



HOMES

No. 2

Consumer Expenditures in Thailand:
An Application of HOMES

Andrew Mason
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Robert M. Kleinbaum

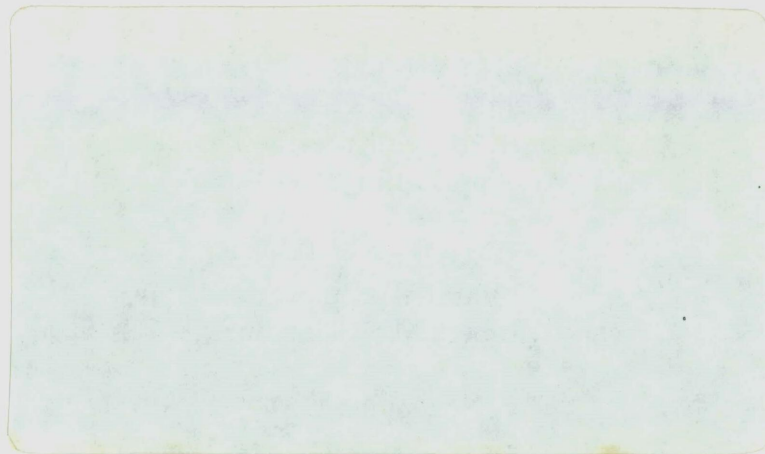
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HOMES Research Report

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**Consumer Expenditures in Thailand:
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This report was prepared in cooperation with the National Economic and Social Development Board and the National Statistical Office of Thailand as part of the Asian Development Bank technical assistance project Economic and Demographic Forecasting for the Kingdom of Thailand.

EXECUTIVE SUMMARY

This report has been prepared with two objectives in mind. The first is to report and document substantive research on consumer expenditures in Thailand. The second is to provide training material to guide other researchers who wish to carry out similar studies.

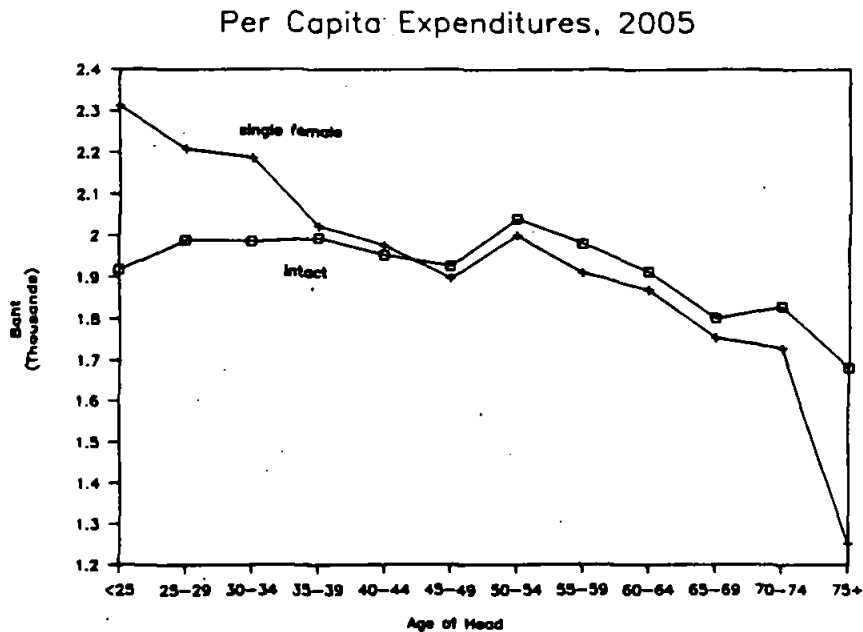
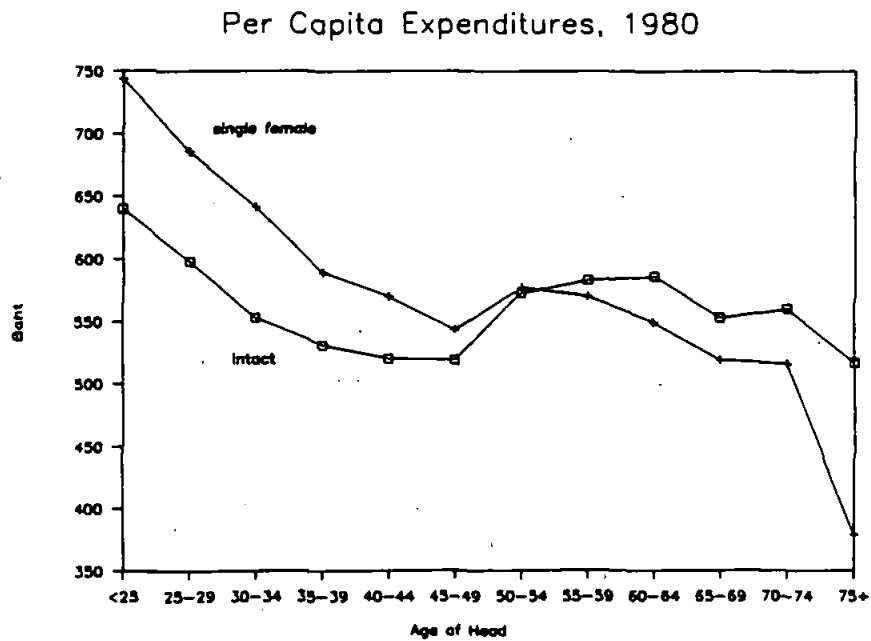
The most recent survey of household expenditures available in Thailand, the 1981 Socio-economic Survey, is analyzed to determine how rising income and changes in the demographic character of households affect the allocation of resources among alternative goods and services. The resulting statistical analysis is then combined with household projections and alternative scenarios about economic growth to forecast consumer expenditure to the year 2005. The findings of the research are described in detail in the text, and methodologies for deriving them are included in the appendix. Some of the major findings concerning changes in household budget allocations are summarized and illustrated here.

Per capita disposable expenditure is expected to rise as a consequence of general improvements in the standard of living in Thailand. The base forecast assumes that per capita expenditure will grow at four per cent per annum due to general increases in productivity. But in addition to this growth, per capita expenditure per household will change in response to changing demographic characteristics. For example, declines in family size lead to additional increases in per capita expenditure depending on the age and sex of the members.

Overall, per capita expenditure by intact family households is forecast to grow at around five per cent per annum depending on the age of the household head. This appears to be true as well as for households headed by single females (Figure 1). The greatest increases are among intact households with large families and low per capita expenditure in 1980. For example, in 1980, for intact households headed by males 45–49 years of age per capita expenditure was around 520 baht; by 2005 it is forecast to be around 1,900 baht, representing annual growth rate of about 5.2%. The smallest increases are forecast for households with few children living at home, i.e., households with older heads; those with heads in their late sixties grow at about 4.7 per annum. As a result of this differential growth pattern, earnings per capita exhibit fairly small variation by age of head in 2005.

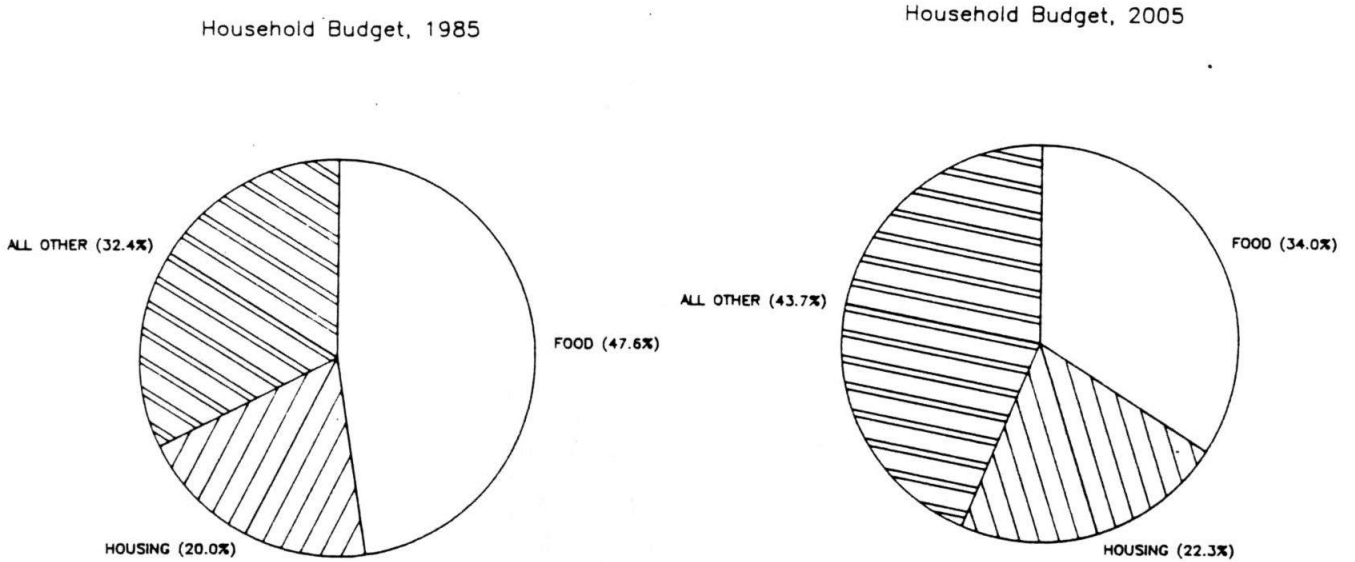
Total monthly private expenditures are forecast to rise from a value of about 26 billion baht per month in 1980 to nearly 133 billion baht per month in 2005, representing a growth rate of about 6.5% per annum. The most rapid growth of private expenditures, 7.1% per annum, is forecast for the 1980–1985 interval. By the end of the forecast interval, 2000–2005, the rate of growth has slowed to 5.9% per annum.

