (MPC) different goods and services for each ethnic group. Once calculated, the MPC can be used to estimate income elasticity for each good or service to see whether or not there are differences in expenditure patterns by ethnicity. Furthermore, income elasticities can be estimated for each ethnic group by using its own mean income ("unadjusted" estimation) or by using the average income for the sample as a whole ("standardized" estimation) where income is needed to estimate these factors. (See table 4.)

In order to achieve these goals most accurately, Box-Cox transformations are performed on both the dependent variables and the income variables in each of the equations. As noted earlier, this reduces heteroscedasticity. The model, then, is specified as follows:

$$Y^* = \alpha_h + \alpha_w D_w + \alpha_b D_b + \beta_{hj}X_j + \beta_{wj}D_wX_j + \beta_{bj}D_bX_j + e$$

where
Y^* is the (Box-Cox transformation of the) dependent variable;
α_h is the intercept of the regression equation;
α_w, α_b are parameter estimates;
D_w, D_b are dummy variables describing ethnicity (*w* for white, *b* for black);
β_{ij} is a vector of parameter estimates for various indepen-

dent variables, with the i subscript indicating ethnicity, and the j subscript indicating the variable;

X_j is a vector of independent variables, including permanent income;

e is the error of the regression.

Note that this specification allows the results to be interpreted in the following way. If a parameter estimate with subscript h is statistically significant, this means that for Hispanics, the parameter estimate is nonzero. If a parameter estimate with subscript w or b (for whites or blacks, respectively) is statistically significant, it means that, for that group, a different relationship exists between the variable in question and the dependent variable than for Hispanics. Summing the parameter estimates gives the estimated effect of a change in the independent variable for the non-Hispanic group.

Because of the Box-Cox transformations, parameter estimates in most of the models do not have any immediately interpretable intuitive meaning. Therefore, for the reader's convenience, important measures that are derived from these parameter estimates (such as the marginal propensities to consume and income elasticities, described subsequently) are presented in tables 4 and 8. They are noted in these tables if the income parameter estimates differ significantly across ethnic origin. Income parameter estimates for Hispanics are all statistically significant at the 95-percent confidence level.

General observations. There are some similarities across ethnic groups. For example, if an expenditure is a necessity good or a luxury good for one group, it is for the other two groups as well. Also, although standardization has substantial effects on at least some of the MPC estimates, it appears to have little effect on elasticities estimated from these MPCs, except for the case of recreation and related expenditures. It also is worth noting that in every case other than unadjusted food at home and recreation and related expenditures, white families have both the lowest MPC and elasticity for all goods and services tested. This is less surprising before standard-

Table 4. Average annualized expenditures, marginal propensities to consume, and income elasticities for selected goods and services by race and Hispanic origin, 1994–95

[Expenditure figures in billions of dollars]

Expenditure category	Unadjusted			Standardized		
	Hispanic	White	Black	Hispanic	White	Black
Total expenditures	$24,911	$32,025	$21,951	$30,329	$30,329	$30,329
Food at home:						
Expenditure level	$3,761	$3,311	$3,104	$3,324	$3,324	$3,324
Marginal propensity to consume	[1].041	.029	.043	[1].031	.031	.033
Elasticity	[1].274	.279	.304	[1].283	.279	.299
Shelter and utilities:						
Expenditure level	$7,216	$7,697	$6,375	$7,510	$7,510	$7,510
Marginal propensity to consume	[1].156	[2].117	[2].176	[1].132	[2].121	[2].144
Elasticity	[1].538	[2].485	[2].606	[1].532	[2].488	[2].581
Apparel and services:						
Expenditure level	$1,246	$1,338	$1,198	$1,315	$1,315	$1,315
Marginal propensity to consume	[1].074	.061	[2].096	[1].064	.063	[2].075
Elasticity	[1]1.480	1.454	[2]1.751	[1]1.470	1.457	[2]1.731
Transportation:						
Expenditure level	$4,632	$5,874	$4,013	$5,566	$5,566	$5,566
Marginal propensity to consume	[1].273	[2].239	[2].300	[1].269	[2].239	[2].301
Elasticity	[1]1.467	[2]1.301	[2]1.640	[1]1.467	[2]1.301	[2]1.640
Recreation and related expenditures:						
Expenditure level	$2,219	$4,003	$1,810	$3,615	$3,615	$3,615
Marginal propensity to consume	[1].147	[2].150	.129	[1].185	[2].145	.171
Elasticity	[1]1.652	[2]1.200	1.566	[1]1.554	[2]1.215	1.436

[1] The Hispanic income parameter estimate used to calculate this item differs from zero at the 99-percent confidence level.

[2] The income parameter estimate used to calculate this item differs from the Hispanic income parameter at the 95-percent confidence level.

ization, when one considers that whites have the highest permanent incomes, on average. Given that white families already have higher incomes, a 1-percent increase in income will not likely induce as large an increase in spending (at least in percent terms) as for the groups with lower incomes. However, it is interesting that even after standardization, whites still have the lowest income elasticities—substantially so in many cases. In line with this reasoning, blacks, who have the lowest permanent income, on average, have the highest elasticities—before and after standardization—for all goods and services except recreation and related expenditures, for which Hispanics have the highest elasticity.

Intra-ethnicity comparisons

As noted earlier, several studies exist that examine spending patterns of Hispanics as a whole. However, Hispanics come from a wide range of countries, each with its own cultural variations. This raises an interesting question: Are Hispanics homogenous, as has been presupposed, or are there significant differences within this group that warrant special study? Hispanic consumers are segmented into the following groups by the Consumer Expenditure Survey: Mexican,[37] Puerto Rican, Cuban, Central or South American, and other Spanish.

Demographics. The Mexican segment is by far the largest subgroup within the Hispanic population, accounting for 62 percent of all Hispanic families. The next largest subgroup consists of families from Central or South America (14 percent), followed by Puerto Rico (12 percent), Cuba (5 percent), and other Spanish origin (8 percent). Demographic characteristics between the subgroups vary almost as much as their proportions in the Hispanic population. For example, average family size ranges from 2.4 persons per Cuban family to 3.7 persons per Mexican family. Also, while Cuban families have fewer children under 18 years than Hispanic families in general (0.5 versus 1.3), they also have more than twice as many persons who are 65 years or older than the average Hispanic family (0.5 versus 0.2). The number of persons over age 65 probably explains both the relatively high age of the reference person for Cuban families (55 years) and the fewer number of children. By comparison, the average age of the reference person ranges only from 39 to 43 years for all other Hispanic groups. For the total Hispanic population (including Cubans), the average age of the reference person is about 41 years. (See table 5.)

