

# Socio-Demographic Dynamics and Household Demand

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## SOCIO-DEMOGRAPHIC CHARACTERISTICS AND EXPENDITURES

The basic hypothesis of this paper is that socio-demographic characteristics of households are important determinants of their expenditure patterns as are price and income variables. In contrast, according to the economic models of consumer behavior, all individuals are “economic men,” i.e., they maximize their utility subject only to the relative prices and the constraints of their incomes. To obtain a reconciliation between the hypothesis of this paper and the received economic theory of consumer behavior, one or both of the following two propositions can be postulated: that socio-demographic characteristics play a crucial role in shaping consumer preferences and/or that socio-demographic factors affect the “true” prices of goods and services on which individuals spend, as well as “permanent” income levels of households. Both of these propositions have been advanced in the literature.<sup>1</sup>

A number of socio-demographic variables that are highlighted in this paper have been included in past studies on expenditure patterns in the United States.<sup>2</sup> The distinctive feature of the present study is that it attempts to include simultaneously a large number of socio-demographic household characteristics to explain their expenditure patterns.<sup>3</sup>

Expenditure by a household on a given item, is estimated as a budget share function. The particular form used here was first specified by Working (1943) and later extensively used by Leser (1963) who related budget shares linearly to the logarithm of income:

$$(1) \quad W_j = \alpha_j + \beta_j \text{Log } Y$$
$$\text{where } W_j = P_j Q_j / \sum_{j=1}^n P_j Q_j = P_j Q_j / Y$$

or  $W_j$  = budget share of item  $j$ ,  $P_j Q_j$  = expenditure on item  $j$ ,  $\sum_{j=1}^n P_j Q_j$  = total household expenditure.  $\beta_j$  is the slope and  $\alpha_j$  is the intercept term of the budget share equation. In this specification, total expenditure is assumed to be equal to households' income. We will utilize this specification since it satisfies the adding up requirement.

## SPECIFICATION OF EXPENDITURE FUNCTIONS

Given the budget share equation specification in (1), the socio-demographic characteristics of households are introduced on the right-hand-side of the equation in the form of (0, 1) dummy variables. For example, to assess the influence of households' region of location—Northeast, Northcentral, South, and West—on their expenditures on product  $j$ , three regional dummy variables are used. The dummy variable  $D_1$  is assigned a value of 1 if the households

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reside in the Northeast; otherwise,  $D_1$  is assigned a value of zero. The dummy variable  $D_2$  is given the value of 1 or 0 depending upon whether or not the household lives in the Northcentral region of the country. Finally,  $D_3$  is assigned 1 if the family resides in the South. The dummy variable for the Western regional location of households is suppressed to avoid perfect multicollinearity. Thus, the regional location variable is used in the form of three intercept dummy variables. This specification allows estimation of four different intercepts for each

**TABLE 1**  
Dummy Structure for Budget Share Equations

Variable		Dummy Structure			
		$D_1$	$D_2$	$D_3$	
1. Region of Location	Northeast	1	0	0	
	Northcentral	0	1	0	
	South	0	0	1	
	West	0	0	0	$D_4$
2. Rural/Urban Base	Urban	1			
	Rural	0			
3. Household Size (HS)	HS 1	1	0	0	0
	1 < HS ≤ 2	0	1	0	0
	2 < HS ≤ 4	0	0	1	0
	4 < HS ≤ 6	0	0	0	1
	6 < HS	0	0	0	0
4. Marital Status	Married	1			
	Unmarried, separated, divorced	0			
5. Race	White & Other than Black	1			
	Black	0			
6. Education of Household Head	None/Grade School only	1	0		
	High School	0	1		
	College	0	0		
7. Education of Spouse	None/Grade School only	1	0		
	High School	0	1		
	College	0	0		
8. Age of Household Head	Age < 35	1	0		
	35 ≤ age < 65	0	1		
	65 ≤ age	0	0		
9. Sex of Household Head	Male	1			
	Female	0			
10. Employment Status of Household Head (male)	Not Working	1			
	Working	0			
11. Employment Status of Spouse (or female)	Not Working	1			
	Working	0			

budget shares equation—one corresponding to each one of the four regions in the country. Various other socio-demographic characteristics of households that are believed to influence their expenditure patterns are also used in the (0, 1) dummy variables format so as to permit the intercept of budget shares equations to change. The dummy structure is given in Table 1.

The choice of the appropriate income concept is not easy from the empirical point of view. Friedman (1957) has argued that consumption is determined more by permanent than by actual measured income. Indeed, in their analysis of the 1960–61 CES data, Houthakker and Taylor (1970) decided to use total expenditure rather than income as the explanatory variable. Their decision was based on the principal components analysis which showed that the first factor loading was much more closely correlated with total expenditure than with income. Hence, total current expenditure is used as the explanatory variable in the empirical work that follows.