Figure 1. Per Capita Expenditures, 1980 and 2005



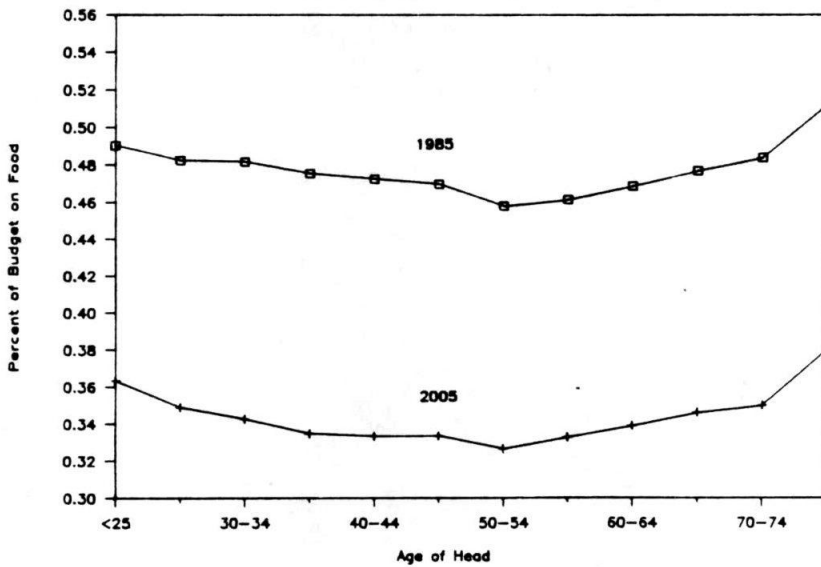
The most significant change forecast for 2005 is the dramatic decline in the importance of food and alcoholic beverages – from over half the family’s budget in 1980 to only one third of the budget in 2005 (Figure 2). Although in percentage terms, expenditures on food and non-alcoholic beverages grows more slowly than do expenditures on other goods and services, the absolute increase is greatest: monthly expenditures on food rise from about 13 billion baht per month in 1980 to 45 billion baht per month in 2005.

Figure 2. Household Budget, 1980 and 2005



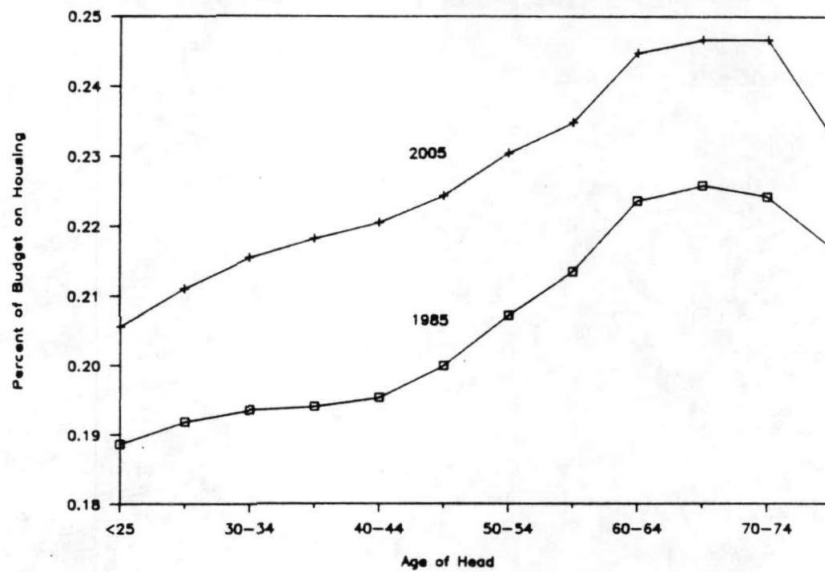
The overall decline in the proportion of the household budget devoted to food is uniform across all household-head age categories: in every age group the same magnitude decline is evident (Figure 3).

Figure 3. Age Profile of Food Expenditures



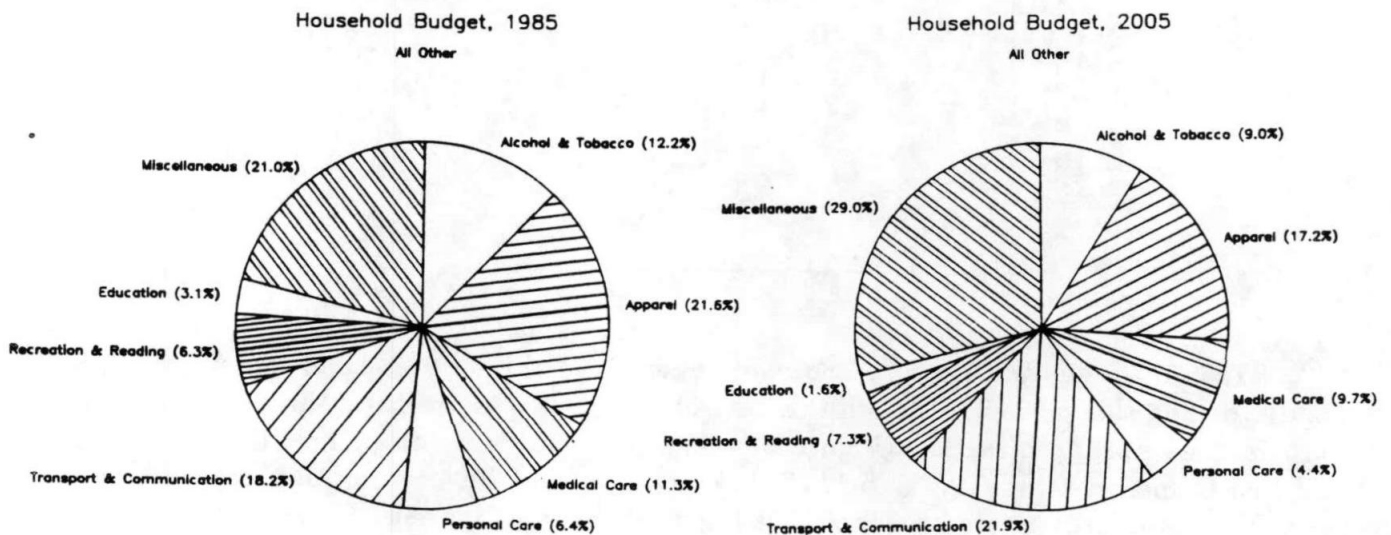
Expenditure on housing and household operations also is forecast to increase significantly during this period, although this rate of change is less dramatic than that for food and in the opposite direction (Figure 2). The percentage of the budget for housing is forecast to increase from 19.4% to 22.3% between 1980 and 2005; as for food expenditures, this shift is uniform across household-head age categories (Figure 4).

