Ethnic Differences in Household Expenditure Patterns

Jessie X. Fan
University of Utah

Using 13 years of Consumer Expenditure Survey data with price information from the Consumer Price Index and the American Chamber of Commerce Cost of Living Index, five household expenditure patterns are identified: shelter-dominated, food-and-utilities-dominated, health-care-dominated, transportation-dominated, and service-dominated. Compared to non-Hispanic White households, Asian American households are more likely to have shelter-dominated, but less likely to have service-dominated expenditure patterns; non-Hispanic Black households are more likely to have food-and-utilities-dominated, but less likely to have shelter-dominated and health-care-dominated expenditure patterns; and Hispanic households are more likely to have shelter-dominated and food-and-utilities-dominated, but less likely to have health-care-dominated and service-dominated expenditure patterns, other things equal. These results are discussed in the context of a conceptual framework of how ethnicity affects households' economic behavior.

The ethnic structure in the United States has been undergoing a significant change. The population of minority groups, including American Indians, Asian and Pacific Islanders, Hispanics, and Black Americans, has grown substantially since 1980. Although the whole U.S. population increase was 12.6% from 1980 to 1992, the population of American Indians and other Native Americans increased by 39.5%, the Asian American population by 121.0%, the non-Hispanic Black American population by 16.0%, and the Hispanic population by 65.9% (U.S. Bureau of the Census, 1994, p. 18).

Statistics suggest significant differences in economic status and demographic characteristics among ethnic groups. Generally, Blacks

Author's Note: Jessie X. Fan is an assistant professor at the Department of Family and Consumer Studies, University of Utah, 225 S 1400 E RM 228, Salt Lake City, UT 84112; telephone: (801) 581-4170; fax: (801) 581-5156; e-mail: fan@fcs.utah.edu. The author would like to thank Drs. Kathryn Stafford, Sherman Hanna, Wen S. Chern, and Gabriel A. Lozada for their many constructive comments on earlier drafts of this article. Three anonymous reviewers also provided helpful suggestions.

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and Hispanics have experienced higher unemployment, received lower income, attained lower levels of education, and experienced higher rates of single parenthood, compared to White households (Myers, 1991). Asian Americans, on the other hand, although having many well-to-do households, also have a higher-than-average poverty rate. In 1993, about 30.9% of Black households, 26.2% of Hispanic households, and 12.0% of Asian American households were below the poverty level, compared to only 8.9% for White households (U.S. Bureau of the Census, 1994, pp. 48, 49, 51). Because of the disadvantaged economic status of the minority groups, many public policies such as welfare programs are disproportionately related to them. In addition, compared to the majority Whites, a larger proportion of minority households needs financial planning advice due to low income and low educational attainment. With the fast-growing minority population, it is important for us to understand the differences in culture-related expenditure habits of the minority groups compared to the majority Whites, and therefore help needy minority families in efficient and effective ways.

Although past research has documented that households with different ethnicity and race exhibited different economic behavior, there has been limited theoretical modeling in how ethnicity affects a household's consumption and expenditure pattern. Some researchers (e.g., Wallendorf & Reilly, 1983) have studied ethnic differences in consumption patterns to test the theory of cultural assimilation, whereas others (e.g., McCracken, 1988) have connected culture with the symbolic character of consumer goods and activities. Neither of these approaches can be directly applied to explain how ethnicity affects a household's expenditure decisions. This research attempts to fill this gap by developing a conceptual framework of how ethnicity can affect a household's economic behavior.

In traditional consumer expenditure research, the focus has been put on the estimation of expenditure or demand equations for one commodity or for a group of commodities to estimate the marginal effects of income, prices, and demographic changes. However, even with a large group of commodities included in an expenditure system, it is difficult to summarize the ethnic differences in expenditure patterns in a meaningful and easy-to-understand way. Because commodities can be substitutes or complements, it is possible that households that spend more money on certain expenditure categories also consistently spend more or less money on certain other expenditure categories. Therefore, additional purposes of this research are (a) to

identify a small number of meaningful and easy-to-use household expenditure patterns using household expenditure data, (b) to investigate the ethnic differences in these expenditure patterns, and (c) to explore explanations of ethnic differences in expenditure patterns in the context of the conceptual framework this article develops.

The article is organized as follows. First, a review of literature is presented to summarize past findings related to household expenditure patterns and ethnic differences in household expenditures. Then, theories on ethnicity and its impact on household expenditure patterns are briefly reviewed and a conceptual framework developed. Hypotheses based on past findings in the literature are also presented in this section. The third section presents the analytical methods of this study. The fourth section discusses the data set. In the fifth section, the results of the analysis are presented. The article ends with discussions and implications.

REVIEW OF LITERATURE

The review of literature is divided into two sections. First, the literature on the identification of household expenditure patterns is reviewed. Second, the literature on ethnic differences in expenditure patterns is reviewed.

Identification of Expenditure Patterns

Empirically, nonparametric multivariate techniques such as factor analysis and cluster analysis have been used to identify households with similar expenditure patterns. Several expenditure patterns have been consistently identified by past researchers. These patterns include a homebound pattern (with higher budget shares for food at home, tobacco, personal care, utilities, health care, and reading materials, compared to other patterns), a shelter-dominated pattern (with higher budget shares for alcoholic beverages, shelter, education, and public transportation), a service-using pattern (with higher budget shares for food away from home, apparel and services, domestic services, house furnishings and equipment, entertainment, and miscellaneous items), and a private-transportation-dominated pattern (with a higher budget share for private transportation) (Cha, 1991; Chung, 1991). In addition, Cha (1991) also identified a balanced-moderate pattern.

Age, permanent income, race, marital status, family size, education, and employment status have been found significant in predicting households' cluster membership (Cha, 1991; Chung, 1991). In particular, non-White households were more likely to have a shelter-dominated expenditure pattern (Cha, 1991; Chung, 1991) but less likely to have a balanced moderate expenditure pattern (Cha, 1991), other things equal.

Ethnic Differences in Expenditures

Research interest in the consumer behavior of subcultures in the United States, including subcultures formed by ethnicity, has been growing in recent years. Excluding past descriptive studies not controlling for socioeconomic differences, there have been two types of research done in the area of consumption and expenditure behavior of minority consumers: studies interested in testing the theory of cultural assimilation using consumption and expenditure data (Deshpande, Hoyer, & Donthu, 1986; Wallendorf & Reilly, 1983) and studies interested in exploring the cultural differences among different ethnic groups in terms of their general expenditure patterns (Abdel-Ghany & Sharpe, 1997; Fan, 1997; Fan & Lewis, 1997; Fan & Zuiker, in press; Wagner & Soberon-Ferrer, 1990; Zuiker & Bae, 1993).

Research focusing on the process of cultural assimilation, reflected in the consumption and expenditure behavior of households, has compared Hispanic American households with Hispanic families still living in their native countries, and with Anglo families in the United States (Wallendorf & Reilly, 1983). Researchers have also compared strong Hispanic identifiers with weak Hispanic identifiers and Anglos (Deshpande et al., 1986). In this type of research, local samples with small sample sizes were typically used. Wallendorf and Reilly's 1983 study included 102 Mexican Americans, and Deshpande et al.'s 1986 study had 147 Hispanic households. Wallendorf and Reilly (1983) found that the at-home food consumption behavior of Mexican Americans was reminiscent of Anglo patterns several years ago, with high levels of red meats, eggs, white breads, and caffeine consumption. Deshpande et al. (1986) found that strong Hispanic identifiers were more brand-loyal and had more of a preference for prestige and ethnically advertised brands than both weak Hispanic identifiers and Anglos. Both studies suggested that cultural assimilation was not a simple process. Hispanic Americans were different from both

Hispanic households in their native countries and Anglo households in the United States.