Differences also exist in the educational attainment level of the reference person. Those from Mexican families are the least educated, on average, while those from other Spanish families are the most educated. More than 3 of 4 Mexican families have a reference person who is not educated beyond the high school level. This compares with only about 2 of 3 Cuban or Puerto Rican families, and about half of all Central or South American

families. Similarly, Mexican families are the least likely to have a reference person who has obtained a college degree—only about 1 in 18 have reached this level of education. For other Hispanic families, the range is between 1 in 9 (Puerto Ricans) and 1 in 4 (other Spanish) reference persons.

Housing tenure also differs among the various Hispanic groups. More than half of Mexicans and Cubans are renters, compared with about two-thirds of Central or South Americans, and nearly the same amount for other Spanish families. Puerto Rican families are the most likely to be renters, with nearly three-fourths of these families renting their home. And even among homeowners, the percentage of those who own their home outright (without a mortgage) varies considerably by group. Only about 10 percent of Central or South American homeowners own their homes outright, compared with 15 percent of Puerto Rican homeowners and 30 to 40 percent of all other Hispanic homeowners. Cuban homeowners are among the most likely (30 percent) to own their homes outright, which is not surprising considering the higher average age of the reference person in these families. It is less clear, on the other hand, why Mexican families—with the lowest permanent income and lower-than-average age of reference person—should have such a high percentage (39 percent) of outright owners.

Despite these differences, the five Hispanic subgroups have surprisingly similar income levels. In fact, when "permanent" incomes (using total expenditures as a proxy) for each group are compared with those for Mexican families (used as a reference group because they are the largest portion of the Hispanic population), only families from Central or South America show a statistically significant difference in income. The largest gap in permanent income is found between Central or South Americans ($28,367) and Puerto Ricans ($23,194), a difference of 22 percent. For perspective, consider that white families ($32,025) have more than 46 percent more in permanent income than black families ($21,951), and black families have less permanent income than Puerto Rican families ($23,194), the Hispanic subgroup with the lowest permanent income.[38] (See tables 3, 5 and 7.)

Family size is another important factor to consider when examining incomes. For example, Puerto Rican families and Central or South American families are of similar size (3.0 and 3.2 persons per family, respectively), yet the latter have much more permanent income to spread among family members. When comparing Puerto Rican and Mexican families the latter have only slightly more permanent income ($970), but also have nearly 1 more person, on average (3.7 members), in their families.[39] Mexican families also have the greatest average number of earners per family (1.6), suggesting that the average earner in a Mexican family earns less than the average earner in other Hispanic families. This may reflect the lower level of educational attainment among Mexican families or other factors that differ across the Hispanic subgroups. (See table 5.)

Table 5.	General characteristics of Hispanics by geographic origin of reference person, 1994–95.					
Characteristic	Total Hispanics	Mexican	Puerto Rican	Cuban	Central or South American	Other Spanish
Sample size	2,940	1,727	331	174	434	274
Consumer units represented:						
Number	7,791,811	4,835,721	897,347	357,584	1,049,660	651,499
Percent	100.0	62.1	11.5	4.6	13.5	8.4
Income before taxes (complete income reporters only)	$27,112	$26,063	$28,332	$28,370	$28,781	$29,703
Age of reference person	41.0	40.1	40.5	54.7	39.2	43.3
Average number in consumer unit:						
Persons under 18 years	1.3	1.5	1.1	.5	1.2	.9
Persons 65 years and older	.2	.2	.2	.5	.1	.2
Earners	1.5	1.6	1.1	1.2	1.5	1.4
Vehicles	1.6	1.8	.9	1.3	1.3	1.5
Automobiles	1.1	1.1	.8	1.1	1.1	1.1
Other vehicles	.5	.7	.1	.2	.2	.4
Housing characteristics:						
Rooms (excluding bedrooms)	4.8	4.8	4.8	4.5	4.7	5.0
Bedrooms	2.4	2.4	2.3	2.1	2.3	2.4
Bathrooms	1.3	1.3	1.2	1.5	1.4	1.3
Half-baths	.1	.1	.1	.1	.2	.2
Percent distribution:						
Housing tenure:						
Homeowner	42.1	48.1	26.2	45.5	30.5	36.5
With mortgage	28.0	29.4	22.4	31.9	27.3	24.7
Without mortgage	14.1	18.7	3.8	13.6	3.2	11.8
Renter	57.9	51.9	73.8	54.5	69.5	63.5
Race of reference person:						
White	95.6	97.9	93.2	94.7	91.5	89.4
Black	3.3	.9	4.9	5.3	7.4	10.4
Other	1.1	1.2	1.9	–	1.1	–
Education of reference person:						
Some high school or less	45.0	52.0	40.8	42.0	34.0	18.6
High school graduate	26.1	25.9	28.7	20.7	23.8	30.4
Some college	18.6	16.4	19.5	18.2	22.6	27.7
College graduate	10.3	5.7	10.9	19.0	19.6	23.3
Family composition:						
Single person	15.8	51.9	19.7	36.2	17.7	25.7
Husband and wife only	10.9	11.6	7.2	17.2	8.1	11.7
Husband and wife, own children only ..	34.1	38.6	27.0	26.1	30.5	20.9
Single parent	11.9	10.4	22.0	2.6	15.4	9.1
Other families	27.3	27.7	24.1	17.9	28.3	32.6
Region:						
Northeast	16.7	.8	67.7	16.0	37.8	30.1
Midwest	7.1	8.3	4.8	.4	6.5	6.0
South	35.6	35.6	24.7	75.4	30.1	37.5
West	40.7	55.3	2.8	8.2	25.7	26.3
Degree urbanization:						
Urban	98.3	98.2	98.2	100.0	99.2	96.8
Rural	1.7	1.8	1.8	–	.8	3.2
Working status of reference person:						
Wage or salary earner	72.1	76.3	57.8	63.6	71.1	66.7
Self-employed	3.8	3.8	2.1	2.0	6.5	3.0
Retired	8.6	9.0	6.6	22.6	3.4	9.1
Other not working	15.5	10.9	33.6	11.8	19.0	21.2

NOTE: Dash indicates no data were reported.

Aggregate shares. Table 6 shows the share of the Hispanic population and the share of total Hispanic spending accounted for by each subgroup. In general, the subgroups spend consistently with their share of the population. For example, Cubans account for 5 percent of Hispanic families and 5 percent of Hispanic expenditures. Spending for public transportation, however—one of only two expenditure categories (the other being food at home) for which Hispanics in general account for a larger share of spending than their population would suggest—varies considerably by subgroup. For example, Mexican families account for more than three-fifths of Hispanic families, but only one-fourth of Hispanic expenditures for public transportation. Other Spanish families, which make up about 8 percent of Hispanic families, account for roughly the same proportion of Hispanic expenditures on public transportation. Finally, families from Central or South America account for nearly 31 percent of Hispanic spending on public transportation,

more than twice their share of the Hispanic population (less than 14 percent).