Figure 4. Age Profile of Housing Expenditures



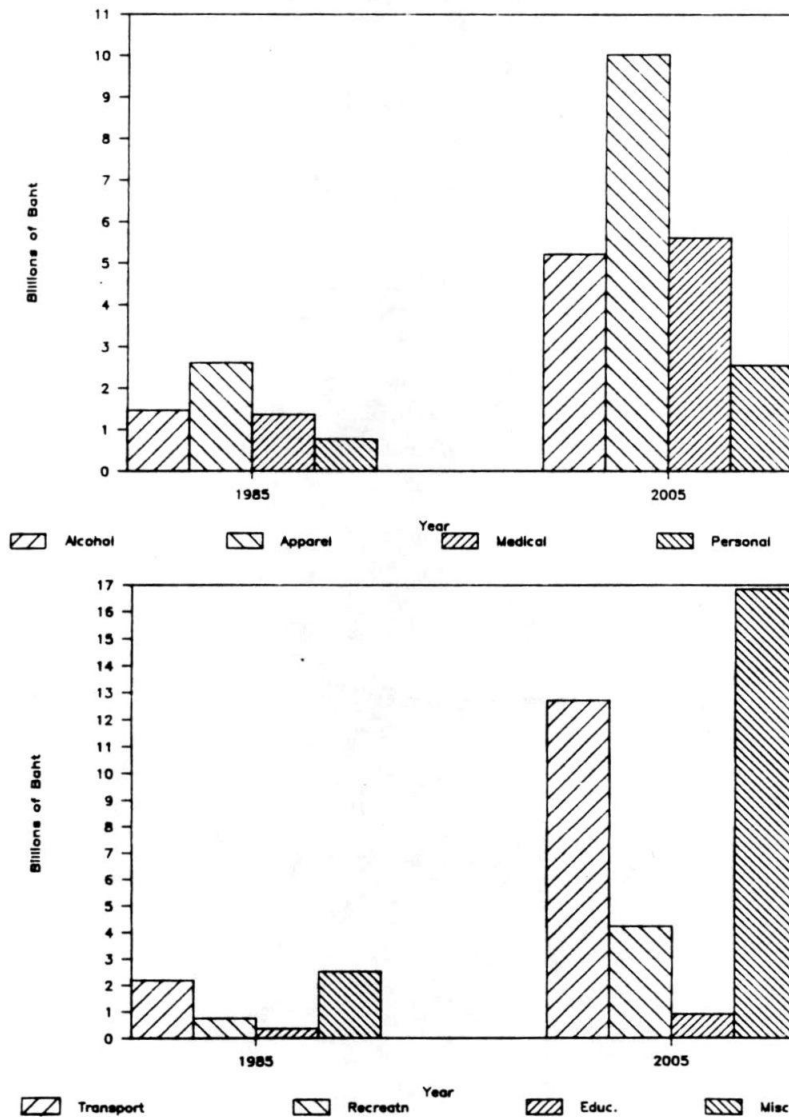
The share of the household budget devoted to non-food or housing items also is expected to shift significantly as monthly expenditures for these items increase, from about 32% in 1985 to nearly 43% in 2005. The most notable increases are allocations for miscellaneous (forecast to increase by about 8%) and transport and communication (nearly a 4% increase); the percentage of the budget allocated for recreation and reading also is expected to increase but by a lesser amount (1%). In each of these categories total expenditure is forecast to increase ten-fold over the 25-year period. On the other hand, allocations for apparel and alcohol and tobacco drop significantly from about 3% for alcohol and tobacco to over 4% for apparel; allocations for medical care, personal care, and education each decrease by about 1 1/2% to 2% (Figure 5).

Figure 5. Nonfood/Nonhousing Budget Allocations, 1985 and 2005



Forecast growth in monthly expenditures for all major budget items except food and housing are illustrated below (Figure 6). The greatest increases, in percentage terms, are anticipated for transportation and communication, recreation and reading, and miscellaneous items; in each category, total expenditure is forecast to rise ten-fold over the twenty-five year period.

Figure 6. Forecast Monthly Expenditures for Nonfood/Nonhousing Budget Items



Changes in expenditure shares can be attributed to two broad causes: economic growth and demographic change. Analysis of forecasts demonstrates that expenditures are influenced more by economic growth than by demographic factors.

These research results, described in considerably more detail in the text, are obtained through extensive analysis that involves the following steps: (1) specification of expenditure equations; (2) preparation of survey data; (3) statistical analysis; and (4) forecasting. Each of these steps is described in full detail in the appendix so that an appropriately trained

research could replicate our analysis or carry out a similar one for a different situation.

In some cases the research involves standard and well-known procedures. For example, statistical analysis employs ordinary least squares regression techniques taught in introductory graduate courses in econometrics. There are a variety of statistical packages that can be used to carry out this analysis; listings of the programs we employed are provided in an appendix to document fully the procedures used here.

Some of the research methods are quite specialized and have not been used previously by other researchers. In particular, the research involves the development of new procedures that use input from the household projection package, HOMES, to forecast expenditures. A full description of the program, including a listing, has been included as an appendix to the report.

PART I. SURVEY ANALYSIS

Specification of Expenditure Equations

Three broad sets of factors can be identified that determine the likely course of consumer expenditures in any country. First, rising income induces changes in expenditure patterns as households devote a smaller share of their resources to necessities and a greater share to luxuries. Second, price changes lead households to substitute items that are less expensive for those that are more. And, third, changing demographic characteristics bear on expenditure decisions as households respond to the changing needs of family members.

Ideally, any analysis of consumer expenditure data would incorporate each of these factors. Quite frequently and in the analysis presented here, however, income and demographic effects are analyzed whereas price effects are not. There are two reasons why price effects are ignored. First, it is difficult to analyze price effects accurately using survey data for a single year because regional price differences may be small and are difficult to measure. Second, even if reliable estimates of price effects are obtained, it is very difficult to forecast changes in price. To estimate price changes in a closed economy requires analysis of both the demand and supply side and simultaneous forecasting of price and expenditure. In an open economy, prices are determined by the world market for which there are no generally accepted price forecasts. Thus, the forecasts presented here are agnostic with respect to price changes, i.e., forecasts are based on the presumption that *relative* prices will not change.

In addition to income and demographic variables, the specification of the expenditure equations also includes control variables that capture important characteristics of the household but do not vary systematically over time. These factors explain differences among households but have an unchanging effect on forecast aggregates.

The general form of the expenditure equation to be estimated is:

$$\begin{aligned} s_i = & \beta_0 + \beta_1 \ln Y/N + \beta_2 (\ln Y/N)^2 + \beta_3 AGE + \beta_4 AGE^2 \\ & + \beta_5 FEM + \beta_6 ONEM + \beta_7 ONEF \\ & + \beta_8 N_1 + \dots + \beta_{7+k} N_k + \beta_{8+k} X_1 + \dots + \beta_{7+k+j} X_j + e \end{aligned} \quad (1)$$

where s_i is expenditure on category i divided by total expenditure, Y/N is per capita disposable income, AGE is the age of the household head, FEM is a dummy variable that takes the value of one for households headed by a woman, $ONEM$ and $ONEF$ are dummy variables for men and women living by themselves, N_k is the number of household members in age and sex category k , and X_j is a control variable.

The functional form of the expenditure equations is selected so that it does not violate axioms of consumer demand theory and is sufficiently flexible to capture the determinants of expenditures in a variety of settings. An attractive feature of the specification is that

it is easy to estimate, to interpret, and to use for forecasting. The choice of specification was based on a number of considerations. The effect of income on the demand for a good is generally measured by income elasticity, the percentage change in expenditure on the good induced by a one percent increase in income. Some specifications assume that the income elasticity for each good is constant; however, income elasticity must vary with the household's income for the household's budget constraint to be satisfied. The specification employed here allows for income elasticity to vary with the level of income. The income elasticity, η_i , can be calculated using estimated coefficients from the share equation:

$$\eta_i = 1 + \frac{\beta_1 + 2\beta_2 \ln Y/N}{s_i}. \quad (2)$$

A variety of specifications have been proposed for including demographic effects in expenditure equations. The most widely discussed issue is whether demographic translating or demographic scaling is the most appropriate specification. The idea behind translating is that an additional household member requires certain expenditures that are essentially independent of the overall standard of living of the household. For example, a new born child costs so much for food, clothing, *et cetera*, in the same sense that a particular good costs the same amount irrespective of the characteristics of the household purchasing it. The idea behind scaling, on the other hand, is that members have a claim on household resources that varies with their demographic characteristics. For example, a child might "require" 50 percent of the expenditure that an adult would "require" irrespective of the level of income. Thus, the cost of any member will vary in direct proportion with the household's income. The specification employed here uses demographic scaling because the impact on any expenditure category of a change in the number of members of type k varies in direct proportion with total expenditures.

In addition, the specification employed here allows for scale economies. The extent of scale economies can be judged by calculating the impact of an equal percentage increase in the number of members of all types using the estimated coefficients of the number of members.

The age categories used to distinguish household members is a matter that is based on judgment and preliminary analysis. Small age categories are used to distinguish among young members who are undergoing the greatest developmental changes. The analysis reported below uses three age categories for those under age 20, 0-2, 2-12, and 13-19, and only two age categories to distinguish adults, 20-59 and 60 and older. The specification also distinguishes the impact of male and female members, although in the case of Thailand gender differences prove to be relatively unimportant.

The age of the head of the household and its square are included to capture lifecycle effects beyond those captured by including the number of members, including the head, of each age. The clearest rationale for including the age of the head is for households in which the head is the principal earner. In a pure lifecycle model expenditure shares are determined by lifetime earnings rather than current earnings. Because earnings generally rise with the age of the household head, the difference between current and lifetime average earnings is systematically related to the age of the head. Consequently, for luxuries age of

head should be inversely related to the budget share and for necessities age of head should be positively related to the budget share. Or, equivalently, the partial effects on budget shares of per capita income and age of head should be of opposite sign.

It may be that expenditures on some goods are more closely related to lifetime earning than others. An obvious example is housing. In general, one might plausibly expect the lifecycle argument to prove more robust with expenditures on durables than on other goods. Age of head may also capture lifecycle phenomena other than the simple relationship between current and lifetime average earnings. And, in particular, age of head may pick up variation in consumption "needs" associated with the age of household members, particularly because very broad age categories are used to include adult members in the expenditure equations.