The second type of research, focusing on documenting the differences in consumer expenditure patterns of households with a particular ethnicity and households of other ethnicity, has typically used the Consumer Expenditure Survey (CEX) data to encompass the overall pattern of household expenditure. One exception is the study by Abdel-Ghany and Sharpe (1997), which used the Canadian Survey of Family Expenditures. Research in this area mainly has focused on the differences between Black households and White households, and more recently, Hispanic households and non-Hispanic households. Table 1 provides a summary of past research results on ethnic differences in 13 expenditure categories. Only studies focusing on ethnic differences and controlling for other socioeconomic differences are included in the table. Note that for many of the expenditure categories, past studies have found conflicting ethnic effects. Studies focusing on Hispanic and Asian households usually had small sample sizes. For example, Zuiker and Bae's 1993 study had 54 Hispanic households. The small sample size may have led to insignificant differences between Hispanics and non-Hispanics in many of the expenditure categories in their study.

The focus of this study is to develop a conceptual framework to model how ethnicity can affect a household's expenditure behavior, to identify a small number of typical household expenditure patterns, and to study ethnic differences in these patterns. This study is unique in the following ways: (a) More recent data over a longer period of time are used in this study compared to previous studies. (b) Compared to previous studies identifying household expenditure patterns, the sample sizes of minority groups are larger, and three minority groups—Asian Americans, Black Americans, and Hispanic Americans— are studied in this research rather than just Black versus non-Black or White versus non-White. (c) In addition to two-category logit analysis commonly used in previous studies on expenditure patterns, this study uses an unordered multinomial logit model to estimate the overall effect of ethnicity simultaneously, and this study imposes the mathematical constraint that the sum of the marginal effects of an independent variable is zero. In addition, simulations are used to assess the size of ethnic effects on household expenditure patterns.

TABLE 1: Selected Past Research Findings on Ethnic Differences in Household Expenditure Patterns

Expenditure Category	*Asians*	*Blacks*	*Hispanics*
Food at home	< Whites (Fan, 1997); > Canadian Whites of Canadian, British, American, and northern and western European origins, but < Whites of southern and eastern European origins (Abdel-Ghany & Sharpe, 1997)	> non-Blacks or Whites (Bae, 1992; Fan & Lewis, 1997); = European-American Whites Wagner & Soberon-Ferrer, 1990)	(> non-Hispanic Whites or European American Whites (Fan & Zuiker, in press; Wagner & Soberon-Ferrer, 1990); = non-Hispanics (Zuiker & Bae, 1993)
Food away from home	= Whites (Fan, 1997); > Canadian Whites for Asians of Chinese and East Asian origins, but < Canadian Whites for other Asians (Abdel-Ghany & Sharpe, 1997)	< non-Blacks, Whites, or European American Whites (Bae, 1992; Fan & Lewis, 1997; Wagner & Soberon-Ferrer, 1990)	< non-Hispanic Whites (Fan & Zuiker, in press); = non-Hispanics or European-American Whites (Wagner & Soberon-Ferrer, 1990)
Shelter	> Whites (Fan, 1997); < Canadian Whites for Asians of Chinese or East Asian origins, but > Canadian Whites for other Asians (Abdel-Ghany & Sharpe, 1997)	= non-Blacks or Whites (Bae, 1992; Fan & Lewis, 1997)	> non-Hispanic Whites (Fan & Zuiker, in press); = non-Hispanics (Zuiker & Bae, 1993)
Fuel/utilities	< Whites (Fan, 1997)	> non-Blacks or Whites (Bae, 1992; Fan & Lewis, 1997)	= non-Hispanic Whites or all non-Hispanics (Fan & Zuiker, in press; Zuiker & Bae, 1993)
Household equipment/ operation	< Whites (Fan, 1997); < Canadian Whites for Asians of Chinese or East Asian origins (Abdel-Ghany & Sharpe, 1997)	= non-Blacks or Whites (Bae, 1992; Fan & Lewis, 1997)	= non-Hispanic Whites (Fan & Zuiker, in press)

TABLE 1: Continued

Expenditure Category	*Asians*	*Blacks*	*Hispanics*
Apparel	= Whites (Fan, 1997); > Canadian Whites (Abdel-Ghany & Sharpe, 1997)	> non-Blacks, Whites, or European American Whites (Dardis, Derrick, & Lehfeld, 1981; Fan & Lewis, 1997; Wagner & Soberon-Ferrer, 1990); = non-Blacks (Bae, 1992)	> non-Hispanic Whites (Fan & Zuiker, in press); = non-Hispanics or European American Whites (Wagner & Soberon-Ferrer, 1990; Zuiker & Bae, 1993)
Entertainment	< Whites (Fan, 1997)	< Whites (Fan & Lewis, 1997); = non-Blacks (Bae, 1992)	< non-Hispanic Whites (Fan & Zuiker, in press); = non-Hispanics (Zuiker & Bae, 1993)
Transportation	= Whites (Fan, 1997); > Canadian Whites (Abdel-Ghany & Sharpe, 1997)	> Whites (Fan & Lewis, 1997); = non-Blacks (Bae, 1992)	= non-Hispanic Whites or all non-Hispanics (Fan & Zuiker, in press; Zuiker & Bae, 1993)
Education	> Whites (Abdel-Ghany & Sharpe, 1997; Fan, 1997)	< non-Blacks or Whites (Bae, 1992; Fan & Lewis, 1997)	< non-Hispanic Whites or all non-Hispanics (Fan & Zuiker, in press; Zuiker & Bae, 1993)
Health care	= Whites (Fan, 1997); > Canadian Whites for Asians of Chinese or East Asian origins, but < Canadian Whites for other Asians (Abdel-Ghany & Sharpe, 1997)	< non-Blacks or Whites (Bae, 1992; Fan & Lewis, 1997)	< non-Hispanic Whites or all non-Hispanics (Fan & Zuiker, in press; Zuiker & Bae, 1993)
Alcohol	< Whites (Abdel-Ghany & Sharpe, 1997; Fan, 1997)	< non-Blacks (Bae, 1992); = Whites (Fan & Lewis, 1997)	= non-Hispanic Whites or all non-Hispanics (Fan & Zuiker, in press; Zuiker & Bae, 1993)
Tobacco	< Whites (Abdel-Ghany & Sharpe, 1997; Fan, 1997)	< Whites (Fan & Lewis, 1997); = non-Blacks (Bae, 1992)	< non-Hispanic Whites (Fan & Zuiker, in press); = non-Hispanics (Zuiker & Bae, 1993)
Personal care	< Canadian Whites (Abdel-Ghany & Sharpe, 1997)	= non-Blacks (Bae, 1992)	> non-Hispanics (Zuiker & Bae, 1993)

THEORY, CONCEPTUAL FRAMEWORK, AND HYPOTHESES

Ethnicity retains a position as a central element in the increasingly complex equation of culture and social structure in the United States (Glazer & Moynihan, 1975; Postiglione, 1983). Sociological theories of ethnicity, including both emerging culture theory and impact-integration theory, suggest that ethnic immigrants, in the process of interaction with the host society, will alter themselves by adopting some of the cultural values of the host society while keeping some of their own original cultural values and traditions (Glazer & Moynihan, 1970; Greeley, 1974; Novak, 1972). In that way, ethnic immigrants are not only different from people in their host culture but also different from people in their native culture. From a cultural assimilation point of view, how similar ethnic immigrants behave compared to people in their host culture is a measure of how successful the assimilation is.