Recreation and related expenditures showed the most divergence in its subcomponents. Mexican families, for example, spend considerably less than their population share on other lodging (such as hotels and vacation homes) and transportation on trips, while Puerto Rican, Central or South American, and other Spanish families spend considerably more for these expenditures. For entertainment expenditures, Mexican families are slightly underrepresented, accounting for 59 percent of Hispanic entertainment expenditures, although they make up 62 percent of Hispanic consumer units. Other Spanish families, by contrast, are overrepresented in this category, accounting for 11 percent of entertainment expenditures, but only 8 percent of Hispanic consumer units. Interestingly, expenditures for food away from home closely match population shares for each of the Hispanic subgroups.

Finally, there also are differences in expenditures for health

Table 6.	Aggregate expenditure shares for Hispanics by geographic origin, 1994–95					
	Expenditures [In billions of dollars]	Expenditure share [In percent]				
Expenditure category	Total Hispanics	Mexican	Puerto Rican	Cuban	Central or South American	Other Spanish
Consumer units:						
Number	7,791,811	4,835,721	897,347	357,584	1,049,660	651,499
Percent of total Hispanics	100.0	62.1	11.5	4.6	13.5	8.4
Total expenditures	$194.1	$60.2	$10.7	4.6	15.3	9.1
Food at home	29.3	63.8	12.4	4.3	13.9	8.5
Housing (less trips)	64.9	57.9	11.8	4.4	17.1	8.8
Shelter and utilities	56.2	57.2	12.0	4.2	17.7	8.9
Other housing	8.6	62.1	10.8	5.4	13.1	8.5
Apparel and services	9.7	64.3	10.4	3.1	13.7	8.5
Transportation (less trips)	36.1	65.3	7.3	4.2	14.0	9.1
Private	35.2	66.3	7.0	4.2	13.6	8.9
Public (less trips)	.9	27.2	20.3	5.8	30.5	16.3
Health care	7.5	60.9	10.0	6.1	14.2	8.8
Health insurance	3.7	61.3	12.2	7.8	9.0	9.6
Medical services	3.0	60.9	6.4	3.6	21.3	7.6
Prescription drugs	.6	59.7	11.8	7.8	10.6	9.6
Medical supplies	.2	55.4	15.2	5.1	15.9	8.4
Recreation and related expenditures	17.3	57.3	11.3	5.4	15.9	10.2
Food away from home	7.0	60.3	9.5	5.4	16.5	8.4
Entertainment	7.3	58.9	11.4	5.2	13.7	10.8
Reading	.6	50.5	13.7	5.5	18.5	12.5
Transportation (on trips)	1.5	42.8	15.6	6.1	21.0	14.3
Other lodging	1.0	49.4	14.9	6.0	18.3	11.3
Other	29.3	58.6	10.8	5.6	15.0	9.9
Alcohol	1.4	65.8	6.8	5.6	14.6	7.3
Tobacco and smoking supplies	1.1	52.2	23.6	4.0	9.6	10.6
Education	2.2	39.6	17.7	7.1	26.6	8.8
Personal care	1.6	55.8	10.6	7.5	16.9	9.4
Cash contributions	3.3	58.0	8.4	10.3	13.4	9.8
Personal Insurance	15.7	59.3	10.4	4.5	14.6	11.2
Miscellaneous	4.0	66.8	8.6	5.4	12.4	6.8

insurance among the Hispanic subgroups. An earlier study by the author and Elizabeth M. Dietz found that Hispanics in general are less likely to be insured than blacks or whites—a finding supported by table 2, which shows that Hispanics account for almost 8 percent of the population, but less than 5 percent of health insurance expenditures. But even within the Hispanic community, health insurance expenditures appear to vary. For example, Cubans are the most overrepresented group in health insurance expenditures. Making up 5 percent of the Hispanic population, they account for 8 percent of health insurance expenditures (the opposite of Hispanics in the population as a whole). Other Spanish families account for more than 8 percent of the Hispanic population and almost 10 percent of Hispanic health insurance expenditures. Mexican and Puerto Rican families have population shares within 1 percentage point of their expenditure shares, while Central and South American families are underrepresented—accounting for 14 percent of the Hispanic population but only 9 percent of Hispanic health insurance expenditures.

Expenditure shares. Although levels of expenditures are shown for convenience in table 6, it is again more useful to compare shares, especially when total expenditures are so similar, at least in statistical terms. Differences in shares make clear how the overall budget is allocated differently, and if income differences are not statistically significant, the shares can be particularly revealing because shares are more likely to differ for reasons of tastes or other factors.

As table 7 shows, when comparing across Hispanic subgroups, Engel's proposition appears to hold more readily than it did in earlier comparisons. For example, Central or South American and other Spanish families have the highest permanent incomes and the smallest shares (14 percent) allocated to food at home Puerto Rican and Mexican families have the lowest incomes, and the largest shares for food at home (18 and 16 percent, respectively). Although Cuban families have lower incomes than other Spanish families, they each allocate the same share (14 percent) to food at home. This is probably because Cubans, on average, also have fewer family members (2.4) than other Spanish families (2.8). Similarly, housing expenditure shares are about one-third of total expenditures for all families, ranging from less than 32 percent (among Cubans) to more than 37 percent (among Central or South Americans). Expenditure shares for apparel and services are about 5 percent of total expenditures for all Hispanic families, except those from Cuba, whose share is 3 percent—again probably due to smaller families and perhaps to older reference persons.[40]

Regression analysis for Hispanic subgroups

Background. Although there is more homogeneity among the Hispanic subgroups than among the ethnic groups com-

pared earlier, there still are substantial differences in demographics that may account for differences in tastes and preferences. To be certain that it is truly geographic origin and not age, family size, or other factors that somehow influence expenditures, regression analysis again is undertaken.

The regressions in this section are similar to those used earlier—that is, total quarterly expenditures are used as a proxy for permanent income, the dependent variables and the income variables are subjected to Box-Cox transformations,[41] and so forth. The specification of the model, however, is slightly different, as follows:

$$Y^* = \alpha_m + \sum \alpha_i D_i + \beta_m I + \sum \beta_i D_i I + \beta_j X_j + e$$

where
Y^* is the (Box-Cox transformation of the) dependent variable;

α_m is the intercept of the regression equation;

α_i are parameter estimates;

D_i are dummy variables describing geographic origin for non-Mexican Hispanics;

β_m, β_i are parameter estimates for the income variable;

I is permanent income (transformed);

β_j is a vector of parameter estimates for various independent variables;

X_j is a vector of independent variables; and

e is the error of the regression.