The final demographic variables included are ones that distinguish consumption patterns among different types of households, those headed by females, and men and women living alone. The principal motivation for including these variables is the fact that these different types of households are projected separately and, using the results of the analysis, forecasts of consumption patterns by type of household are provided below.

In addition to the factors described above a number of background characteristics are controlled for in the analysis undertaken here. Particular emphasis is given to occupation, socio-economic status, and place of residence.

Description of Survey

The 1981 Socio-Economic Survey was conducted throughout the Kingdom by the National Statistical Office during the 12-month period February, 1981 through January, 1982. The primary objective of the survey was to assess patterns and levels of household expenditures and income and to relate variations in expenditure patterns to differences in household characteristics.

The survey covered all private, non-institutional households. Individuals living in transient hotels and rooming houses, boarding schools, military barracks, wats (temples), hospitals, prisons, and other such establishments, as well as foreign diplomats and other temporary residents, were not interviewed.

Sampling Procedure

Information was obtained from a sample of households selected by a statistical sampling procedure to represent all private, non-institutional households in each region (the Northern, Northeastern, Central, and Southern) and the Greater Bangkok Metropolitan Area. This procedure was based on a self-weighting, stratified, three-stage sample design.

In the first stage, sample amphoe were selected as primary sampling units with probability of selection proportional to size. The total sample was 135 amphoes, scattered in 63 changwats. In the second stage, geographic areas within sample amphoes were stratified into three community types representing different levels of urbanization: municipal areas (MA), sanitary districts (SD), and villages (V). Sample blocks were selected systematically from the MA stratum, and sample villages were selected from the SD and V strata, with probability of selection proportional to their populations. In the third stage, all households

and vacant units in sample blocks and villages were listed and classified by size and occupation of the household head or as vacant. Within sample blocks, 12 addresses in municipal areas, 8 in sanitary districts and 6 in villages were selected from these listings. A similar procedure was followed for the Greater Bangkok Metropolitan Area, which includes the Bangkok metropolis, Nonthaburi, Pathumthani and Samutprakarn. At the second stage, however, communities were stratified into city core, suburbs and fringe areas.

The number of blocks and villages selected in the second stage was determined so as to give a uniform sampling rate within each community type stratum. This second-stage sample size was calculated by the following formula:

$$N_i = \frac{1}{C} \times \frac{1}{N} \times \frac{1}{P_i} \times \frac{M}{N_{ij}}, \text{ and}$$

N_i = sample size (number of blocks and villages in the i^{th} amphoe)

$\frac{1}{C}$ = overall sampling fraction

N = number of sample amphones in sub-region

P_i = probability of selecting the first-stage i^{th} amphoe in a sub-region

M_i = total number of households in the i^{th} sample amphoe

N_{ij} = number of sample households in the j^{th} block of village in the i^{th} amphoe.

The overall sampling fraction $\frac{1}{C}$ varies according to area as follows:

Area	Sampling Fraction
Greater Bangkok Metropolitan Area	1/300
Municipal areas in other changwats	1/250
Villages in sanitary districts	1/500
Villages	1/1000

A total of 12,250 sample addresses were selected for the survey. They were distributed by region and community type as follows:

Area	Total	Municipal Areas	Sanitary Districts	Villages
Northern	2,302	600	472	1,230
Northeastern	3,180	612	576	1,992
Central	2,146	468	496	1,182
Southern	1,448	624	176	648
Bangkok*	3,174	2,112	240	822
Total	12,250	4,416	1,960	5,874

*community types are city core, suburbs, and fringe areas

The total household sample was divided into twelve regionally representative sub-samples, and one sub-sample of households was interviewed during each month of the year.

Every effort was made to interview all households living in the sample dwelling units. If an interview proved to be impossible, a substitute household from the same size and occupation group was selected and interviewed. Substitutions were made if 1) after several visits, no responsible member of the household could be found at home, 2) the household was temporarily away and not expected to return during the survey period, 3) the sample address could not be found because of improper listing, 4) the dwelling could not be reached due to impassable roads or for security reasons, and 5) the household absolutely refused to be interviewed. However, no substitutions were made for vacant dwelling units.

Data Collection

One or two weeks prior to the scheduled interview period, interviewers who were permanent members of the Field Operation division working out of NSO provincial branch offices were sent out to list all households residing in sample blocks and villages. From the listing, sample households were selected. In order to obtain complete information, several visits were made. The first visit was to collect information on household composition, housing facilities, income and work experience of each household member, and expenditure on non-food consumption. Various reference periods were used for collecting data. For all goods and services, data were obtained for the preceding month. However, for items usually purchased infrequently and for income, data were obtained for the preceding 12 months. During the second half of the month, interviewers visited households every other day over a 7-day period to obtain detailed information about expenditures and consumption of food, beverages, and tobacco.

Quality Control

To provide the highest possible quality of collected data, supervisors were expected to reinterview about 10 percent of the sample households each month, and to assist interviewers as problems occurred. In addition, each completed interview was subjected to a thorough field edit, followed by a follow-up interview if the information was found to be incomplete or internally inconsistent. In this connection, a household account balance sheet was prepared for each completed interview. This balance compared total money "disbursements" with total money "receipts" for the preceding month. If the account was more than 15 percent out of balance, the interviewer was expected to revisit the household in order to reconcile the difference.

Data Editing

All questionnaires were examined for completeness and consistency. Descriptive information was coded numerically for computer processing. All expenditure and income values were converted to a monthly basis by dividing annual values by 12 and multiplying weekly values by 4.3.

Farm income was calculated as the total annual value of production less operating expenses plus rent received from renting out agricultural equipment or animals (if any). Non-farm, business income was calculated as sales less operating expenses.

Concepts and Definitions

Household was defined as:

- 1) a group of two or more related individuals who make common provision for food and other living essentials; or,
- 2) an individual living with a group of unrelated persons, not exceeding five persons. Even if the individuals shared meals, each was treated as a one-person household; or,
- 3) an individual who makes provision for his/her own food and other living essentials without having common housekeeping or financial arrangements with other persons.

Members of a household may pool their income and have a common budget. They may be related or not. Unrelated boarders or lodgers not paying for living quarters or meals, and servants receiving food, clothing, and housing as part of wages or free were counted as household members. Married children and their spouses were treated as separate households.

Unrelated boarders or lodgers and their families members, if any, paying for living quarters or meals, were treated as separate households.

Household Members – The criteria used to identify household members were:

- 1) common housekeeping arrangements
- 2) sharing of principal meals
- 3) common financial arrangements for supplying basic living essentials, and
- 4) recognition of one member as head.

If a usual member of the household was absent at the time of interview but not expected to be away for more than three months, he/she was counted as a member provided his/her income and expenditures could be recorded.

Head of Household – The head of household was the person recognized as such by other members whether he/she was responsible for financial support or welfare of the household members or not.

Household Income – The total household income includes:

- 1) wages and salaries, tips, bonuses, etc.
- 2) net profits from farming and non-farming
- 3) property income, such as land rent, royalties, interest, and dividends
- 4) transfer payments received, such as assistance payments, pensions, scholarships and grants
- 5) income-in-kind – the value of goods and services received as part of pay, home-produced and consumed (including rental value of owner-occupied dwelling), or received free from other sources, and

6) other money receipts such as insurance proceeds, lottery winnings and other windfall receipts.

Household Disposable Income – total household income less taxes paid.

Household Expenditures – total household expenditures include:

- 1) the amount spent to purchase goods and services used for living purposes;
- 2) the value of goods and services received as part of pay, home-produced and consumed (including rental value of owner-occupied dwelling), or received free from other sources; and,
- 3) the amount spent for contributions, insurance premiums, lottery tickets, interest on debts, and other non-consumption items.

Occupation – the type of work performed by a person at his/her principal job. If, during the previous 52 weeks, the respondent had more than one job, the job at which he/she worked for the greater number of weeks was recorded. If the number of weeks worked for each job was the same, the job with the highest income was recorded.

Socio-economic class – The classification of households into socio-economic groups was based on the main source of livelihood, economic activity and occupation. Ten categories are employed:

- 1) farm operators mainly owning land
- 2) farm operators mainly renting land
- 3) own-account trade and industrial workers
- 4) own-account professional, technical, and administrative workers
- 5) professional, technical, and administrative workers who worked for pay
- 6) farm workers
- 7) general workers
- 8) clerical, sales, and service workers
- 9) production workers, and
- 10) economically inactive households.

In general, socio-economic class is based on the principal source of livelihood and the employment status of the chief income earner, usually the household head. However, if the combined earnings of several members of the household represented the main source of livelihood, the classification is based on the employment status of these members. For example, if a household operated a small farm but the earnings of the household members working off the farm as common laborers exceeded farm profits (including the value of home-produced and consumed products), the household was then classified in the general worker group.