Neoclassical consumer demand theory suggests that household expenditure patterns are determined by household income, market prices, and household preferences (Varian, 1992). Ethnicity may affect household expenditure patterns in several ways. First, ethnicity reflects culture and tradition that are unique to a particular ethnic group. This unique culture and tradition may affect ethnic households' preferences, and therefore affect their economic behavior. Second, culture and tradition may affect ethnic households' demographic characteristics such as family size and household composition. These household demographic characteristics then affect the preferences of the household and this in turn affects its economic behavior. Third, ethnicity also may cause ethnic households to face a set of noneconomic constraints beyond the traditional monetary constraints—noneconomic constraints such as language barriers and racial discrimination. These constraints change ethnic households' choice sets and therefore change their economic behavior. Based on these arguments, a conceptual framework is developed to show how ethnicity can affect a household's economic behavior. The conceptual framework is illustrated in Figure 1. In this study, the focus is on the direct impacts of ethnicity due to differences in household preferences and differences in noneconomic constraints minority households face.

Based on the results of previous studies, the following two hypotheses are formed: (a) Important expenditure patterns include shelter-dominated, home-necessities-dominated (or homebound),

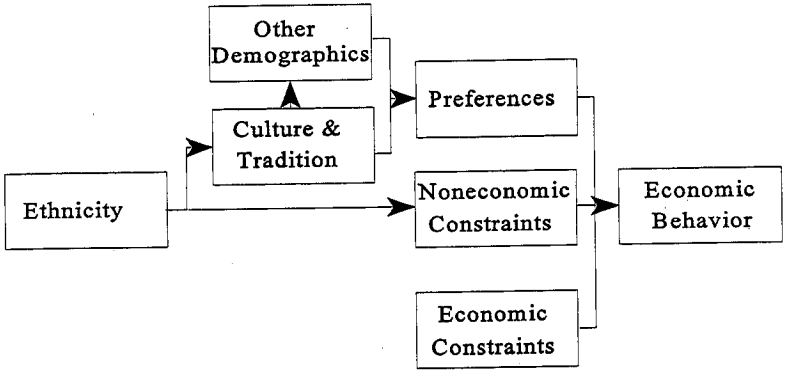

Figure 1: Conceptual framework: The relationship between ethnicity and household economic behavior.

and service-use (social-emphasis) patterns. (b) Non-White households are more likely to have a shelter-dominated pattern, especially Asian American and Hispanic households. Not enough information is available to form detailed hypotheses regarding ethnic effects on other expenditure patterns.

ANALYTICAL METHODS

The analysis has four stages. First, to identify household expenditure patterns, cluster analysis is employed to find natural groupings of households with similar expenditure patterns. Cluster analysis is a multivariate technique by which households can be grouped based on similarities in their budget allocation patterns through maximizing within-group similarities and between-group differences (Johnson & Wichern, 1988). For this study, the similarity measurement used is the Euclidian distance, and the centroid method of measuring similarity is employed because this method is more robust to outliers than most other hierarchical methods. For detail specifications of this method, see Johnson and Wichern (1988).

The second stage of the analysis is to investigate the impact of ethnicity on household expenditure patterns. An unordered multinomial logit analysis is performed to control for differences in house-

holds' demographic variables other than ethnicity. Following Maddala (1983), the multinomial logit model is specified as

$$\log\left(\frac{P_i}{P_m}\right) \quad {}_i x, \quad i \quad 1,2,\ldots,m \quad 1,$$

where P_i is the probability that a certain observation falls into the i^{th} cluster, and x is a set of independent variables with as corresponding regression coefficients. A total of $(m-1)$ binary logit equations are fit simultaneously and the sum of the m predicted probabilities is restricted to be *1*. The dependent variables of the multinomial logit analysis are the log-odds ratios of being in cluster i versus in cluster m. A household's probability of inclusion in cluster i is computed using

$$P_i = \frac{e^{\ x}}{1 - \sum_{j\ 1}^{m\ 1} e^{\ x}} \quad i,j \quad 2,\ldots,m \quad 1$$

and the household's probability of inclusion in cluster m is calculated using

$$P_m = \frac{1}{1 - \sum_{j\ 1}^{m\ 1} e^{\ x}}.$$

With the unordered multinomial logit, the overall impact of an independent variable on the dependent variables is assessed by computing an overall chi-square statistic. However, this approach does not provide a statistical test of whether a given ethnic group is more likely to have a particular expenditure pattern relative to all other expenditure patterns when compared to another ethnic group. Therefore, at the third stage of the analysis, m two-category logit models are estimated separately. These two-category logit models are specified as follows:

$$\log\left(\frac{P_i}{1 \quad P_i}\right) \quad {}_i x, \quad i \quad 1,2,\ldots,m \ .$$

With this analysis, one can test, for example, whether Blacks are more likely to have expenditure pattern *i* relative to all other expenditure patterns when compared to White households.

To assess the size of the ethnic effects, controlled probabilities of cluster inclusion are estimated based on the results of the unordered multinomial logit equations. For comparisons, White households in the sample are used for the simulation. First, the predicted probabilities of cluster inclusion for all these White households are estimated as the comparison group. Then their ethnicity only is changed to Asian American, and the probability of inclusion in each cluster is simulated as if these White households were Asian Americans. The same procedure is then used to simulate Whites as Blacks and Hispanics. Mean statistics are then computed for comparisons. This method allows the assessment of pure ethnic effects while controlling for other factors.

DATA AND VARIABLES

The major data source used in this study is the CEX from 1980 to 1992 (U.S. Bureau of Labor Statistics [BLS], 1980 to 1989, 1990 to 1992). The CEX data set, collected continuously since 1980 by the BLS, provides detailed information on household expenditures and household demographic characteristics. For this study, only households that have completed the interview for an entire calendar year are selected. To construct a consistent data set, all the expenditure categories of interest are constructed or modified following the category definitions used in the 1990 CEX.

Because this data set includes households interviewed in 13 different years, controlling for price changes of commodities and services over time is important. One common approach is to use the overall Consumer Price Index (CPI) to adjust household income to constant dollars. However, over the 13-year period the price changes for different expenditure categories were very different. To take the diversity in price changes into consideration, two additional data sets are used. They are the 1980 to 1992 CPI (U.S. BLS, 1993) and the 1990 American Chamber of Commerce Cost of Living Index (American Chamber of Commerce Researchers Association [ACCRA], 1990). The CPI, published by the BLS since 1913, is compatible and consistent with the CEX because the CPI data use expenditure weights obtained from the CEX. The portion of the CPI used in this study is the region/city-size

price index for selected commodity groups. Four regions in the United States, including three city-size classifications each for the Northeast and the West and four city-size classifications each for the Midwest and the South, yield a total of 14 region/city-size combinations each year. For the 13 years (1980 to 1992), 182 price index numbers (14 region/city-size classifications each year for 13 years) are available for each commodity group.

The CPI is only a price index over time. For each commodity group and for each region/city-size combination, the average price in 1982 to 1984 is set as the base price of 100. Thus, the CPI region/city-size index can only be used if a data set on area differences in prices can be introduced. The only data set containing area price differences in the United States is the ACCRA data set. The ACCRA data give price differences among Standard Metropolitan Statistical Areas for major expenditure categories. The portion of the ACCRA data used in this study is the composite index for selected commodity groups for the third quarter of 1990. ACCRA price information for metropolitan areas that are in the CPI area sample is used for this study. Although the ACCRA data set has problems in terms of its definition of the market basket and sampling (Fan, 1996), the benefit of using it outweighs the disadvantages, because the use of one year's ACCRA data allows one to use 13 years of CPI region/city-size indexes. The alternative, without the use of the ACCRA data, would have limited us to use only the CPI national index, which has one price for each commodity each year, with a total of 13 prices for each commodity over the 13-year period. This is equivalent to assuming no price differences at all among regions and cities for all commodities and for all 13 years.