The main difference here from the earlier specification is that only the intercept and income variables are interacted with ethnic background, whereas all variables (age, family size, and so on) were interacted with ethnicity earlier. The difference is primarily due to degrees of freedom. In the earlier part of the article, there were sufficient observations in each ethnicity to run separate regressions for each group had that been the goal. This specification, however, allows relationships for all variables to differ by ethnicity and permits statistical tests to be taken to ascertain whether or not observed differences are statistically significant. (For example, the results can be used to ascertain whether there are different spending patterns by ethnic background in the Northeast.)

But when dividing Hispanics into subcomponents, some groups (particularly Cubans) have sufficient sample for the regressions to be computed in a technical sense, but the sample is not large enough to draw inferences about differences by the multiple independent variables tested. In other words, given a large sample, statistically significant differences might be found between Cubans living in the Midwest compared with Mexicans living in the Midwest. But because there are few observations for Cubans living in the Midwest, it is unlikely that a statistically significant difference will be found for these groups, even if the test is conducted appropri-

Table 7. Average annual expenditures and expenditure shares for Hispanics by geographic origin, 1994–95

Expenditure category	Expenditures [in billions of dollars]						Expenditure shares [in percent]					
	Total Hispanics	Mexican	Puerto Rican	Cuban	Central or South American	Other Spanish	Total Hispanics	Mexican	Puerto Rican	Cuban	Central or South American	Other Spanish
Number of consumer units	7,791,811	4,835,721	897,347	357,584	1,049,660	651,499	(1)	(1)	(1)	(1)	(1)	(1)
Total expenditures (billions of dollars) ...	$24,911	$24,164	$23,194	$25,127	$28,367	$27,127	100.0	100.7	100.1	100.1	100.1	100.0
Food at home	3,761	3,868	4,052	3,535	3,884	3,839	15.1	16.0	17.5	14.1	13.7	14.2
Housing (less trips) .	8,325	7,764	8,533	7,953	10,584	8,770	33.4	32.1	36.8	31.7	37.3	32.3
Shelter and utilities	7,216	6,653	7,489	6,651	9,505	7,642	29.0	27.5	32.3	26.5	33.5	28.2
Other housing	1,110	1,111	1,045	1,301	1,080	1,128	4.5	4.6	4.5	5.2	3.8	4.2
Apparel and services	1,246	1,291	1,125	848	1,264	1,263	5.0	5.3	4.9	3.4	4.5	4.7
Transportation (less trips)	4,632	4,875	2,950	4,264	4,813	5,058	18.6	20.2	12.7	17.0	17.0	18.6
Private	4,518	4,825	2,749	4,122	4,555	4,836	18.1	20.0	11.9	16.4	16.1	17.8
Public (less trips) ..	114	50	201	143	258	222	.5	.2	.9	.6	.9	.8
Health care	966	948	838	1,287	1,019	1,014	3.9	3.9	3.6	5.1	3.6	3.7
Health insurance ..	480	474	509	818	322	552	1.9	2.0	2.2	3.3	1.1	2.0
Medical services ..	380	373	211	302	602	344	1.5	1.5	.9	1.2	2.1	1.3
Prescription drugs	79	76	81	135	62							
Medical supplies ...	28	25	37	31	33	28	.1	.1	.2	.1	.1	.1
Recreation and related expenditures	2,219	2,047	2,170	2,617	2,613	2,712	8.9	8.5	9.4	10.4	9.2	10.0
Food away from home	894	869	740	1,055	1,092	893	3.6	3.6	3.2	4.2	3.8	3.3
Entertainment	937	889	924	1,058	955	1,215	3.8	3.7	4.0	4.2	3.4	4.5
Reading	75	61	89	90	103	112	.3	.3	.4	.4	.4	.4
Transportation (on trips)	190	131	258	254	296	325	.8	.5	1.1	1.0	1.0	1.2
Other lodging	123	98	159	161	167	166	.5	.4	.7	.6	.6	.6
Other	3,762	3,553	3,528	4,624	4,190	4,471	15.1	14.7	15.2	18.4	14.8	16.5
Alcohol	182	193	108	223	197	159	.7	.8	.5	.9	.7	.6
Tobacco and smoking supplies	145	122	297	126	103	183	.6	.5	1.3	.5	.4	.7
Education	276	176	423	430	545	292	1.1	.7	1.8	1.7	1.9	1.1
Personal care	207	186	191	339	260	233	.8	.8	.8	1.3	.9	.9
Cash contributions	426	398	311	955	425	499	1.7	1.6	1.3	3.8	1.5	1.8
Personal insurance	2,013	1,925	1,815	1,953	2,188	2,686	8.1	8.0	7.8	7.8	7.7	9.9
Miscellaneous	513	552	383	599	472	419	2.1	2.3	1.7	2.4	1.7	1.5

[1] Not applicable.

ately. Therefore, the two most important variables are chosen for examination. The importance of the income effect was discussed earlier. The intercept is allowed to vary by group to capture any intracharacteristic variation that may be present among variables other than income.

Similar to the regressions in the first part of the article, there is only one control group. Because Mexicans are the largest segment of the Hispanic population, it is with refer-ence to them that statistically significant differences are ex-amined. While it is possible to test each group against each of the others (for example, are there statistically significant dif-ferences between Cubans and Puerto Ricans?), such compari-sons would be cumbersome with five groups. Because the main point of this section is to test whether Hispanics are ho-mogeneous or not, if at least one group shows a statistically significant difference from Mexicans, this is sufficient to prove

the point that Hispanics are not homogeneous, at least with respect to that expenditure category.

Results. Table 8 shows the results of the regressions in standardized form. The standardized figures use average expenditures and permanent income from all Hispanic families. As expected, the data show that there are differences across groups for some expenditures when the data are evaluated at the mean of each expenditure and the mean permanent income for each of those groups. More surprising is that standardization does little to change the MPC or elasticity for most of the expenditures under study. As before, standardization allows one to test whether the differences in the groups are due to underlying tastes or differences in levels of income and expenditure. If the parameter estimate for the permanent income variable differs significantly from the parameter estimate for Mexican families, the standardized results for the group in question are interpreted to mean that there are differences between Hispanic subgroups. For convenience, only standardized results are discussed below.

Mexican and Cuban families have the most similar expenditure patterns—the differences in their income parameter estimates are not statistically significant for any of the goods and services tested, at least not at the 95-percent confidence level. (The parameter estimates for transportation and recreation and related expenditures are significant only at the 90-percent level.) Similarly, the income parameter estimate for other Spanish families is significant only for transportation. Puerto Rican families have significantly different income parameter estimates for food at home, shelter and utilities, and transportation. (The estimate in the apparel model is significant at the 90-percent confidence level.) Central or South American families differ significantly only for food at home and shelter and utilities.