Four broad groups are employed below to describe the characteristics of the sample:

- 1) farm owners
- 2) farm renters
- 3) entrepreneurs (included all own-account workers), and
- 4) others (professional, technical, and administrative workers, farm and general workers, clerical, sales, and service workers, production workers, and economically inactive households).

Data and Estimation Procedure

Consumer expenditures were divided into 10 broad categories which with a few exceptions conform to the conventions followed by the National Statistical Office. Tobacco products and alcoholic beverages were combined into a single expenditure category and non-consumption expenditures, e.g., gifts, insurance premiums, lottery tickets, and interest payments, were combined with miscellaneous consumption expenditures. Direct taxes, counted as a non-consumption expenditure by NSO, were not included as an expenditure item.

Two alternative measures of income are used: per capita disposable income and, as a proxy, per capita expenditure. The advantage of per capita expenditure is that it is less subject to year-to-year fluctuations than income, making it a more reliable measure of permanent income. This is advantageous particularly for farm households or entrepreneurial households, which often experience wide fluctuations in income. On the other hand, using per capita expenditure for analyzing expenditures on high cost items, e.g., consumer durables, may be ill advised. Years in which a consumer purchases a car, for example, should have higher expenditure than normal because of the lumpiness of the expenditure. Thus, the use of expenditure as a proxy may lead to a downward biased estimate of income elasticity. The analysis carried out here uses both per capita expenditure and per capita disposable income as regressors.

Disposable income is the sum of all receipts, including earnings, property income, transfers, insurance proceeds, lottery winnings, and non-money income, e.g., foods produced for home consumption and the rental value of owner-occupied housing. From this value, direct taxes are subtracted to obtain disposable income.

Demographic characteristics of households are distinguished in a number of ways. First, households are distinguished using a dummy variable that takes the value of one if the head is a female and zero if the head of the household is male. One-person male households and one-person female households are also distinguished using dummy variables. Second, the demographic composition of household membership is captured using a series of variables assigned a value equal to the number of members who are males or females at selected ages. The following age categories are used for both males and females: 0-2, 3-12, 13-19, 20-59, and 60 and older. The number of members variable includes heads, as well as other household members. Third, the age of the household head and its square are included as regressors.

Finally, a series of dummy variables is employed to measure socio-economic status of the household. These variables are used in lieu of variables that measure occupation of the head and household assets. Occupation of the head is available but adequately captured by the socio-economic status variables. Household assets are not available from the survey. Socio-economic status is based on a combination of occupation and economic status. Farm owners are distinguished from farm renters and further distinguished by the size of their landholdings. Self-employed households are distinguished by whether they have employees or not. A complete description of the socio-economic variables is provided in Table 1.

Table 2 reports summary statistics for each of the variables used in the statistical analysis. Items are weighted so as to obtain a representative estimate for Thailand, as a whole.¹

The shares of consumer expenditures devoted to each category were regressed on the independent variables described above. Two sets of regressions were estimated: one using per capita expenditures as an independent variable and the other using per capita disposable income. There are no special statistical problems associated with estimating share equations. Although cross-equation information exists (the shares must sum to one), there is no loss of efficiency from using least squares regression if the right hand side variables are the same in all share equations.² An additional advantage of ordinary least squares is that calculated budget shares will always sum to one as long as the right hand side variables are identical in all share equations. The estimates presented below are obtained using weighted least-squares regression. The weights used are those calculated by the World Bank for the 1981 Socio-Economic Survey, obtained by comparing 1980 census tabulations of the number of households to sample sizes in each sampling unit (World Bank, 1985). Because a weighting scheme different from that used by the National Statistical Office of Thailand was used here, the results are not directly comparable to those in NSO publications.

The dependence of the natural log of per capita expenditure and per capita income on demographic characteristics of the household and socio-economic status was analyzed using the same independent variables, with the exception of the log of expenditure/income and its square. Again, coefficients were estimated using weighted least squares.

¹ The weighting procedure is described below.

² See Kmenta, 1971 for a discussion of seemingly unrelated regression.

Table 1. Description of Variables

Name	Definition
s_i	Expenditures on category i as proportion of total expenditures <ol style="list-style-type: none"> 1. Food and non-alcoholic beverages 2. Alcoholic beverages and tobacco products 3. Apparel and footwear 4. Housing and household operations 5. Medical care 6. Personal care 7. Transport and communication 8. Recreation and reading 9. Education 10. Ceremonies and miscellaneous items
LNE	Natural logarithm of expenditures per capita
LNE2	Square of LNE
LN Y	Natural logarithm of disposable income per capita
LN Y 2	Square of LN Y
NM i	Number of male household members in age category i
NF i	Number of female household members in age category i <ol style="list-style-type: none"> 1. Age 0-2 2. Age 3-12 3. Age 13-19 4. Age 20-59 5. Age 60 and older
F	Female head; 0 if male head, 1 if female head
OPM	One person, male (equal to 1, zero otherwise)
OPF	One person, female (equal to 1, zero otherwise)
V16	Farm operator, small landowner (equal to 1, zero otherwise)
V17	Farm operator, medium landowner (equal to 1, zero otherwise)
V18	Farm operator, large landowner (equal to 1, zero otherwise)
V19	Farm operator, small land renter (equal to 1, zero otherwise)
V20	Farm operator, large land renter (equal to 1, zero otherwise)
V21	Farm operator, fishing, forestry, etc. (equal to 1, zero otherwise)
V22	Entrepreneur, paid employees (equal to 1, zero otherwise)
V23	Entrepreneur, no paid employees (equal to 1, zero otherwise)
V24	Professional, technical, and managerial (equal to 1, zero otherwise)
V25	Laborers, farm (equal to 1, zero otherwise)
V26	Laborers, non-farm (equal to 1, zero otherwise)
V27	Clerical, sales and service workers (equal to 1, zero otherwise)
V28	Production workers (equal to 1, zero otherwise)
V29	Economically inactive (equal to 1, zero otherwise)

Table 2. Summary Statistics
1981 Socioeconomic Survey of Thailand

Variable Name	Mean	Standard Deviation	Minimum Value	Maximum Value
Budget Shares				
Food	0.5102	0.1626	0	0.9764
Alcohol & Tobacco	0.0369	0.0516	0	0.6408
Apparel	0.0665	0.0837	0	0.6781
Housing	0.1859	0.1128	0	0.9502
Medical Care	0.0320	0.0623	0	0.9458
Personal Care	0.0226	0.0176	0	0.3256
Transport & Communication	0.0539	0.0859	0	0.9294
Recreation & Reading	0.0194	0.0411	0	0.6124
Education	0.0105	0.0227	0	0.6001
Miscellaneous	0.0621	0.0953	0	0.9291
Income and Expenditure				
LNE	6.3555	0.9040	3.6775	11.5151
LN Y	6.4243	0.8078	4.1799	10.8483
Number of Members				
NM1	0.1220	0.3531	1	2
NM2	0.5685	0.8428	0	5
NM3	0.6864	1.3349	0	5
NM4	1.1809	1.1513	0	12
NM5	0.1418	0.3747	0	3
NF1	0.1353	0.3749	0	2
NF2	0.5429	0.8322	0	5
NF3	0.7159	1.3405	0	10
NF4	1.3208	1.1832	0	12
NF5	0.1833	0.4341	0	4
Household Type				
F	0.2057	0.4190	0	1
OPM	0.0380	0.1983	0	1
OPF	0.0459	0.2170	0	1
Socioeconomic Status				
V16	0.0983	0.2977	0	1
V17	0.1080	0.3217	0	1
V18	0.1393	0.3589	0	1
V19	0.0337	0.1872	0	1
V20	0.0280	0.1712	0	1
V21	0.0177	0.1366	0	1
V22	0.0308	0.1790	0	1
V23	0.1458	0.3658	0	1
V24	0.0751	0.2733	0	1
V25	0.0563	0.2388	0	1
V26	0.0193	0.1428	0	1
V27	0.0916	0.2990	0	1
V28	0.0828	0.2857	0	1
V29	0.0733	0.2701	0	1

Number of Observations = 11,892

Results of Analysis

In general terms, the statistical analysis is reasonably successful. Coefficients are estimated with a fairly high degree of accuracy. The independent variables, taken together, explain as little as three percent of the variance in the case of medical care expenditures and as much as forty percent of the variance in the case of food and non-alcoholic beverages. Of the two sets of regressions, a consistently higher percent of the variation is explained when per capita expenditures, rather than per capita income, is used as a regressor. Because expenditures on durables are not an important component of most expenditure categories, the discussion of results will focus on regressions using per capita expenditures.

The Effect of Income The relationship between per capita expenditure and the composition of expenditure is summarized in Table 3. The expenditure elasticity is the percentage increase in expenditure on a given item yielded by a one percent increase in per capita expenditure. It is calculated using the coefficients of the per capita expenditure terms as explained above.