Considering data availability and compatibility, a limited number of summary expenditures are used. After careful examination of the data available in these three data sources, 13 mutually exclusive summary expenditure categories are selected. They are (a) food at home, (b) food away from home, (c) shelter, (d) fuel and utilities, (e) household operation and household equipment and furnishing, (f) apparel and upkeep, (g) entertainment, (h) transportation, (i) education, (j) health care, (k) alcoholic beverages, (l) tobacco and tobacco-related products, and (m) personal care. Commodities and services included in each category are summarized in Appendix A. For a more detailed description, refer to 1990 CEX EXPN data documentation (U.S. BLS, 1990 to 1992).

Compared to the BLS-defined total expenditure in the CEX data, social security tax, cash contribution, life insurance payment, and net

vehicle outlay are excluded from this study. Cash contribution and life insurance payment are excluded because no price information is available for these two categories in the CPI data. Vehicle purchase expenditure is excluded because in the early years of the CEX interview surveys, no information on the payment method of vehicle purchase is available—only the total price of a car is reported. Because most households do not pay lump sum cash for a car, including the total purchasing price as the expenditure on a vehicle would only distort the results. The decision to combine expenditures into 13 expenditure categories is due to the price data compatibility.

The first step in data construction is to use the CPI area sample, the CPI population weights (U.S. BLS, 1992), and the ACCRA price information to construct region/city-size price index numbers for the 14 region/city-size classifications for each expenditure category in 1990. Because the ACCRA composite index has only six commodity groups, the 1990 ACCRA price index for "other commodities" is used for food away from home, household operation and equipment, apparel, education, alcoholic beverages, tobacco, and personal care. This treatment of data asserts an assumption that in 1990, the prices of these eight expenditure categories are either all higher or all lower in one area compared to another area. The other five categories have their corresponding price indexes in the ACCRA data.

The second step is to use the CPI region/city-size price index numbers, combined with 1990 region/city-size price index numbers created in the first step, to construct region/city-size price index numbers for all years from 1980 to 1992. The result is that each commodity has 182 different price index numbers (14 region/city-size combinations by 13 years).

The third step is to incorporate the created price index numbers into the 1980-1992 CEX data, using the region/city size information for households in the CEX sample. Because the CEX does not provide city size information for households living in the West region, price index numbers reflecting prices in the whole West region are constructed and used for all households in the West. In the final data, each commodity has 156 different prices (12 region/city-size combinations by 13 years).

Because the CPI does not provide price index information for households in rural areas, and because no expenditure data were collected from rural households from 1980 to 1983, rural households are excluded from this study. For details of the data construction process and a discussion of the strengths and weaknesses of this approach,

see Fan (1996). For an example of how the price data are created, see Appendix B.

The total sample size is 10,400 households. Households in the sample were interviewed for a whole calendar year from 1980 to 1992. Among them, 222 were Asian American households, 1,146 non-Hispanic Black households, 588 Hispanic households (Hispanic households can be either Black or White), and 8,444 non-Hispanic White households. A household is classified into a particular ethnic group if the reference person was reported as having that particular ethnic or racial background (Information on both race and ethnicity is used to form this variable.) Households not belonging to any of the above four ethnic groups (such as Native American Indians) are excluded from this study because their sample size is too small to form an independent group.

Three ethnic dummy variables are used in the logit model. They are (a) Asian (Asian American = 1, others = 0), (b) Black (Black American = 1, others = 0), and (c) Hispanic (Hispanic American = 1, others = 0). White households are used as the comparison group.

Total household expenditure is used as a proxy for household permanent income. Total expenditure is defined as the sum of the expenditures on the 13 commodities. Compared to the BLS-defined total expenditure variable, the variable used in this study does not include social security tax, cash contribution, life insurance payment, and net vehicle outlay. The natural log form of income is used to capture nonlinear relationships.

In addition to ethnicity and income variables, the following variables are controlled in the analysis: (a) natural log forms of 13 prices, one for each of the 13 commodities; (b) other characteristics of the reference person: gender (female, male [base]); the natural log form of age; education dummies (less than high school [base], high school graduate, some college, college graduate and more); employment status (full-time, others [base]); and occupation (white-collar, self-employed, others [base]); (c) characteristics of the household: number of earners; family composition (single-person family [base], husband and wife only, husband and wife with children younger than 18, husband and wife with children older than or equal to 18, single parent, and all other types of households); housing tenure (renter [base], owner with mortgage, owner without mortgage); region (Northeast [base], Midwest, South, West); and (d) a continuous variable indicating the year of the interview.

RESULTS

Results of the Cluster Analysis

The cluster analysis identifies five expenditure patterns. Because the cluster analysis technique puts more weight on large budget share items, the variances of large budget share categories such as food at home are better explained than small budget share categories such as alcohol and tobacco. This characteristic is not a severe drawback for analyzing household decision making in budget allocation because large budget share items figure more prominently in the household decision-making process.

In Table 2, the means and standard deviations of budget shares are presented for each of the five clusters, together with the same statistics for the whole sample. The mean budget shares for each cluster indicate that every cluster represents a distinguishable pattern of budget allocation. These clusters are named according to their dominant budget share or shares as (a) shelter-dominated, (b) food-and-utilities-dominated, (c) health-care-dominated, (d) transportation-dominated, and (e) service-dominated. Demographic profiles for the whole sample and for each cluster are presented in Table 3. Information on the proportion of households in each cluster by ethnicity is presented in Table 4.

The shelter-dominated cluster accounted for 28.5% of the sample households. Households in this cluster allocated 38.5% of their budget to shelter, on average, which was about 71% higher than the sample average. Households in this cluster had a mean total expenditure of $22,919 (in 1992 dollars) per year, second only to the service-dominated cluster. A typical household reference person in this cluster was fairly well educated, relatively young, and likely to be a renter or homeowner with a mortgage. Only 7.7% of the households in this group were homeowners without mortgages on their primary residence, compared to the overall sample frequency of 25.1%. This cluster included 43.7% of the Asian households and 35.2% of the Hispanic households in the sample, compared to 26.2% for Blacks and 27.9% for Whites.

The food-and-utilities-dominated cluster included 14.3% of the sample households. On average, households having this expenditure pattern allocated 31.7% of their total budget to food at home, 82% higher than the sample mean (17.4%). Households in this cluster also

TABLE 2: Descriptive Statistics: Budget Shares (%) by Cluster (Mean and Standard Deviation)