Food at home shows substantial variation in both MPC and elasticity. The MPC's range from 0.034 (Mexican) to 0.061 (Central or South American), while the elasticities range from 0.161 (Mexican) to 0.407 (Central or South American). However, regardless of geographic origin, food at home has the lowest income elasticity of any of the goods and services tested. Similarly, the shelter and utilities category has a relatively low elasticity regardless of geographic origin.

Transportation expenditures differ significantly, at least for some of the groups. The lowest elasticity (0.902) is for other Spanish families; the highest (2.081) is for Puerto Rican families. Both of these elasticities differ from those of Mexican families (1.444) at statistically significant levels. Transportation is the only item tested that spans the range of necessity (for other Spanish) to luxury (for all others) in a statistically significant way; the range in elasticities is wider

Table 8. Average annualized expenditures, marginal propensities to consume, and income elasticities for selected goods and services, standardized using averages for all Hispanics

Expenditure category	Mexican	Puerto Rican	Cuban	Central or South American	Other Spanish
Total expenditures	$24,911	$24,911	$24,911	$24,911	$24,911
Food at home:					
Expenditure level	$3,761	$3,761	$3,761	$3,761	$3,761
Marginal propensity to consume	[1].034	[2].055	.045	[2].061	.038
Elasticity	[1].161	[2].362	.300	[2].407	.252
Shelter and utilities:					
Expenditure level	$7,216	$7,216	$7,216	$7,216	$7,216
Marginal propensity to consume	[1].145	[2].189	.120	[2].184	.154
Elasticity	[1].501	[2].654	.416	[2].634	.530
Apparel and services:[2]					
Expenditure level	$1,246	$1,246	$1,246	$1,246	$1,246
Marginal propensity to consume	[1].073	.093	.049	.069	.086
Elasticity	[1]1.467	1.861	.975	1.372	1.726
Transportation:					
Expenditure level	$4,632	$4,632	$4,632	$4,632	$4,632
Marginal propensity to consume	[1].269	[2].387	.340	.254	[2].168
Elasticity	[1]1.444	[2]2.081	1.828	1.365	[2].902
Recreation and related expenditures:					
Expenditure level	$2,219	$2,219	$2,219	$2,219	$2,219
Marginal propensity to consume	[1].144	.159	.183	.142	.150
Elasticity	[1]1.618	1.789	2.049	1.597	1.686

[1] The Hispanic income parameter estimate used to calculate this item differs from 0 at the 99-percent confidence level.

[2] The income parameter estimate used to calculate this item differs from the Hispanic income parameter at the 95-percent confidence level.

than for any other group. Also, the elasticity of 2.081 for Puerto Rican families is greater than any other elasticity for any other good or service tested, including recreation and related services.

Finally, for apparel and services, no group has an income parameter estimate that differs in a statistically significant way from that which is found for Mexican families (although Puerto Rican and other Spanish families appear to have larger elasticities than Mexican families, and Central or South American and Cuban families appear to have lower elasticities). Also, elasticities for Cuban families are estimated to be less than 1, indicating that apparel and services are necessities, not luxuries, for these families. (See table 8.)

Summary and conclusions

Most economists probably would agree that three demographic characteristics, more than any others, explain expenditure patterns: income, family size, and age. Yet, even if these factors are identical, spending patterns will differ across families because each family has different tastes and preferences. Identifying variables that influence tastes and preferences is the first step to understanding the variation in spending patterns by different families. Clearly, the results of this study show that ethnicity is a factor that influences tastes and preferences.

The Hispanic ethnic group is becoming increasingly important in both its proportion of the population and its share of total consumer spending. In the first part of this article, Hispanic families are compared with white and black families. The relationships of expenditures to nonethnic demographic characteristics are examined for each of the three groups. At first, Hispanics appear to have more in common with blacks than with whites—for example, there were no statistically significant differences between the two groups in the share of total expenditures allocated to the major expenditure categories (food at home, housing, apparel, transportation, health care, recreation and related expenditures, or other expenditures); also, Hispanics and whites have statistically significant differences in their shares for all categories except transportation. However, this does not take into account that blacks and Hispanics have lower incomes, on average, than whites. It also does not take into account other demographic differences—specifically, that Hispanics have the largest families and the youngest reference persons, on average.

To control for these differences in basic demographic composition of the groups, regression analysis was performed. Marginal propensities to consume and income elasticities for different expenditure categories by ethnic background are estimated from these analyses. Each of these factors is estimated first to represent the average family in each group, and second to represent how the average family in each group would react if income and expenditures for all items were held constant. Even after such standardization, Hispanics are sometimes more similar to whites, sometimes more similar to blacks, and sometimes in the middle of the two groups. The evidence seems to suggest, therefore, that ethnic differences do affect tastes and, hence, should be accounted for in analysis.

Given that ethnicity is related to tastes, is it still reasonable to assume that Hispanics as a group are homogeneous, even though they come from a variety of geographic backgrounds? In order to test this hypothesis, Hispanics were divided into five groups, based on area of origin: Mexican, Puerto Rican, Cuban, Central or South American, and other Spanish. Analyses similar to those described earlier were then performed, this time with Mexican families serving as the reference group. Again, even when results are standardized by income and expenditure levels, many differences exist in expenditure patterns across the Hispanic subgroups.[42] □

Footnotes

[1] *Statistical Absract of the United States: 1996* (Bureau of the Census, 1996), table 19.

[2] For examples, see Mark Lino, "Income and spending patterns of single-mother families," *Monthly Labor Review*, May 1994, pp. 29–37; Geoffrey D. Paulin and Wolf D. Weber, "The effects of health insurance on consumer spending," *Monthly Labor Review*, March 1995, pp. 34–54; Geoffrey D. Paulin and Elizabeth M. Dietz, "Health insurance coverage for families with children," *Monthly Labor Review*, August 1995, pp. 13–23; and Geoffrey D. Paulin, "Health Insurance Coverage for Low-Income Families: Findings from the Consumer Expenditure Survey," *Advancing the Consumer Interest*, fall 1996, pp. 20–32. The lat-

ter article includes results of regressions, the equations for which include ethnic dummy variables. However, the coefficients for the ethnic variables are not shown.

[3] Scott Koslow, Prem N. Shamdasani, and Ellen E. Touchstone, "Exploring Language Effects in Ethnic Advertising: A Sociolinguistic Perspective," *Journal of Consumer Research*, March 1994, pp. 575–85.

[4] Lisa Peñaloza, "Border Crossings: A Critical Ethnographic Exploration of the Consumer Acculturation of Mexican Immigrants," *Journal of Consumer Research*, June 1994, pp. 32–54; and Cynthia Webster, "Effects of Hispanic Ethnic Identification on Marital Roles in the Purchase Decision Process," *Journal of Consumer Research*, September 1994, pp. 319–31.