Table 3. Effects of Income on Expenditure
Thailand, 1981

Expenditure Category	Expenditure Elasticity
Food	0.722
Alcohol & Tobacco	0.979
Apparel	1.290
Housing	1.085
Medical Care	1.299
Personal Care	0.884
Transport & Communication	1.708
Recreation & Reading	1.655
Education	1.242
Miscellaneous	1.762

All values calculated at the mean

The impact of increased income (as proxied by expenditure per capita) on the composition of the budget is generally in keeping with the results obtained in studies of other countries. Expenditures on food and beverages increase more slowly than total expenditures and its share of the budget declines as households achieve higher standards of living. By contrast, expenditures on miscellaneous items, transport and communication, recreation, and to a lesser extent, education, medical care, and apparel, consume a larger share of the budget among higher income households. The shares devoted to housing, alcohol and tobacco, and personal care are less strongly influenced by income.

For the most part, the standard errors of the coefficients that form the basis of Table 3 are relatively small, indicating that the regression coefficients are estimated with a reasonable degree of accuracy. For all expenditure categories but one, the coefficient of the squared term is significant, indicating that the impact of per capita expenditures varies with the level of per capita expenditure. However, even fairly substantial changes in per capita expenditure are not associated with changes in the sign of the partial effect.

Household Size and Scale Effects

The impact of the number of household members on the composition of the budget is assessed by calculating the predicted change in budget shares were the average number of members in each age and sex category to increase by a given percentage, holding all other variables constant. Budget shares will change as a consequence of scale economies. In general, goods that are jointly consumed are most likely to exhibit scale economies. Housing provides a clear example of a good with scale economies, because at least some rooms and facilities are shared among family members. Thus, if a household has ten percent more members (and ten percent more income), expenditures on housing would undoubtedly increase, but by less than ten percent. Thus, the budget share of housing would decline.

The impact on budget shares of a ten percent increase in average household size is shown in Table 4. Three expenditure categories exhibit scale economies: food, housing, and alcohol and tobacco products. Food and housing clearly fit the normal notion of scale economies. That alcohol and tobacco products would exhibit scale economies is somewhat puzzling.

Table 4. Household Size and Scale Effects
Thailand, 1981

Expenditure Category	Scale Elasticity
Food	-0.094
Alcohol & Tobacco	-0.149
Apparel	0.284
Housing	-0.091
Medical Care	0.009
Personal Care	0.017
Transport & Communication	0.448
Recreation & Reading	0.416
Education	0.080
Miscellaneous	0.160

All values calculated at the mean

When scale economies are present for some goods, the shares of other goods and services will increase, by definition, with household size. But the presence of scale economies may result in some goods increasing by a greater amount than others. In

percentage terms, the largest increases are for transportation and communication and for recreation and reading. Transportation is a particularly interesting category because there is clear potential for joint consumption if private transportation, e.g., personal automobile or motorcycle, is an important transportation mode, because household members can pool. Offsetting this economy, however, is the possibility that transportation requirements may be greater for larger households because it is more difficult to locate one's residence so as to minimize transportation cost. Thus, if household members rely on public transport, an increase in household size may lead to disproportionate increases in transportation expenditure. Another aspect of increasing household size may account for the disproportionate increase in recreation and reading. To the extent that members of larger families have reduced privacy, the demand for outside recreational activities may increase.

Household Composition

Statistical results show that, in general, the age composition of households has an important bearing on expenditure patterns whereas the sex composition does not. The analysis of composition is distinguished from the analysis of changes in the number of members by considering the impact on budget share of a shift in a household member from one age category to another or from male to female. The effect is calculated by taking the difference between the two coefficients that correspond to the two age-sex groups in question.

Table 5 provides a fairly complete picture of the impact on the food share of changes in composition. The first four columns quantify changes in the age composition of male or female members and the fifth column to changes in the sex composition. The first row shows the change in the share devoted to food associated with the loss of a male child two or under and the gain of a male member within the four alternative age groups. The greatest positive impact is for a child in the 3 to 12 age category – the share devoted to food increases by 0.008. The most intuitive approach to the table is probably to look at the principal diagonal which essentially shows the impact of a household member aging. As a male reaches age 3, food expenditure shifts up substantially, drops back down as he reaches his teens, is unaffected by the transition to adulthood, and rises again as he passes sixty years of age. The effect associated with a sixty year old is not statistically significant, however. The age pattern for females is surprisingly similar to that observed for males. The only substantial difference is that associated with the presence of older women.

The last column in Table 5 confirms the observation that the age pattern of consumption is quite similar for male and female members. Save for the unreliably estimated impact of an elderly male member, having a female rather than a male member in the household has no noticeable impact on food expenditure.

The main features of the regression results required for an exhaustive analysis of compositional effects are reported elsewhere and summarized here. The presence of an adult male aged 20–59 has a substantial positive impact on the consumption of alcoholic beverages and tobacco products. The presence of an elderly male or female has a substantial positive impact on expenditures on housing and household operations.

Table 5. Household Composition and Food Expenditure
Thailand, 1980

Age of Member Lost	Age of Member Gained				Female of Same Age
	3-12	13-19	20-59	60+	
MALES					
0- 2	0.008	0.001	0.001	0.006	0.002
3-12		-0.007	-0.007	-0.002	-0.001
13-19			0.000	0.005	-0.000
20-59				0.005	0.003
65+					-0.011
FEMALES					
0- 2	0.006	-0.001	-0.003	-0.006	
3-12		-0.006	-0.009	-0.012	
13-19			-0.003	-0.006	
20-59				-0.003	
65+					

Medical care expenditures are higher in households with young children. Expenditures on education are lower for households with children under 3 and higher with children aged 3 to 19. With the exception of alcohol and tobacco, the gender of household members has no apparent bearing on spending patterns.

Household Type

The share equations are specified to allow us to distinguish four type of households: family households with a male head, family households with a female head, men living alone and women living alone.³ The effect associated with household type, *per se*, is shown in Table 6, which gives adjusted mean values for each of the expenditure categories.

The details of the method by which adjusted means are calculated are not included here, but the interpretation of the adjusted means is perfectly straightforward. The adjusted means give the calculated value of expenditure shares if all variables, except those governing household type, are set to the mean value for the entire sample. This allows us to compare, for example, food expenditures of female-headed and male-headed family households were there no difference in household size or composition, per capita expenditures, or socio-economic status. It is important to understand that this is a theoretical construct intended to identify the effect of household type, *per se*. Thus, one-person household adjusted means are calculated by setting the number of member variables to their sample's mean even though one-person households cannot have five or six members. But by controlling for household size and other variables in this manner, we can quantify the unique

³ Primary individual households, groups of unrelated individuals, are treated as one-person households by the socio-economic survey. In the great majority of family households headed by a woman, the husband of the head is not present in the household.

effect associated with one-person households beyond the effect associated with variation in household size observed across all types of households.

Table 6. Household Type and Adjusted Mean Expenditures
Thailand, 1980

Expenditure Category	Male Head	Female Head	One Person Male	One Person Female	All Combined
Food	0.506	0.505	0.560	0.564	0.510
Alcohol & Tobacco	0.040	0.023	0.063	0.021	0.037
Apparel	0.065	0.072	0.058	0.076	0.067
Housing	0.184	0.191	0.176	0.198	0.186
Medical Care	0.032	0.036	0.015	0.027	0.032
Personal Care	0.022	0.025	0.025	0.026	0.023
Transport & Communication	0.057	0.051	0.034	0.024	0.054
Recreation & Reading	0.020	0.022	0.009	0.014	0.019
Education	0.010	0.013	0.011	0.008	0.010
Miscellaneous	0.064	0.062	0.050	0.042	0.062

Comparison of expenditures by family households headed by a male with those headed by a female shows moderate differences. The share devoted to food is essentially the same for both household types, but male-headed family households spend about 20 percent more on alcohol and tobacco products than do female-headed family households. Female headed households spend more on apparel, medical care, personal care, recreation, and education whereas male-headed family households spend about 6 percent more on transport and communication.

Other considerations aside, one-person households spend a substantially higher percent of their budget on food and a substantially lower percent on medical care, transport and communication, recreation, and ceremonies and miscellaneous items than do family households irrespective of the sex of the household head. Gender differences are, for the most part, similar to those observed for family households but of substantially greater magnitude. Expenditure on alcohol and tobacco products by single males is exceptionally high. Education expenditure, which is somewhat higher for single males than for single females, is the only case for which the gender pattern for one-person households is different from that for family households.

Age of Head

The age of the household head and its square are included in the share equations allowing for a non-linear relationship. For all but medical expenditures, either age or its square and usually both are statistically significant. Table 7 summarizes the age of head relationship by presenting adjusted means, which control for all variables except the age of the head. Three ages were selected – the mean age for the entire sample or 45 years of age in round numbers; one standard deviation below the mean or 30 years of age; and one

standard deviation above the mean or 60 years of age.

One noteworthy feature of these results is the well-behaved nature of the share – age of head relationship. Despite the flexibility of the function used, the estimated relationship is very nearly linear for every expenditure category over the age range shown. And in no case is there even a hint of a non-monotonic relationship.