	Whole Sample (10,400)	*Cluster 1 (2,959)*	*Cluster 2 (1,484)*	*Cluster 3 (968)*	*Cluster 4 (2,579)*	*Cluster 5 (2,410)*
Food at home	17.4	14.4	31.7	18.1	16.4	13.1
	(8.8)	(6.7)	(8.5)	(6.7)	(5.5)	(4.9)
Food away from home	5.2	4.6	3.0	3.5	6.4	6.8
	(4.5)	(4.2)	(3.1)	(3.4)	(4.8)	(4.8)
Shelter	22.5	38.5	15.6	12.5	14.4	19.9
	(12.9)	(8.7)	(8.7)	(7.6)	(7.1)	(6.4)
Fuel/utilities	11.3	9.0	17.6	15.0	11.1	9.1
	(6.6)	(5.2)	(9.2)	(7.7)	(4.7)	(4.0)
Household equipment/ operation	5.5	3.8	3.3	4.6	4.4	10.4
	(5.7)	(4.1)	(4.1)	(4.6)	(3.7)	(7.5)
Apparel	5.8	4.8	4.9	3.6	6.1	8.0
	(4.1)	(3.3)	(3.8)	(2.9)	(3.8)	(4.7)
Entertainment	5.2	4.0	3.2	3.2	5.7	8.1
	(5.0)	(3.3)	(3.2)	(3.1)	(4.2)	(7.0)
Transportation	14.1	11.0	9.8	10.3	23.1	12.4
	(7.8)	(6.2)	(6.4)	(6.3)	(6.0)	(4.5)
Education	2.0	1.4	1.3	1.3	2.2	3.0
	(3.6)	(2.5)	(2.4)	(1.9)	(3.7)	(5.3)
Health care	6.9	4.9	4.8	24.7	5.6	5.1
	(7.8)	(5.0)	(4.6)	(10.0)	(4.2)	(4.0)
Alcohol	1.4	1.3	1.0	0.7	1.7	1.8
	(2.2)	(2.1)	(2.0)	(1.5)	(2.5)	(2.4)
Tobacco	1.5	1.2	2.5	1.2	1.7	1.1
	(2.4)	(2.2)	(3.2)	(2.2)	(2.3)	(1.9)
Personal care	1.2	1.1	1.3	1.4	1.3	1.3
	(1.2)	(1.0)	(1.5)	(1.4)	(1.1)	(1.1)

spent a large portion of their budget on fuel and utilities (17.6%), about 54% higher than sample average (11.3%). Also, this group had the highest mean budget share for tobacco products (2.5%), 66.7% higher than the sample mean (1.5%). Households in this cluster had the lowest mean total annual expenditure at $13,846 (in 1992 constant dollars). About half of the household reference persons had a lower-than-high-school education. Although their mean family size was 3.2, largest among all clusters, their mean number of earners was only 1.1, the second lowest among all clusters. From the sample, 31.8% of Black households and 28.2% of Hispanic households were in this cluster,

TABLE 3: Descriptive Statistics: Demographic Profiles by Cluster

	Whole Sample (10,400)	*Cluster 1 (2,959)*	*Cluster 2 (1,484)*	*Cluster 3 (968)*	*Cluster 4 (2,579)*	*Cluster 5 (2,410)*
Total expenditure (in 1992 dollars)	22,817	22,919	13,846	16,183	20,293	30,370
Age	49.0	46.0	51.7	67.6	48.2	44.5
Gender:						
Male	67.0%	60.8%	54.8%	61.4%	77.4%	73.2%
Female	33.0%	39.2%	45.3%	38.6%	22.6%	26.8%
Ethnicity:						
White	81.2%	79.6%	62.9%	89.5%	83.5%	88.6%
Asian	2.1%	3.3%	1.4%	1.0%	2.2%	1.5%
Black	11.0%	10.1%	24.5%	7.2%	9.7%	6.8%
Hispanic	5.7%	7.0%	11.2%	2.3%	4.6%	3.1%
Education:						
< High school	25.5%	21.3%	49.5%	44.5%	22.9%	10.7%
High school	31.2%	27.0%	33.0%	30.8%	37.5%	28.7%
Some college	20.9%	23.2%	11.5%	15.5%	20.6%	26.4%
College or more	22.4%	28.4%	6.1%	9.2%	18.9%	34.2%
Employment:						
Do not work	28.6%	25.4%	47.5%	69.1%	19.2%	14.7%
Part-time worker	7.9%	8.4%	8.4%	8.1%	7.5%	7.4%
Full-time worker	63.5%	66.2%	44.1%	22.8%	73.3%	77.9%
Number of earners	1.4	1.3	1.1	0.6	1.8	1.6
Family size	2.7	2.4	3.2	2.0	2.9	2.8
Family composition:						
Single consumers	23.7%	36.0%	18.6%	30.8%	15.2%	18.4%
Husband/wife only	22.9%	18.2%	16.1%	41.6%	24.4%	23.7%
Husband/wife w/child(ren) < 18	23.1%	22.6%	18.4%	5.5%	23.5%	33.0%
Husband/wife w/child(ren) ≥ 18	9.5%	4.2%	9.2%	6.5%	18.1%	8.1%
Single parents	5.9%	6.3%	13.9%	1.3%	2.9%	5.4%
Other types	14.9%	12.7%	23.9%	14.3%	15.9%	11.3%
Housing tenure:						
Renter	29.9%	44.9%	37.0%	16.3%	19.6%	23.4%
Owner with mortgage	45.0%	47.3%	28.5%	18.9%	48.5%	59.3%
Owner without mortgage	25.1%	7.7%	34.5%	64.8%	31.9%	17.4%
Region:						
Northeast	24.2%	24.5%	29.0%	22.1%	23.7%	22.1%
Midwest	27.5%	24.3%	27.0%	28.8%	29.3%	29.2%
South	27.0%	22.8%	30.5%	33.0%	27.6%	27.1%
West	21.3%	28.4%	13.5%	16.1%	19.5%	21.6%
Year	2.2	7.8	6.7	7.9	6.4	7.4

TABLE 4: Descriptive Statistics: Proportion (%) of the Total Population of Each Ethnic Group Represented in Each Cluster

	Whites	*Asians*	*Blacks*	*Hispanics*
Shelter-dominated	27.9	43.7	26.2	35.2
Food-and-utilities-dominated	11.0	9.5	31.8	28.2
Health-care-dominated	10.3	4.5	6.1	3.7
Transportation-dominated	25.5	25.6	21.6	20.1
Service-dominated	25.3	16.7	14.2	12.8
Total	100.0	100.0	100.0	100.0

compared to 9.5% of Asian American households and 11.0% of White households.

The health-care-dominated cluster included 9.3% of the sample households. Although these households allocated a much smaller proportion of their budget to shelter, apparel, entertainment, transportation, alcohol, and tobacco than households in all other clusters, their mean budget share for health care (24.7%) was about 258% higher than the sample mean (6.9%). The demographic profile of this cluster shows that the mean age of the reference person in this group was about 68, much higher than in any other cluster. Many households in this cluster were retired families. About 64.8% of these households had their own house without any mortgage, so their mean budget share for shelter was the lowest among all clusters. From the sample, 10.3% of White households were in this cluster, compared to 4.5% for Asian Americans, 6.1% for Blacks, and 3.7% for Hispanics.

The transportation-dominated cluster, represented by 24.8% of the sample households, was distinguished from other clusters by a high mean budget share for transportation (23.1%), whereas all other budget shares were fairly balanced. Households in this cluster had the highest mean number of earners at 1.8 earners per household. About 37.5% of the reference persons had a high school degree, the highest proportion among all clusters, but the proportion with more than a high school education was less than that of the shelter- and service-dominated clusters. From the sample, 25.7% of Asian American households and 25.5% of White households were in this cluster, compared to 21.7% of Black households and 20.1% of Hispanic households.

Households in the service-dominated cluster spent a larger proportion of their budget on food away from home, household equipment and operation, apparel, entertainment, and alcoholic beverages than any other clusters. This cluster included 23.2% of the sample

households. Households in this cluster had the highest mean annual after-tax income, per capita income, total expenditure, and per capita expenditure. On average, the reference persons of households in this cluster were relatively young and highly educated. Their budget allocation pattern reflected a "yuppie" lifestyle. From the sample, 25.3% of White households were in this cluster, compared to 16.7% of Asian American households, 14.2% of Black households, and 12.8% of Hispanic households.