[5] Jessie X. Fan and Virginia Solis Zuiker, "Budget Allocation Patterns of Hispanic versus Non-Hispanic White Households," *Consumer Interests An-*

nual, 1994, pp. 89–96; a more extensive version of the article has been accepted for publication in *Journal of Family and Economic Issues*, forthcoming. Also see Janet Wagner and Horacio Soberon-Ferrer, "The Effect of Ethnicity on Selected Household Expenditures," *The Social Science Journal*, February 1990, pp. 181–98.

[6] Peter Cattan, "The diversity of Hispanics in the U.S. work force." *Monthly Labor Review*, August 1993, pp. 3–15.

[7] José F. Medina, Joel Saegert, and Alicia Gresham, "Comparison of Mexican-American and Anglo-American Attitudes Toward Money," *Journal of Consumer Affairs*, summer 1996, pp. 124–45.

[8] See Fan and Zuiker, "Budget Allocation Patterns"; and Wagner and Soberon-Ferrer, "Effect of Ethnicity."

[9] See Peñaloza, "Border Crossings." The author conducts an interesting study to answer this question, relying on personal observations of 23 Mexican immigrants from 14 households. Despite her name and heritage, however, Peñaloza's "Anglo" appearance and inability to speak Spanish well made it difficult for her to ensure the trust and participation of her respondents. She had to "prove [her] intentions were earnest, which [she] did by sustained contact, focused interest, and by doing things for the informants, such as providing transportation and translations." As she gained trust, she was able to observe respondents during their daily routines, an experience she found both "challenging and rewarding."

[10] See Medina and others, "Attitudes Toward Money," pp. 137–38.

[11] See Cattan, "Diversity of Hispanics."

[12] See Fan and Zuiker, "Budget Allocation Patterns," and Wagner and Soberon-Ferrer, "Effect of Ethnicity."

[13] See Webster, "Effects of Hispanic Ethnic Identification," footnote 1.

[14] See Fan and Zuiker, "Budget Allocation Patterns," p. 89.

[15] See Wagner and Soberon-Ferrer, "Effect of Ethnicity."

[16] See Webster, "Effects of Hispanic Ethnic Identification"; Peñaloza, "Border Crossings"; and Medina and others, "Attitudes Toward Money."

[17] Koslow and others, "Exploring Language Effects," p. 580.

[18] The Interview survey data break down ethnicity for those of Mexican origin into Mexican, Mexican-American, and Chicano. However, the Cattan model (grouping these together as persons of Mexican origin) is used here instead of that of Koslow and others (making distinctions based on degree of "ethnic identification" with the United States). This choice is made both for practical considerations (the approach of Koslow and others adds to the number of potential comparisons, thus yielding smaller sample sizes and making the comparisons more cumbersome) and due to theoretical assumptions (it is assumed that spending patterns are not vastly different for these three groups). Furthermore, there are no other measures of "ethnic identity" for the other Hispanic groups—only for geographic origin. Hence, the term "Mexican" is used here to indicate geographic origin.

[19] In "Effect of Ethnicity," Wagner and Soberon-Ferrer examine Interview survey data from 1980–81; in "Budget Allocation Patterns," Fan and Zuiker examine Interview survey data from 1980 to 1990.

[20] A report describing the 1992–93 survey results indicates that the "Interview survey collects detailed data on an estimated 60 to 70 percent of total household expenditures. In addition, global estimates—that is, expense patterns for a 3-month period—are obtained for food and other selected items. These global estimates account for an additional 20 to 25 percent of total expenditures." See *Consumer Expenditure Survey 1992–93*, Bulletin 2462 (Bureau of Labor Statistics, September 1995), p. 231.

[21] The reference person is the first person the respondent names when asked to "Start with the name of the person or one of the persons who owns or rents this home." It is with respect to this person that the relationship of other members of the consumer unit is determined.

[22] As used here, the Hispanic group includes the following subgroups: Mexican American, Chicano, Mexican, Puerto Rican, Cuban, Central or South American, and other Spanish.

[23] The following categories are classified here as non-Hispanic: German, Italian, Irish, French, Polish, Russian, English, Scottish, Afro-American, Dutch, Swedish, Hungarian, other, and "do not know."

[24] Other races include American Indian, Aleut, Eskimo, Asian or Pacific Islander, and other.

[25] Because the focus of this study is expenditure patterns by *ethnicity* (specifically Hispanics), it may seem curious that the data are defined, in part, based on *race* as well as ethnicity. This reflects the standards used by U.S. statistical agencies as specified by the Office of Management and Budget. See "Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity," *Federal Register*, Oct. 30, 1997, pp. 58781–90. Also, because Hispanics are overwhelmingly white by race (see table 1), no attempt is made to control for racial differences among Hispanics in this study.

[26] Results include complete reporters only. In general, complete income reporters are those families that provide values for at least one major source of income, such as wages and salaries, self-employment income, or Social Security income. However, even complete income reporters may not have provided a full accounting of all income from all sources.

[27] The Consumer Expenditure Survey defines children as the offspring— by birth, adoption, or other legal arrangement—of the reference person and spouse, if present. However, this means that grandparents raising grandchildren and other similar consumer units are not technically defined as having children, even though these persons are under 18. In this study, children are defined as persons under the age of 18, although it is possible that persons 18 years and older are still living with parents or that persons under 18 could, in unusual circumstances (college students who are under 18, for example), be the reference person. It is assumed that, although parents may still be providing support for some, persons under the age of 18 have different needs than those 18 years and older, so family expenditure patterns will differ by age of persons present more so than by the relationship of these persons to the reference person.

[28] Conservative estimates from the Bureau of the Census suggest that Hispanics accounted for more than one-fourth of all immigrants in 1994, with the following breakdown by geographic origin: Mexico (111,400), Cuba (14,700), Central America (39,900), South America (excluding Brazil and Guyana, 35,200), and Spain (1,400). Note that countries like the Dominican Republic, which accounted for 51,200 Hispanic immigrants in 1994, are not included in this estimate because it is assumed that immigrants from such areas would define themselves as being of "other Spanish" origin. Also, Brazil and Guyana are omitted because only persons from *Spanish*-speaking countries in Central or South America are considered Hispanic. And because Puerto Rico is technically part of the United States, persons moving from Puerto Rico to the U.S. mainland are not considered immigrants. Also, in 1994, Hispanic immigrants accounted for about 0.8 percent of the resident Hispanic population; non-Hispanic immigrants accounted for 0.2 percent of the resident non-Hispanic population. (See *Statistical Abstract*, tables 8 and 12.)

[29] The annualized aggregate expenditures are obtained by finding average expenditures per family in each ethnic group for the 3 months for which they report their expenditures. These 3-month average figures are then multiplied by 4 to "annualize" them, and this figure is multiplied by the total number of consumer units in each group. For example, table 1 shows that there were 7,791,811 Hispanic consumer units in the population during the study period. Table 3 shows that the average annualized expenditure for food at home is $3,761. Multiplying 7,791,811 by $3,761 yields approximately $29.3 billion, as shown in table 2.