Table 7. Age of Head and Adjusted Mean Expenditures
Thailand, 1981

Expenditure Category	Age of Head		
	30	45	60
Food	0.519	0.510	0.502
Alcohol & Tobacco	0.033	0.037	0.041
Apparel	0.076	0.067	0.057
Housing	0.177	0.186	0.195
Medical Care	0.028	0.032	0.036
Personal Care	0.026	0.023	0.019
Transport & Communication	0.060	0.054	0.048
Recreation & Reading	0.021	0.019	0.018
Education	0.012	0.011	0.009
Miscellaneous	0.049	0.062	0.076

The changes in expenditures are moderate but far from inconsequential. Over the 30-year age span shown, expenditures on alcohol and tobacco, housing, medical care, and miscellaneous items increase by ten percent or more. On the other hand, expenditures on apparel, personal care, transportation and communication, recreation and reading, and education decrease by at least ten percent and, in some cases, by substantially more.

The statistical results are not consistent with a single theoretical explanation of the relationship between age of head and expenditure shares. There are two distinct reasons why shares should vary with the age of the head. First, per capita income for young heads generally understates lifetime economic prospects because earnings rise with the age and experience of workers. From a lifetime perspective, then, households with young heads will have higher lifetime earnings than household with old heads even though current per capita incomes are identical. Consequently, households with young heads should devote a higher percentage of their expenditures to luxuries (goods with high income elasticities) and a lower percentage to necessities (goods with low income elasticities). The negative relationship between food expenditures and age is inconsistent, then, with the first theoretical explanation. Of the nine expenditure categories with income elasticities substantially different from one, only four had elasticities consistent with the age of head relationship. Clearly, age is not solely a proxy for the difference between current and lifetime resources.

A second explanation is that age is capturing demographic effects that are not adequately captured by the extensive number of demographic variables already included. The

age of the head is captured to some extent because the head is included as a household member. However, the age category for prime age adults is very broad (20-59) so that the age of the head may capture age differences within the broad range. One approach to judging this hypothesis is to compare the age relationship to the impact of substituting a member 60 or older for one 20 to 59. If this leads to a decline in the share, one might expect a negative relationship between age of head and share, as well. Again, the impact of changes in adult composition are only partially consistent with the age of head relationship. The impact of an elderly male, appropriate because most heads are men, is consistent with the age relationship in only four of ten cases. On the other hand, the impact of an elderly woman is consistent in seven cases. In four cases, the impact of a sixty year old man and a sixty year old women are the same and, in three of these cases, consistent with the share - age of head relationship.

The Effect of Control Variables

The regression equations also include a number of control variables that measure different dimensions of socio-economic status, including residence (farm vs non-farm), occupation, and wealth (size of farm). There is no simple way to summarize these findings, and as they are not of central interest here they are not included in this report.

The Determinants of Per Capita Expenditure

The analysis of the effects of household membership on expenditure described above considers the impact of adding a member given per capita income or per capita expenditure. This approach neglects a second way in which changes in membership affect expenditure - namely, that per capita expenditure itself will be influenced by household membership. For example, the loss of a prime age male should certainly lead to lower per capita expenditure. Or, the birth of an additional child should lead to lower per capita expenditure.

In order to consider the indirect impact of changes in household composition on expenditure, the statistical relationship between per capita expenditure and household composition is estimated using the same independent variables as used in the share equations above. Of course, neither per capita expenditure nor its square are included as independent variables.

Interpretation of the results of this analysis should be undertaken with some caution, however, because per capita income or expenditure may influence the size and composition of households in a number of important ways. Income may affect childbearing, for example. If, in accord with traditional economic theory, men with higher earnings are likely to have more children, the analysis conducted below will underestimate the impact of a birth on per capita expenditure or income for any particular family. Likewise, if elderly parents are more likely to live with their offspring if they have depleted their economic resources, the adverse impact of adding an elderly member to the household may be overestimated.

Detailed per capita expenditure and per capita income regression results indicate that the coefficients of the independent variables are estimated with considerable accuracy and that virtually every coefficient is significantly different from zero at the 99 percent confidence level. The independent variables, taken together, explain fifty percent of the variation in the dependent variable.

The results are quite interesting in their own right. An increase in family size leads to reduced per capita expenditures irrespective of the sex or age of the member in question. Children have the greatest impact: an additional child under age 3 reduces per capita expenditure by about one-quarter, irrespective of the sex of the child, whereas an additional child between the ages of 3 and 12 reduces per capita expenditure by about 15 percent. The addition of older members reduces per capita expenditures by smaller percentages. An alternative way of looking at the impact of family size is to consider the impact of a ten-percent increase in family size that leaves age composition unaffected. A ten-percent increase in the number of male members leads to a 2.8 percent reduction in per capita expenditure, whereas a comparable increase in female members leads to a 2.5 percent reduction.

The type of household also has a very important influence on per capita expenditure. Compared to family households with a male head, per capita expenditures of family households with a female head are 12.3 percent lower. By contrast, one-person male households have a per capita expenditure that is 52 percent higher and one-person female households have a per capita expenditure that is 35 percent higher.

Per capita expenditure bears a non-linear relationship to age of head. The peak of per capita expenditure occurs at age 38, about six percent higher than per capita expenditure for age 20 and about nine percent higher than per capita expenditure for age 60.

The relationship of per capita income to demographic variables is quite similar in all respects to the relationship of per capita expenditure and the details will not be discussed.

PART II. FORECASTS

Description of Methodology

Consumer expenditures are forecast using aggregate level demographic data generated by HOMES and exogenously supplied assumptions about growth in per capita income. Budget shares are calculated separately for intact family households, family households with female heads, male one-person households, and female one-person households. For each household type, forecasts are further broken down by the age of the household head. Of course, average budget shares for all households of each type, all households with heads of specified age, and all households combined are also calculated.

Forecast budget shares are calculated using the estimated share equations and three types of independent variables: per capita disposable expenditures, demographic characteristics of the household, and control variables.

Per capita disposable expenditure is expected to rise as a consequence of general improvements in the standard of living in Thailand. Alternative scenarios are described that reflect different assumptions about the pace of economic growth. The base forecast, which will be discussed most extensively, assumes that per capita expenditure will grow at four per cent per annum. But in addition to this growth, per capita expenditure per

household will change in response to changing demographic characteristics. Based on regression estimates of per capita expenditure, declines in family size lead to additional increases in per capita expenditure depending on the age and sex of the members.

Forecasts of the age of head, type of households, and number of male and female members in five-year age groups is a direct output of HOMES. For forecast purposes, however, we require the number of members in age groupings that do not correspond to the five-year schema. Standard demographic procedures for interpolating single-year age data from five-year age groupings are used to obtain the number of members aged 0-2, 3-12, and 13-19.⁴

The socio-economic status variables included in the regression equations are treated as control variables for purposes of forecasting. In other words, the proportion of households in each socio-economic category is held constant at the 1981 level observed for each age of head and household type group. The proportions are obtained directly from the 1981 Socio-Economic Survey.

Description of Independent Variables

Number of Members

The average number of members per household in 1980 is compared with the average number in 2005 in Table 8. Overall average household size is projected to decline from 5.3 to 3.7 members over the twenty-five year interval.⁵ The greatest declines are among households with heads aged 35-49. In 1980, for example, households with heads 40-44 averaged 6.2 members as compared with only 4.2 members in 2005. Because the greatest decline is expected among households at the peak of their family size, variation across the life cycle was considerably greater in 1980 than is expected for 2005.

The greatest part of the decline in average household size can be traced to reduced number of children per household. Table 9 illustrates this fact for intact households. Between 1980 and 2005, the number of children under 3 declines by 50 percent or more depending upon the age of the head's spouse. Similar percentage declines are registered for older children and teenagers as well. The decline in the average number of adults per household is quite dependent on the age of the head or his wife. Among older heads, the number of adults aged 20 to 59 declines by roughly one-quarter. But in the case of households with younger heads, no decline is anticipated. The number of elderly per household is not anticipated to change at all during the period in question.

⁴ Sprague multipliers are employed for this purpose.

⁵ These averages do not include primary individual households so they differ somewhat from projected values presented in Mason et al. (1987a).

Table 8. Average Number of Household Members
Thailand, 1980 and 2005

Age of Head	1980	2005
Less than 25	3.72	3.17
25-29	4.60	3.48
30-34	5.32	3.69
35-39	6.09	4.11
40-44	6.35	4.22
45-49	6.33	4.05
50-54	5.92	3.76
55-59	5.25	3.41
60-64	4.85	3.27
65-69	4.54	3.10
70-74	4.48	3.18
75 and Older	4.54	3.28
Total	5.31	3.72

Per Capita Expenditures

Per capita expenditures calculated for 1980 are presented in Table 10.⁶ One-person households, which for the most part consist of a single earner, have the highest per capita expenditure and men living alone have expenditures that are generally 20 to 25 percent above that of their female counterparts. Total household expenditures for intact households are generally about 10 to 20 percent higher than for households headed by a single female. But because single female households are smaller, their per capita expenditures are comparable to those of intact households. For younger female heads, per capita expenditures are substantially greater, whereas for older female heads per capita expenditures are substantially lower.