Results of Logit Analyses

The overall Cragg-Uhler *R*-squared for the unordered multinomial logit analysis is 0.58, indicating cluster inclusions are fairly well explained by the set of independent variables. The parameter estimates and the corresponding chi-square statistics of the unordered multinomial logit model are presented in Appendix C. Estimated average marginal effects of the independent variables and their corresponding levels of statistical significance are available from the author on request. Likewise, the results of the five sets of two-category logit models are available on request.

Overall, all three minority groups investigated in this study are statistically significantly different from non-Hispanic White households in terms of household expenditure patterns. The simulation results, computed based on the unordered logit model results, are presented in Table 5, together with the levels of statistical significance from the five sets of two-category logit models.

The results show that compared to non-Hispanic White households, Asian American households were about 30% more likely to be in the shelter-dominated cluster (36.3% vs. 27.9%) and about 28% less likely to be in the service-dominated cluster (18.3% vs. 25.3%), other things equal. Compared to non-Hispanic White households, non-Hispanic Black households were about 26% more likely to be in the food-and-utilities-dominated cluster (13.9% vs. 11.0%), but about 5% (26.5% vs. 27.9%) and 27% (7.5% vs. 10.3%) less likely to be in the shelter-dominated and health-care-dominated clusters, respectively, other things controlled. Compared to non-Hispanic White households, Hispanic households were 23% more likely to be in the shelter-dominated cluster (34.3% vs. 27.9%) and about 25% more likely to be in the food-and-utilities-dominated cluster (13.7% vs. 11.0%), but about 35% less likely to be in the health-care-dominated

cluster (6.7% vs. 10.3%) and about 18% less likely to be in the service-dominated cluster (20.7% vs. 25.3%), other things being equal.

Total expenditure, as a proxy for permanent income, had a large effect on a household's probability of inclusion in four out of the five expenditure patterns. Age, gender, education, family size and family composition, employment status, number of earners, and housing tenure status all had very significant effects on the probability of cluster membership. Out of the 13 prices, 7 were significant.

DISCUSSION AND IMPLICATIONS

Identification of Household Expenditure Patterns

The hypothesis that important expenditure patterns include shelter-dominated, home-necessities-dominated (or homebound), and service-use (social-emphasis) patterns is confirmed. The five expenditure patterns identified in the cluster analysis are similar to patterns identified in previous studies. Table 6 provides a comparison of the patterns identified in this study with those identified by Cha (1991) and Chung (1991).

Most of the expenditure patterns identified are similar, indicating that the cluster analysis results are quite consistent and reliable. The major difference between the current study and the two previous studies is that the two previous studies did not identify a health-care-dominated pattern. Instead, households with high health care expenditure were combined with households in the food-and-utilities-dominated pattern. This difference may be caused by a significant difference in sample size. This study has about six times more households in the sample than the two previous studies. Only a small percentage of the households in this sample belonged to the health-care-dominated pattern. If a similar percentage were applied to the much smaller samples in these two previous studies, the number of households with high health care expenditure might be too small to form an independent cluster.

Ethnic Differences in Household Expenditure Patterns

The second hypothesis, that non-White households are more likely to be in the shelter-dominated pattern, especially Asian American and Hispanic households, is confirmed for Asian and Hispanic

TABLE 5: Simulation: Predicted Mean Probabilities (%) of Cluster Inclusion by Ethnicity

	Whites (actual)	*If Whites Were Asians*	*If Whites Were Blacks*	*If Whites Were Hispanics*
Shelter-dominated	27.9	36.3***	26.5**	34.3***
Food-and-utilities-dominated	11.0	10.2	13.9***	13.7**
Health-care-dominated	10.3	7.5	7.5***	6.7***
Transportation-dominated	25.5	27.7	28.5	24.6
Service-dominated	25.3	18.3**	23.6	20.7**

NOTE: Simulation results are generated from the unordered logit estimates. Statistical significance levels are from the five sets of two-category logit models. This table can be interpreted as adjusted frequencies of expenditure pattern breakdown by ethnicity. For White households, the actual breakdown was 27.9% in the shelter-dominated cluster, 11.0% in the food-and-utilities-dominated cluster, 10.3% in the health-care-dominated cluster, 25.5% in the transportation-dominated cluster, and 25.3% in the service-dominated cluster. If these White households were Asian Americans, then 36.3% would be in the shelter-dominated cluster, 10.2% in the food-and-utilities-dominated cluster, 7.5% in the health-care-dominated cluster, 27.7% in the transportation-dominated cluster, and 18.3% in the service-dominated cluster. Only the differences in the shelter-dominated and the service-dominated clusters are statistically significant. The same interpretations hold for Blacks and Hispanics.

**$p \leq .05$. ***$p \leq .01$.

households, but not for Black households. Compared to non-Hispanic White households, Black households were less likely to have a shelter-dominated expenditure pattern. This finding is not necessarily contradictory to the findings of Cha (1991) and Chung (1991) that non-White households were more likely to have a shelter-dominated expenditure pattern because they combined all the minority groups into one group, and the positive effect of two groups might have overpowered the negative effect of the other group. The finding about Asian American and Hispanic American households is consistent with previous findings by Fan (1997) and Fan and Zuiker (in press).

Culture-related ethnic differences. Some of the differences in expenditure patterns among different ethnic groups can be traced back to cultural differences. Past research suggests that both Asian culture and Hispanic culture emphasize family kinship and family togetherness (Fan, 1997; Fan & Zuiker, in press; Fost, 1990; Maher, 1986). Given that a large proportion of Asian American households and Hispanic households in the United States are recent immigrants, they are more likely to keep lifestyles of less-industrialized societies where the

TABLE 6: A Comparison of Expenditure Patterns Identified in Three Studies

Current Study	*Chung (1991)*	*Cha (1991)*
Shelter-dominated	Shelter-dominated	Shelter-dominated
Transportation-dominated	Private-transportation-dominated	Private-transportation-dominated
Service-dominated	Service-using	Social-emphasis
Food-and-utilities-dominated		
	Home-bound	Health-and-home-necessities-emphasis
Health-care-dominated		
		Balanced-moderate

interdependence of family members is high and the use of commercial services is low. The emphasis on family can partially explain why Asian and Hispanic American households are more likely to have a shelter-dominated expenditure pattern. In addition to the idea that home is where the family spends most of its gathering time and is therefore very important, most immigrants also perceive a nice house as a way of showing others that the family is doing well economically, thereby showing status and gaining respect from friends and relatives both in the United States and in their countries of origin. Furthermore, Asian Americans have been cited as having strong savings and investment incentives, and shelter expenditure is often seen as an investment rather than spending (Fost, 1990; Maher, 1986). On the other hand, the high housing expenditure also may be related to high housing prices in the coastal cities of California where many Asian and Hispanic households reside. Due to data limitations discussed in the data section, the whole Western region is treated as if all Western states had the same housing prices.

A strong emphasis on family can also partially explain why Asians and Hispanics are less likely to have a service-dominated expenditure pattern, compared to non-Hispanic Whites. Asian and Hispanic families may spend less money on household services such as day care and household cleaning services because other family members such as grandparents may help with raising children in the family and help with cooking and cleaning. The high percentage of extended families among Asian and Hispanic households in the sample (12.6% for Asians and 12.2% for Hispanics vs. 3.4% for White households) lends this credence. Although family composition is controlled for in this

study, the functions performed by household members may be quite different due to different ideas of family role-playing in different cultures.

That Blacks and Hispanics are more likely to have a food-and-utilities-dominated pattern may reflect a cultural preference for dining with friends and extended family rather than going to a restaurant for an evening out. Sociological studies have found evidence that Black people are more likely than White people to attend church activities (such as church dinners) and friend and family gatherings (Miner, 1993).