[30] Graham Bannock, Ron Baxter, and R. Rees, *A Dictionary of Economics* (Middlesex, Harmondsworth, Penguin Books Ltd., 1972), p. 140.

[31] Milton Friedman, *A Theory of the Consumption Function* (Princeton, NJ, Princeton University Press for National Bureau of Economic Research, 1957), p. 221.

[32] Recent studies using total expenditures as a proxy for permanent income include Julie Nelson, "Individual Consumption Within the Household: A study of Expenditure on Clothing," *Journal of Consumer Affairs,* summer 1989, pp. 21–43; E. Raphael Branch, "Short Run Income Elasticity of Demand for Residential Electricity Using Consumer Expenditure Survey Data," *The Energy Journal,* 1993, pp. 111–21; and Geoffrey Paulin, "A Comparison of Consumer Expenditures by Housing Tenure," *Journal of Consumer Affairs,* summer 1995. A version that includes an analysis of condominium owners is available from the Bureau of Labor Statistics, Division of Consumer Expenditure Surveys (Working Paper 249, December 1993).

[33] In this way, the "other" category is omitted. Although it accounts for more than 5 percent of the budget, it is not clear what kinds of intracategory substitutions would be made with respect to changes in income or other characteristics, so the regression of other expenditures on characteristics leads to results that are at best unclear and at worst meaningless.

[34] There are slightly fewer degrees of freedom for the housing regressions because variables related to size of dwelling are occasionally missing in the Consumer Expenditure Survey data. Because there are few missing values and the pattern is presumed to be random, however, the analysis should not be detrimentally affected.

[35] Suppose, for example, that one family usually earns $20,000 per year, and another one usually earns $15,000 per year, but for some reason, the latter family unexpectedly received an additional $5,000 in income during the past year. Even though both families earned $20,000 in current income, they probably would have different spending patterns due to different permanent incomes.

[36] For a detailed discussion of complete and incomplete reporters and plans to impute missing incomes, see Geoffrey D. Paulin and David L. Ferraro "Imputing income in the Consumer Expenditure Survey," *Monthly Labor Review*, December 1994, pp. 23–31.

[37] The Mexican subgroup includes reference persons describing their ethnicity as Mexican American, Chicano, or Mexican.

[38] See table 8 for total expenditures (permanent income) for each of the Hispanic subgroups.

[39] Because Mexican families have, on average, 0.4 more children than other Hispanic families, while also having the same number of persons over 65, it would appear equally likely that the extra person is either a child or another adult aged 18 to 64.

[40] According to the Interview survey results for the total population in 1994, families whose reference person was 65 years or older were less likely to buy apparel than those who reference person was under the age of 65. Only 73 percent of the former group reported purchases, compared with 85 percent of all consumer units (regardless of age). Similarly, only 72 percent of families whose reference person was retired reported expenditures for apparel in 1994. (Retired persons presumably make fewer purchases of business attire items, for example.) Thus, the fact that Cuban families are more likely to have reference persons who are 65 years and older may help explain why they report lower apparel expenditures, on average.

[41] The values of λ for each expenditure in this section are unchanged from their values in the earlier portion of this article.

[42] Reprints of this article with additional regression results are available from the author at the Bureau of Labor Statistics, Division of Consumer Expenditure Survey, Room 3985, Washington, DC 20212; telephone: (202) 606-6900; or from the *Monthly Labor Review* at the address listed on cover two.

Appendix: Notes on methodology

Box-Cox transformations.   The two most important variables (aside from ethnicity) considered in this article are expenditures and income. However, neither of these is often found to have a normal distribution, a problem that can cause biased regression results.[1] One solution is to transform these data so that they are approximately normally distributed. One method that has been used with expenditure data is the Box-Cox transformation.[2] Perhaps the most frequently cited version is

$$Y^* = (Y^{\lambda} - 1)/\lambda$$

where

Y^* is the transformed version of the variable

Y is expenditures for a specific good or service (food at home or apparel, for example)

λ is a parameter.

This version of the equation is most useful in demonstrating two special cases for the value of λ. That is, if λ is equal to 1, then no transformation of the independent variable is necessary.[3] If λ approaches zero, then Y^* is approximately equal to the natural logarithm of Y.

Although this specification is useful for deriving the value of Y^* when λ approaches zero, it does not yield an intuitive interpretation when λ takes on any other value. However, Box and Cox point out that their equation can be simplified to

$$Y^* = Y^{\lambda}$$

This leads to a simple interpretation of both λ and the equation as a whole. For example, if λ is found to be ½, then the transformed variable is simply the square root of Y. In the regression, then, each value of the dependent value is replaced by its square root, and the regression is performed in the usual way. (Note that at least for the special case where λ equals 1, it is even easier to see that no transformation is necessary; Y^* equals Y in this case.)

The obvious question raised is how one calculates the value of λ. Conventionally, this is done by trial and error. Several values for λ are used, and whichever one yields the model with the lowest mean square error is the selected value. However, this method is extremely time consuming, and nearly impossible when one considers that there are two variables (expenditures and income) that are being transformed. In this study, λ is estimated through a maximum likelihood procedure described by Stuart Scott and Daniel J. Rope, who specifically study transformations of Consumer Expenditure Survey data.[4] The results of this procedure are shown below:

Expenditure	Optimal value for λ
Food at home	0.250
Shelter and utilities	.250
Apparel and services	.125
Transportation (less trips)	.000
Recreation and related expenditures	.125
Health care	.125

Marginal propensity to consume.   One of the most important results that can be derived from the regressions presented is the marginal propensity to consume (MPC). This term is defined as the percentage of an additional dollar the family would spend on a specific good if given an additional dollar. The MPC is equal to the slope of the Engel curve (that is, expenditures as a function of income for each good or service) and is a critical component of elasticity; each of the elasticities shown in table 5 is derived from the marginal propensity to consume the same good.

It is also important to point out that the MPC can be derived in two ways. First, it can be derived for the average family in each ethnic group. These are shown in table 5 as the unadjusted MPC's. In other words, to compute the MPC for food at home for Hispanics, income and food expenditures for the average Hispanic family are used. However, these results by themselves do not tell the whole story; that is, how much of the difference in MPC is attributable to underlying differences across ethnic groups, and how much is attributable to differences in income and expenditures by ethnic groups? To answer this important question, the standardized MPC's are also presented. That is, the MPC is recalculated for each ethnic group, for a hypothetical family in that group whose income and food at home expenditures happen to match the all-consumer-unit averages. When these factors are held constant, the differences must be due to tastes or other factors captured in the income parameter estimate. An example of the calculation of the unadjusted and standardized MPC is shown subsequently.