The estimated budget share equation for a typical item  $j$  is given below

$$(2) \quad W_j = \alpha_j + \beta_j \log Y + c \text{ Region} + d. \text{ Age} + e. \text{ Sex} + f. \text{ Marital status} + g. \text{ family size} + h. \text{ Urban/Rural location} + k. \text{ Race} + l. \text{ Education of the household head} + m. \text{ Education of the spouse} + n. \text{ Employment status of the household head} + o. \text{ Employment status of the spouse} + u$$

where  $\beta$ ,  $c$ ,  $d$ ,  $e$ ,  $f$ ,  $g$ ,  $h$ ,  $k$ ,  $l$ ,  $m$ ,  $n$ ,  $o$  are the parameters of the exogeneous variables and  $\alpha$  is the constant term. The error term  $u$  is assumed to be normally distributed.  $Y$  is the total household expenditure or permanent income.

#### ESTIMATION OF BUDGET SHARE FUNCTIONS

The expenditure functions are estimated for various items of personal consumption expenditures. The cross-section data from the 1972–73 Consumer Expenditure Survey (CES) conducted by the Bureau of Labor Statistics (1978) are used for this purpose. Nearly 20,000 households participated in this survey, either during 1972 or 1973 calendar years. Their responses are used in the statistical analysis that follows.

The 1972–73 survey reports current expenditures on 1,651 distinct items of consumption which are matched with 80 categories of personal consumption in the national income accounts.<sup>4</sup> A drawback of cross-section data is that they are unsuited to estimate the price effects. In general, there is not enough variation in prices faced by various households participating in a survey. Furthermore, much of the apparent price variation is often due to differences in product quality. On the other hand, the consumer expenditure survey data is eminently suited to study the effects of variations in income, regional location, and other socio-demographic characteristics.

Two specifications of the budget share equations are estimated. Under one specification, the aggregate expenditure is the independent variable in addition to the 11 socio-demographic variables. Under the second specification, the expenditure share equations are estimated with the log of aggregate expenditure and the eleven socio-demographic variables on the right hand side. Furthermore, two alternative measures of aggregate expenditure are adopted. One measure corresponds to the CES definition; i.e. current expenditure on all items. Under the alternative measure, the value of items received without direct expense is added to current consumption expenditure of households. Ordinary least squares method is used to estimate four alternative equations for each of the commodity groups. Clearly, the budget shares of several products are determined jointly by households. Therefore, it would seem that the Generalized

Least Squares (GLS) estimation technique ought to be used. But since the same aggregate expenditure and socio-demographic variables appear on the right hand side of all equations, the GLS technique collapses to ordinary least squares (Zellner 1962). Hence the use of ordinary least squares technique is justifiable.

## FINDINGS

Since the results obtained for alternative specifications of the "income" variable are broadly similar, only those with the log of aggregate expenditures, including value of items received without direct expense, are discussed here. A summary of all regression results is presented in Table 2. In this table for each socio-demographic variable, the items which are found to be statistically significant at  $t$  value  $\pm 2$  are reported. Household income is found to be statistically significant for all items of personal consumption.

In general, the socio-demographic characteristics of households are found to be significant determinants of their expenditure patterns. Out of a total of 80 items, socio-demographic variables are not found to be statistically significant for only four items. These items are: PCE 5—food furnished to employees, 24—Owner-occupied non-farm dwellings, 61—funeral and burial expenses, and 81—other purchased intercity transportation. The expenditure on food furnished by employers is not determined by employees, hence socio-demographic variables are unlikely to affect this category of spending. The funeral and burial expenses are non-discretionary and are determined by social and religious traditions in addition to household's income. The expenditure on the other purchased intercity transportation (which consists of expenditure on luggage charges, coastal and inland waterway fares and travel agent fees, etc.) is predetermined by the decision to travel. Therefore it is not surprising that socio-demographic factors exert no direct influence on this item of household expenditure. The surprising finding is that the expenditure on owner occupied housing is independent of all socio-demographic characteristics.

Broadly speaking, the eleven socio-demographic variables can be divided into two groups. One group consisting of geographic location and demographic variables is assumed to change the household expenditure patterns by changing the households tastes or its utility function. The second group consisting of socio-economic variables; i.e. education and employment of the household head and the spouse are assumed to change the household expenditure patterns by changing the "true" prices faced by the households. It is observed that both the geographic location variables; i.e. households place and region of location significantly change the households expenditure pattern. For instance, the urban households are observed to spend larger share of their income on food—both at home and outside, clothing, personal care, furniture and other house furnishings, books, toys, sports equipment and other types of recreation and on various types of services provided by dentists, lawyers, auto maintenance and the like. As far as the region of location variable is concerned, the households expenditure patterns in the West are compared against the households in the Northeast, North Central and South. Surprisingly, it is observed that the households in the rest of the country spend less than the households in the West on food—outside the home, rental housing, farm dwellings, semi-durable house furnishings, physicians, dentists, motor vehicles other than autos, airline transportation, various types of recreational activities and foreign travel. However, the households in the rest of the country are observed to spend more than the households in the West on items like gas and electricity, gasoline and tobacco products. The households in the Northeast, in addition, spend more on purchased transportation and theatre. The households in