Noneconomic-constraints-related ethnic differences. Noneconomic constraints such as supply-side constraints, racial discrimination, and language barriers can also be causes of ethnic differences in expenditure patterns. Expenditure differences in entertainment serve as a good example of supply-side constraints. For Asian Americans and Hispanic Americans, culture-related entertainment events are often unavailable in most U.S. cities. This unavailability of culture-related entertainment events can also lead to more informal family and friend entertainment gatherings as a substitute. Because these informal gatherings usually happen at home, the importance of a nice house is even more enhanced.

Past and current racial discrimination can also be a possible cause of ethnic differences in expenditure patterns. Compared to non-Hispanic White households, Hispanic households and non-Hispanic Black households are more likely to have a food-and-utilities-dominated expenditure pattern. This finding is consistent with past findings that Black households and Hispanic households spend more money on food at home, compared to non-Hispanic White households (Bae, 1992; Fan & Lewis, 1997; Fan & Zuiker, in press). Because food at home and food away from home are substitutes, it is possible that high expenditure on food at home by Blacks and Hispanics may be related to past and current racial discrimination in exclusive and expensive restaurants. In the past, Blacks were not allowed to dine in any restaurants with Whites. Although this type of discrimination in public accommodations was historically more of an institutional feature in the South, such discrimination may have created psychological barriers for minority people in going to exclusive restaurants, even if they are, theoretically, no longer being discriminated against today, especially in other regions of the country.

Compared to non-Hispanic White households, non-Hispanic Black households are also less likely to have a shelter-dominated expenditure pattern. This result is not consistent with previous findings by Bae (1992) and Fan and Lewis (1997), which showed no significant difference in expenditure on shelter between Black households and non-Black or White households. However, it is possible that Black households spend less on shelter due to racial segregation in the housing market. In many cities, especially in the South, racial segregation in housing is not uncommon. A house in a Black neighborhood usually costs less than a similar house in a White neighborhood. Although the price of shelter is controlled in this study, the price information is not detailed enough to distinguish price differences in different neighborhoods.

Black households and Hispanic households are also less likely to have a health-care-dominated expenditure pattern. Ethnicity-related or race-related genetic differences in health status can be a reason, but no past study has suggested that the nation's minority groups are healthier than Whites. On the other hand, institutional barriers or language barriers are certainly good candidates for explaining the differences. Because the percentage of Black and Hispanic doctors is rather small, it is possible that Black and Hispanic households are less likely to have hospital visits because they feel less comfortable seeing a doctor of another race or ethnicity. Furthermore, for Hispanic patients, language barriers may prevent some Hispanic consumers from getting medical assistance due to lack of information and problems with communication (Estrada, Trevino, & Ray, 1990; Solis, Marks, Garcia, & Shelton, 1990).

Implications and Suggestions for Future Research

The results of this study clearly suggest that expenditures are related to culture and noneconomic constraints. Not only does ethnicity affect people's preferences, but it also affects the consumption constraints people face. Economists, educators, producers, and public-policy makers should respect expenditure differences caused by cultural differences, just as one should respect ethnic music and art. At the same time, one should keep in mind that so-called color-blind public policies are not necessarily color-blind. For example, tax benefits for homeownership may be more beneficial to certain ethnic groups, such as Asian Americans and Hispanic Americans, but less beneficial to other groups, such as Blacks. When differences are due to

noneconomic constraints such as racial discrimination, society has a responsibility to change the situation. As a first step in addressing the need for such responsible change, this study has concluded that there are ethnic differences in household expenditure patterns and provided some discussion of why there are these differences. Although many of the explanations provided in this study are based on anecdotal evidence, these explanations certainly are worth further investigation. For example, if Blacks and Hispanics are indeed less likely to use health care services and less likely to eat out due to perceived racial discrimination and institutional barriers, then it is certainly not yet time for the federal government to abolish policies designed to ensure racial and ethnic equality such as affirmative action.

APPENDIX A
Definition of Expenditure Categories

Variables	Description
Food at home	(a) Food and nonalcoholic beverages at grocery stores; (b) food and nonalcoholic beverages at convenience or specialty stores; (c) food prepared by consumer units on trips.
Food away from home	(a) Food on board, including at school; (b) catered affairs; (c) food on out-of-town trips; (d) dining out at restaurants etc. (excluding alcoholic beverages); (e) meals received as pay; (f) school meals.
Shelter	(a) Rent of dwelling, including parking fees; (b) lodging away from home; (c) housing for someone at school; (d) ground rent; (e) fire and extended coverage; (f) homeowner's insurance; (g) property taxes; (h) mortgage interest; (i) penalty charges on special or lump-sum mortgage payments; (j) parking; (k) repair or maintenance services; (l) contractor's labor and material costs; (m) construction materials; (n) management and upkeep services for security; (o) tenants' insurance; (p) rent received as pay.
Fuel/utilities	(a) Fuel oil; (b) gas, bottled or tank; (c) coal; (d) wood and other fuels; (e) electricity; (f) natural gas; (g) telephone services; (h) water and sewerage services; (i) trash and garbage collection; (j) septic tank cleaning.

(continued)

Appenidix A Continued

Household equipment/ operation	(a) Household textiles, including linens, curtains, drapes, slipcovers, and decorative pillows; (b) household furniture, including living room, dining room, bedroom, and nursery furniture, and porch, lawn, and other outdoor furniture; (c) floor covering, including installation and replacement of wall-to-wall carpets, room size rugs, and other soft floor coverings; (d) household appliances and other equipment; (e) baby-sitters, day care fees, care of invalids, and house cleaning and maintenance; (f) other household services, including termite and pest control products, repair of household appliances and other household equipment, furniture repair, rental and repair of lawn and garden tools, and rental of other household equipment.
Apparel	(a) Men's, boys', women's, and girls' apparel; (b) footwear; (c) other apparel products and services.
Entertainment	(a) Fees and admissions; (b) television, radio, and sound equipment; (c) other entertainment supplies; (d) subscriptions for newspapers, magazines, and book and record clubs.
Transportation	(a) Vehicle maintenance and repair; (b) gasoline and motor oil; (c) vehicle insurance; (d) vehicle rent; (e) public transportation.
Health care	(a) Health insurance; (b) medical services; (c) prescription drugs and medical supplies.
Education	(a) Books; (b) school supplies; (c) tuition.
Alcohol	(a) Alcoholic beverages at home; (b) alcoholic beverages away from home.
Tobacco	(a) Tobacco products.
Personal care	(a) Electric personal care appliances; (b) personal care services; (c) rent or repair of electric personal care appliances, wigs, and hairpieces.

APPENDIX B
Example of the Data Construction Process

Step 1

For Northeast region cities with populations between 500,000 and 1,200,000 (Northeast B), the CPI sample areas and population weights are (a) Hartford-New Britain-Middletown, CT, CMSA (population weight 0.991); (b) Syracuse, NY (population weight 0.767); (c) Springfield, MA, MSA (population weight 0.847); and (d) Scranton–Wilkes-Barre, PA (population weight 0.974) (U.S. Bureau of Labor Statistics, 1992, pp. 217-220).

In 1990 ACCRA data, the health care price index numbers for these four areas are (a) 133.6 for Hartford-New Britain-Middletown, CT, CMSA; (b) 116.9 for Syracuse, NY; (c) 113.2 for Springfield, MA, MSA; and (d) 88.6 for Scranton–Wilkes-Barre, PA (ACCRA, 1990). A price index number of 100 is the national average for that year.