In cases where the Engel curve is specified in linear terms, the MPC is constant and is equal to the value of the parameter estimate associated with income. It is estimated through the following regression equation:[5]

$Y = a + bI + e$

where

Y is expenditure for the good in question

a is the intercept

b is a parameter estimate

I is permanent income

e is the error term.

Using calculus, one can see that

$\partial Y/\partial I = b,$

and so b is equal to the MPC.

However, in the text, the Engel curves are not specified as a linear function. In all cases except transportation (described below), they are specified as

$Y^{\lambda} = a + b\ln I + e$

where

λ is a parameter estimated with a maximum likelihood procedure described in the text.

While it is still appropriate to use calculus to find the first derivative of the equation, the chain rule is now needed because Y is a function of λ. Therefore, we make the substitution

$U = Y^{\lambda}$

and so

$\partial U/\partial I = \partial U/\partial Y * \partial Y/\partial I$

$\partial U/\partial Y = \lambda Y^{\lambda-1};$

$\partial(a + b\ln I + e)/\partial I = b/I;$

therefore,

$\partial U/\partial I = \lambda Y^{\lambda-1} * \partial Y/\partial I = b/I$

$\partial Y/\partial I = b/(I\lambda Y^{\lambda-1})$

and because $0 < \lambda < 1$ in these cases,

$\partial Y/\partial I = bY^{1-\lambda}/\lambda I$

Because the MPC ($\partial Y/\partial I$) is related to levels of expenditure and income, average values are used to evaluate the MPC as described in the text.

As noted earlier, the one exception is transportation. In this special case, the optimal value of λ is found to be zero. From the original Box-Cox formula,

$Y^* = (Y^{\lambda} - 1)/\lambda$

it can be shown that as λ approaches zero, Y^* approaches the natural logarithm of Y.[6] In this case, then, the Engel curve is specified as

$\ln(Y) = a + b\ln I + e$

and so

$\partial U/\partial I = \partial U/\partial Y * \partial Y/\partial I$

$\partial U/\partial Y = 1/Y;$

$\partial(a + b\ln I + e)/\partial I = b/I;$

therefore,

$\partial U/\partial I = (1/Y)*\partial Y/\partial I = b/I$

$\partial Y/\partial I = b*(Y/I)$

Given these equations, calculating the actual value of the MPC is not difficult, but care must be taken to get the correct value for b. In the case of Hispanics, the appropriate value for b is shown in the regression equation—that is, it is the parameter estimate associated with income. However, for the average white family, the proper value of b is found by summing the income parameter shown for Hispanics with the income parameter shown for whites. (The reasons are described in the text.) Note that b is used to calculate MPC in both the standardized and unstandardized cases. If the parameter estimate for white families is statistically significant, Hispanics and whites have different MPCs.[7] Therefore, even given the same income and food-at-home expenditure levels, Hispanics and whites are predicted to allocate an additional dollar of income differently.

Income elasticity. Another important value that can be computed using the regression results is the income elasticity of each expenditure category. Income elasticity (often symbolized by the Greek letter η) is defined as the percent change in an expenditure given a 1-percent change in income. (For convenience, the income change is assumed to be positive throughout this analysis.) Most goods and services have a positive income elasticity—that is, a 1-percent increase in income yields an increase in expenditures for most goods and services. If the income elasticity is greater than 0 but less than 1, the good is considered "inelastic" because it is not very responsive to income changes. For example, an income elasticity of 0.5 indicates that a 1-percent increase in income is associated with an increase of 0.5 percent in expenditures. However, if the elasticity is greater than 1, the good or service is called "elastic" because it is more responsive to these changes. Income inelastic goods are also frequently called "necessities," and income elastic goods and services are often called "luxuries." (Goods and services with negative income elasticities are called "inferior" goods because an increase in income is associated with a *decrease* in expenditures for these items; however, no inferior goods are found in this analysis.) As usual, total expenditures are used as a proxy for permanent income here.

Once the MPC is found, the income elasticity is easily calculated. Its value is simply the MPC multiplied by the inverse expenditure share, or

$\eta = \partial Y/\partial I * I/Y$

For the cases where λ is greater than zero, the formula becomes

$\eta = (bY^{1-\lambda}/\lambda I)*I/Y = bY^{-\lambda}/\lambda = b/\lambda Y^{\lambda}$

where Y is the average expenditure either for the ethnic group or for

all consumer units, depending on whether the unadjusted or standardized elasticity is being calculated.

In the case of transportation the elasticity is even easier to calculate. It is simply the parameter estimate associated with income, regardless of whether the unadjusted or standardized elasticity is calculated. (As with the MPC, unadjusted elasticities are calculated using average annual expenditures and income of each ethnic group, whereas standardized elasticities are calculated using average annual expenditures and income for all consumer units.) The following equation proves this statement, using the MPC for the situation where λ equals zero:

$$\eta = \partial Y / \partial I * I/Y = b*(Y/I)*I/Y = b$$

Footnotes to the appendix

[1] Geoffrey D. Paulin and David L. Ferraro, "Do Expenditures Explain Income? A study of variables for Income Permutation," *Journal of Economic and Social Measurement*, 22, 1996, pp. 103–28.

[2] G.E.P. Box and D.R. Cox, "An Analysis of Transformations," *Journal of the Royal Statistical Society*, number 2, Series B, 1964, pp. 211–43.

[3] Even if λ is equal to 1, it is hard to imagine why Y is transformed to be $Y - 1$. The net result is that $Y*$ equals $Y - 1$, and substracting a constant from each observation of Y will not affect the distribution.

[4] Stuart Scott and Daniel J. Rope "Distributions and Transformations for Family Expenditures," *1993 Proceedings of the Section on Social Statistics* (Alexandria, VA, American Statistical Association, 1993), pp. 741–46.

[5] In this equation, the variable e is a random error term. Although the natural log of income is used in the equation, this symbol e should not be confused with the transcendental number e (approximately 2.71828), which serves as the base number for calculating the natural log.

[6] To show this without using calculus, choose some very small number, such as 0.0001, for λ. Choose some positive number for Y. (Choosing 1 will make the equation equal to zero, because 1 to any power still equals 1. Anything smaller will make the function negative, and a natural log is impossible to find. Because most expenditures, on average, are greater than \$1, choosing Y greater than 1 is plausible.) Exponentiating $Y*$ should yield the original value assumed for Y.

[7] For convenience, both unstandardized and standardized results are marked to indicate a statistically significant difference in parameter estimates. Although the standardized results can be interpreted more scientifically, because they indicate that there is a difference in MPC even with other things being equal, the statistical significance marker for the unstandardized results emphasizes that the difference is not just because mean expenditures or permanent incomes are different, but that there are additional effects to consider.