**TABLE 2**  
Summary of Household Budget Share Equation Results

Socio-Economic & Demographic Variables	Statistically Significant at 5%	Percent of Total Expenditure	Commodity Groups (PCE)
1. Place of Location—Urban/Rural	40	Urban Greater than Rural	3, 4, 7, 11, 12, 14, 15, 17, 18, 19, 21, 22, 25, 27, 29, 31, 33, 39, 41, 42, 43, 48, 60, 62, 69, 71, 72, 74, 75, 76, 80, 83, 84, 85, 87, 88, 89, 93, 95, 97
2. Race—White <sup>1</sup> /Black	6 30	Urban Less than Rural White Greater than Blacks	6, 40, 45, 66, 68, 70 4, 16, 18, 19, 21, 22, 27; 31, 32, 33, 39, 40, 45, 48, 49, 66, 69, 70, 71, 72, 80, 83, 84, 87, 88, 89, 92, 94, 97, 102
3. Marital Status—Married/Not Married	3 33	White Less than Blacks Married Greater than not Married	17, 38, 96 3, 4, 11, 14, 15, 17, 21, 22, 30, 32, 33, 37, 38, 39, 41, 42, 43, 45, 46, 48, 49, 66, 69, 70, 71, 72, 84, 89, 93, 95, 97, 98, 102
4. Employment Status—Male Working/not working	1 16	Married Less than not Married Working Greater than Not Working	62 3, 4, 14, 37, 39, 41, 46, 50, 51, 68, 70, 84, 86, 89, 97, 102
5. Employment Status—Female Working/not working	3 3	Working Less than Not Working Male Greater than Female Not Working	21, 22, 69 4, 42, 83
6. Sex of the Household Head—Male/Female	6 3	Less than Female Not Working Greater than Female	45, 69, 78, 79, 92, 96 7, 92, 94
7. Age of the Household Head	12 1	Less than Female Young Greater than Senior	6, 14, 32, 37, 39, 42, 43, 45, 46, 78, 79, 102 25
less than 35 yrs. (young)	20	Young Less than Senior	3, 21, 22, 33, 37, 38, 39, 40, 43, 45, 50, 51, 66, 67, 68, 72, 84, 88, 89, 97
35–65 (middle)	8	Middle Greater than Senior	11, 14, 15, 17, 18, 19, 25, 102
and 65 and older (senior)	7	Middle Less than Senior	6, 45, 50, 51, 57, 66, 68
8. Education of the Head	2	Grade School Greater than College	4, 26
Grade School	43	Grade School Less than College	3, 4, 11, 12, 14, 15, 17, 18, 19, 21, 22, 25, 27, 29, 30, 32, 33, 34, 37, 39, 41, 48, 65, 68, 69, 70, 71, 72, 78, 79, 80, 83, 84, 87, 88, 89, 92, 93, 94, 95, 96, 97, 102
High School	2	High School Greater than College	6
College			