The 1990 health care price index number for Northeast B is a weighted average of prices in these four areas. The price index number is computed using the following formula:

$$P_{accra(90)} = [(133.6*0.991) + (116.9*0.767) + (113.2*0.847) + (88.6*0.974)] / (0.991 + 0.767 + 0.847 + 0.974) = 112.95$$

Using the same method, the 1990 health care price index number for Northeast A (areas with populations more than 1,200,000) is 134.62.

Step 2

The CPI price index numbers for health care for Northeast A and B are as follows. Notice that the average price index numbers for 1982-1984 are 100 for both areas.

	1980	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*
A	76.65	84.10	91.93	100.55	108.55	116.85	126.33	134.95	144.10	155.53	170.79	185.98	199.97
B	75.20	83.18	92.60	99.85	108.48	115.10	124.80	131.88	139.50	150.93	168.25	181.18	197.88

From Step 1, we know the 1990 area price index numbers for health care in Northeast A and B are 112.95 for Northeast B and 134.62 for Northeast A. The following formula is used to create the new index numbers, which take area price differences into consideration:

$$P_{new(year)} = (P_{cpi(year)} / P_{cpi(90)})*P_{accra(90)}$$

For example, for Northeast B in 1980, the new health care price index number is as follows:

$$P_{new(80)} = (P_{cpi(80)} / P_{cpi(90)})*P_{accra(90)} = (75.20/168.25)*112.95 = 50.48$$

For Northeast A in 1980, the new health care price index number is as follows:

$$P_{new(80)} = (P_{cpi(80)} / P_{cpi(90)})*P_{accra(90)} = (76.65/170.79)*134.62 = 60.42.$$

Step 3

Match the new price index numbers with information provided in the CEX on the size of the metropolitan area where the household resides.

APPENDIX B
Example of the Data Construction Process

Step 1

For Northeast region cities with populations between 500,000 and 1,200,000 (Northeast B), the CPI sample areas and population weights are (a) Hartford-New Britain-Middletown, CT, CMSA (population weight 0.991); (b) Syracuse, NY (population weight 0.767); (c) Springfield, MA, MSA (population weight 0.847); and (d) Scranton–Wilkes-Barre, PA (population weight 0.974) (U.S. Bureau of Labor Statistics, 1992, pp. 217-220).

In 1990 ACCRA data, the health care price index numbers for these four areas are (a) 133.6 for Hartford-New Britain-Middletown, CT, CMSA; (b) 116.9 for Syracuse, NY; (c) 113.2 for Springfield, MA, MSA; and (d) 88.6 for Scranton–Wilkes-Barre, PA (ACCRA, 1990). A price index number of 100 is the national average for that year.

The 1990 health care price index number for Northeast B is a weighted average of prices in these four areas. The price index number is computed using the following formula:

$$P_{accra(90)} = [(133.6*0.991) + (116.9*0.767) + (113.2*0.847) + (88.6*0.974)] / (0.991 + 0.767 + 0.847 + 0.974) = 112.95$$

Using the same method, the 1990 health care price index number for Northeast A (areas with populations more than 1,200,000) is 134.62.

Step 2

The CPI price index numbers for health care for Northeast A and B are as follows. Notice that the average price index numbers for 1982-1984 are 100 for both areas.

	1980	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*
A	76.65	84.10	91.93	100.55	108.55	116.85	126.33	134.95	144.10	155.53	170.79	185.98	199.97
B	75.20	83.18	92.60	99.85	108.48	115.10	124.80	131.88	139.50	150.93	168.25	181.18	197.88

From Step 1, we know the 1990 area price index numbers for health care in Northeast A and B are 112.95 for Northeast B and 134.62 for Northeast A. The following formula is used to create the new index numbers, which take area price differences into consideration:

$$P_{new(year)} = (P_{cpi(year)} / P_{cpi(90)})*P_{accra(90)}$$

For example, for Northeast B in 1980, the new health care price index number is as follows:

$$P_{new(80)} = (P_{cpi(80)} / P_{cpi(90)})*P_{accra(90)} = (75.20/168.25)*112.95 = 50.48$$

For Northeast A in 1980, the new health care price index number is as follows:

$$P_{new(80)} = (P_{cpi(80)} / P_{cpi(90)})*P_{accra(90)} = (76.65/170.79)*134.62 = 60.42.$$

Step 3

Match the new price index numbers with information provided in the CEX on the size of the metropolitan area where the household resides.

APPENDIX C
Results of the Unordered Multinomial Logit Model

Variables	*Chi-Square*	*Log* (P_1/P_5)	*Log* (P_4/P_5)	*Log* (P_3/P_5)	*Log* (P_2/P_5)
Intercept	2.15	6.74	5.73	-5.77	1.71
Log (total expenditure)	1068.92***	-1.23	-3.76	-2.15	-1.49
Prices:					
Log (food at home)	7.25	2.11	0.41	5.13	-1.50
Log (food away)	4.08	1.43	1.80	-1.20	2.08
Log (shelter)	17.43***	0.41	2.14	2.00	-0.10
Log (fuel/utilities)	1.21	0.76	0.77	0.13	0.50
Log (equipment/operation)	10.94**	-2.47	2.67	0.30	3.05
Log (apparel)	5.89	-0.84	1.54	-0.25	-0.93
Log (entertainment)	12.13**	-2.19	3.27	0.70	2.08
Log (transportation)	17.82***	-2.97	3.72	1.07	0.73
Log (education)	30.19***	0.55	-9.81	0.19	-5.70
Log (health care)	38.33***	2.00	-2.93	-4.99	0.11
Log (alcohol)	7.77*	2.68	0.80	-1.09	1.88
Log (tobacco)	4.52	-1.08	0.08	1.98	-0.40
Log (personal care)	2.06	1.12	0.21	-1.49	0.46
Log (age)	152.95***	-0.19	0.64	2.98	0.20
Gender (male):					
Female	28.87***	0.06	-0.11	-0.11	-0.35
Ethnicity (White):					
Asian	12.07**	0.64	0.20	-0.08	0.40
Black	21.57***	0.01	0.36	0.27	0.21
Hispanic	18.92***	0.46	0.45	0.29	0.16
Education (< high school)					
High school	24.44***	-0.40	-0.42	-0.37	-0.16
Some college	41.30***	-0.42	-0.84	-0.47	-0.43
College or more	58.26***	-0.22	-0.93	-0.86	-0.54
Employment (don't work):					
Part-time worker	10.84**	-0.39	-0.36	0.04	-0.19
Full-time worker	15.32***	-0.37	-0.25	-0.31	-0.04
Number of earners	106.10***	-0.01	-0.13	-0.33	0.32
Family size	290.05***	0.02	0.61	0.17	0.05
Family composition (singles)					
Husband/wife only	108.32***	-0.21	1.05	1.02	0.37
Husband/wife w/ child(ren) < 18	54.37***	0.37	-0.28	0.90	0.22
Husband/wife w/ child(ren) ≥ 18	141.82***	-0.42	1.85	1.43	1.03
Single parents	96.04***	-0.37	1.37	0.41	-0.08
Other types	101.33***	-0.11	1.36	1.10	0.60
Housing tenure (renter):					
Owner with mortgage	43.05***	-0.08	0.40	0.39	0.34
Owner without mortgage	564.58***	-1.47	0.64	0.81	0.81
Region (Northeast):					
Midwest	6.89	0.15	0.64	0.32	0.38
South	4.52	0.38	0.49	0.76	0.22
West	17.64***	0.22	-2.12	1.07	-1.32
Year	11.18**	-0.07	0.53	0.13	0.21

*$p \leq .10$. **$p \leq .05$. ***$p \leq .01$.

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