**TABLE 2**  
(Continued)

Socio-Economic & Demographic Variables	Statistically Significant at 5%	Percent of Total Expenditure	Commodity Groups (PCE)
	31	High School Less than College	3, 7, 11, 14, 15, 17, 18, 19, 21, 22, 25, 29, 32, 33, 37, 38, 39, 41, 46, 48, 68, 69, 70, 72, 84, 87, 88, 92, 93, 95, 102
9. Education of the Spouse	2	Grade School Greater than College	34, 56
Grade School	30	Grade School Less than College	3, 4, 7, 11, 14, 15, 17, 21, 22, 25, 26, 32, 33, 37, 38, 39, 40, 41, 45, 46, 50, 51, 69, 70, 84, 85, 89, 93, 95, 97
High School			
College			
	1	High School Greater than College	56
	10	High School Less than College	3, 6, 11, 34, 37, 50, 51, 66, 67, 68
10. Region of Location	17	NE Greater than W	3, 7, 14, 16, 35, 37, 38, 40, 71, 72, 74, 75, 76, 85, 92, 94, 98
NE <sup>2</sup>			
NC			
S	27	NE Less than W	4, 6, 12, 18, 19, 25, 31, 33, 39, 47, 60, 62, 67, 68, 70, 80, 83, 84, 86, 87, 88, 89, 93, 95, 97, 104, 105
W			
	7	NC Greater than W	6, 7, 37, 38, 40, 71, 98
	34	NC Less than W	3, 4, 11, 12, 17, 18, 19, 25, 26, 33, 39, 42, 43, 47, 48, 49, 62, 67, 69, 78, 79, 80, 83, 84, 86, 87, 89, 92, 93, 94, 95, 97, 104, 105
	6	S Greater than W	7, 11, 37, 45, 71, 102
	29	S Less than W	4, 12, 25, 26, 27, 30, 31, 32, 33, 48, 49, 62, 67, 69, 72, 74, 75, 76, 78, 79, 80, 83, 84, 86, 87, 93, 95, 104, 105
11. Household size	2	1 Person Greater than 7 or more persons	91, 102
one person			
two persons			
three to four persons	16	1 Person Less than 7 or more persons	3, 6, 7, 11, 15, 26, 30, 37, 39, 56, 66, 68, 70, 72, 92, 94
five to six persons	1	2 Persons Greater than 7 or more persons	91
seven or more persons			
	28	2 Persons Less than 7 or more persons	3, 6, 7, 11, 14, 15, 21, 22, 25, 26, 30, 33, 37, 38, 39, 41, 46, 56, 66, 68, 69, 70, 72, 87, 92, 93, 94, 95
	10	3-4 Persons Greater than 7 or more	3, 6, 11, 15, 26, 37, 56, 68, 70, 72
	0	3-4 Persons Less than 7 or more	
	1	5-6 Persons Greater than 7 or more persons	91
	0	5-6 Persons Less than 7 or more persons	

<sup>1</sup>White includes all others than blacks.

<sup>2</sup>NE = North East, NC = North Central, S = South, W = West

both Northeast and Northcentral are observed to spend more on private education and the households in the south are observed to spend more on religious and welfare activities than the households in the West.

Among the demographic variables race, marital status and the household size variables are observed to influence expenditures on more items than the age and the sex of the household head variables. The race variable influences expenditure on food outside the house, personal care, vacation and other types of housing, house furnishings, utilities, drugs and dentists and other professional services, used autos and their operation and maintenance, various types of recreational activities, and religious and welfare activities. Married households spend more than the single, divorced or widowed households on a number of items in each commodity group. The sex of the household primarily influences expenditures on tobacco products, women's clothing, utilities, domestic service, drugs, inter-city transportation, some types of recreation and religious and welfare activities.<sup>5</sup> There seems to be a greater difference in the expenditure pattern of the young and the senior households than between the expenditure patterns of the middle and the senior households. Young households are observed to spend less than the senior households on food at home, personal care, semi-durable house furnishings, utilities, drugs and hospitals, automobile and parts, and some recreational activities but more on rental housing. The expenditure patterns of households with more than 3-4 persons are not found to be different from the households with 7 or more persons. Single person households are observed to spend less than large households on food at home, tobacco products, men's clothing, farm dwellings, kitchen appliances, utilities, brokerage charges, new autos and parts, gasoline, auto insurance, theaters and clubs but more on movies and religious and welfare activities. Two person household expenditures differ for food, clothing, personal care, rented housing, household furnishings and utilities, automobile and related expenditures, and recreational activities.

Among the socio-economic variables, the education variable seems to influence household expenditures on a much wider array of items than the employment variable. Surprisingly the difference between the expenditure patterns of the households headed with persons with grade school or college level education is almost as significant as between the households headed by the persons with high school or college level education. Finally, the employment status of the household head or spouse does not seem to affect the expenditures on too many items. The employment status of females seems to directly affect expenditures on only a few items such as food-away-from-home, domestic service, drugs, railway and bus transportation and reading materials. This confirms the conclusion of Stober (1977) and Vickery (1979) that it is the income level which affects the household expenditure patterns, and not who earns it.

#### FOOTNOTES

1. The first approach is illustrated in Robert A. Pollak and Terence J. Wales (1978). The proposition that demographic characteristics affect "true" prices and "permanent" incomes is to be found in the works of Becker and Stigler (1977) and Becker (1965).
2. See, for example, Houthakker and Taylor (1970), Cooper and Piro (1974), Strober (1977), Vickery (1977), Espenshade (1978), and Van de Gaag and Smolensky (1980).
3. The U.S. Department of Labor, *Consumer Expenditure Survey: Interview Survey 1972-73*. Volume 2: Regional Tables, Washington, D.C., 1978, Bureau of Labor Statistics.
4. It is not always possible to match completely the CES items with the personal consumption expenditure categories. As a result, CES data are used to estimate budget share functions for 70 out of 80 categories of personal consumption expenditures. The budget share functions are estimated for the remaining 10 items using time series data. A complete listing of these 80 items of expenditures is provided in the Appendix available on request from the authors.
5. Over 95% of the households in the U.S. have male heads.

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