Younger individuals living alone generally have higher per capita expenditure than do older individuals. Men in their early thirties spend about two-thirds more than do men in their late sixties and women in their early thirties spend about 50 percent more than women in their late sixties. In the case of family households, per capita expenditure is less systematically related to the age of the household head. For intact households with heads between 25 and 74 years of age, per capita expenditure varies from 519 baht per month up to 598 baht per month. The lowest per capita expenditure occurs among households with heads in their forties whose households are at their peak size. The pattern for single female headed family households is somewhat different. Per capita expenditure is highest for women in their late twenties and early thirties, declines to a plateau at around 570 baht for women in their forties and fifties, and then drops again for women who are sixty or older.

⁶ These values are obtained using demographic data from the 1980 Census to adjust means from the 1981 Soci-economic Survey.

Table 9. Age of Members, Intact Households
Thailand, 1980 and 2005

Age of Member	Age of Spouse of Head			
	25-29	40-44	55-59	70-74
MALES	1980			
0- 2	0.38	0.18	0.15	0.15
3-12	0.82	0.98	0.42	0.51
13-19	0.09	0.86	0.47	0.21
20-59	1.08	1.34	1.36	0.67
60+	0.03	0.05	0.53	0.96
FEMALES				
0- 2	0.36	0.18	0.15	0.13
3-12	0.79	0.94	0.39	0.45
13-19	0.09	0.79	0.46	0.20
20-59	1.08	1.28	1.81	0.68
60+	0.05	0.07	0.03	1.02
TOTAL	4.77	6.67	5.77	4.98
MALES	2005			
0- 2	0.18	0.07	0.05	0.05
3-12	0.48	0.34	0.16	0.19
13-19	0.05	0.44	0.17	0.11
20-59	1.06	1.37	1.04	0.56
60+	0.03	0.06	0.52	0.96
FEMALES				
0- 2	0.17	0.06	0.05	0.04
3-12	0.47	0.32	0.14	0.16
13-19	0.05	0.41	0.16	0.10
20-59	1.06	1.27	1.47	0.51
60+	0.05	0.08	0.03	1.02
TOTAL	3.60	4.42	3.79	3.70

The simulated change in per capita expenditures is dominated by the assumed growth in productivity or living standards expected to occur independently of changes in the demographic composition of the household. As discussed above, per capita expenditures are expected to increase by four percent per year. But in addition, per capita expenditures per household are forecast to undergo additional growth in response to declines in the number of household members.

Table 10. Calculated Per Capita Expenditures
Thailand, 1980

Age of Head	Intact	Single Male Head	Single Female Head	One Person Male	One Person Female	All Combined
Less than 25	640	864	744	1989	1787	709.0
25-29	598	974	686	2236	2275	659.0
30-34	553	864	641	2566	1830	606.0
35-39	531	711	589	2275	1859	572.0
40-44	520	707	570	1827	1557	555.0
45-49	519	766	543	1707	1592	558.0
50-54	573	640	577	1704	1347	605.0
55-59	583	598	570	1637	1251	616.0
60-64	586	491	549	1656	1170	612.0
65-69	553	466	519	1528	1295	610.0
70-74	560	344	516	1506	1324	609.0
75 and Older	517	154	379	1392	1155	500.0
Total	565	636	562	1950	1483	610.0

All values in baht

Table 11 shows forecast expenditures per capita in 2005. Because one-person households do not undergo change in demographic composition, the annual growth in forecast expenditures for any age sex group is equal to four per cent.

Per capita expenditure by intact family households grows at around 5 per cent per annum depending on the age of the household head. The greatest increases are among households with large families and low per capita expenditure in 1980. For example, the growth for households with heads 45-49 years of age is 5.2 per cent. The smallest increases are forecast for households with few children living at home, namely households with older heads. Those with heads in their late sixties grow at about 4.7 per cent per annum. As a result of this differential growth pattern, earnings per capita exhibit fairly small variation by age of head in 2005. But expenditures per capita of older households lag behind those of younger households to some extent.

Per capita expenditures for single female households are also forecast to grow at about 5 per cent per annum, with somewhat less variation in the rate of growth than forecast for intact households. Expenditures by households with older heads is expected to grow at a somewhat slower pace so that in relative terms the situation of older households is forecast to deteriorate slightly over the next twenty-five years.

Table 11. Forecast Per Capita Expenditures
Thailand, 2005

Age of Head	Intact	Single Male Head	Single Female Head	One Person Male	One Person Female	All Combined
Less than 25	1919	2639	2313	5414	4863	2091
25-29	1990	3121	2209	6078	6185	2137
30-34	1987	2781	2187	6975	4976	2114
35-39	1994	2252	2022	6185	5054	2080
40-44	1953	2278	1976	4967	4234	2019
45-49	1926	2508	1897	4639	4326	2004
50-54	2040	2162	2000	4633	3662	2099
55-59	1980	2087	1910	4451	3402	2050
60-64	1913	1817	1869	4501	3180	1999
65-69	1801	1865	1757	4153	3521	1978
70-74	1829	1370	1727	4093	3599	1946
75 and Older	1681	866	1251	3783	3139	1598
Total	1965	2118	1898	5249	3955	2055

All values in baht

Forecasting Consumer Expenditures

Forecast budget shares are presented in Table 12. The most significant change is the dramatic decline in the importance of food and non-alcoholic beverages – from over half of the family's budget in 1980 to only one-third of the budget in 2005. The resources thus freed up are devoted to a number of areas – the largest increases are in miscellaneous items and ceremonies (plus 7 percentage points), transportation and communication (plus 4.6 percentage points), and housing and household operations (plus 3 percentage points). In percentage terms, expenditures on apparel, medical care, and reading and recreation also increase quite substantially. Expenditures on alcohol and tobacco products are constant at 3.9 percent of the budget and the percents devoted to personal care and education drop modestly.

Forecasts of total monthly private expenditures are presented in Table 13. From a value of about 26 billion baht per month in 1980, expenditures on all goods and services combined are forecast to reach nearly 133 billion baht per month in 2005, which represents a rate of growth of 6.5 per cent per annum. The forecast aggregates represent a gradual decline in the rate of growth of private expenditures from 7.1 per cent during the 1980–1985 quinquennium to reach 5.9 per cent during the 2000–2005 quinquennium. Although in *percentage* terms, expenditures on food and non-alcoholic beverages grows more slowly

than expenditures on any other category, the *absolute* increase is greatest. Monthly expenditures rise from 13 billion baht per month in 1980 to 45 billion baht per month in 2005. The greatest increases in percentage terms are anticipated for transportation and communication, recreation and reading, and miscellaneous items. Total expenditure in each category is forecast to rise ten-fold over the twenty-five year period tracked.

Table 12. Forecast Budget Shares
Thailand, 1980 - 2005

Expenditure Category	1980	1985	1990	1995	2000	2005
Food	0.511	0.476	0.442	0.407	0.373	0.340
Alcohol & Tobacco	0.039	0.039	0.040	0.040	0.039	0.039
Apparel	0.066	0.070	0.073	0.075	0.076	0.075
Housing	0.194	0.200	0.205	0.211	0.217	0.223
Medical Care	0.035	0.037	0.038	0.040	0.041	0.043
Personal Care	0.021	0.021	0.021	0.020	0.020	0.019
Transport & Communication	0.050	0.059	0.068	0.077	0.086	0.096
Recreation & Reading	0.018	0.021	0.023	0.026	0.029	0.032
Education	0.010	0.010	0.010	0.009	0.008	0.007
Miscellaneous	0.056	0.068	0.081	0.095	0.111	0.127

Table 13. Forecast Monthly Expenditures
Thailand, 1980 - 2005

Expenditure Category	1980	1985	1990	1995	2000	2005
Food	13,311	17,717	23,198	29,652	36,979	45,021
Alcohol & Tobacco	1,027	1,479	2,102	2,918	3,950	5,222
Apparel	1,721	2,618	3,855	5,476	7,521	10,041
Housing	5,049	7,411	10,774	15,369	21,470	29,387
Medical Care	917	1,368	2,006	2,886	4,077	5,624
Personal Care	550	779	1,086	1,479	1,965	2,555
Transport & Communication	1,316	2,205	3,592	5,652	8,599	12,723
Recreation & Reading	460	760	1,223	1,906	2,882	4,246
Education	260	375	512	661	801	916
Miscellaneous	1,468	2,540	4,284	6,997	11,035	16,848
Total Expenditure	26,079	37,253	52,633	72,999	99,279	132,583

All values in millions of baht

Economic Growth versus Demographic Change

Changes in expenditure shares can be attributed to two broad causes – economic growth and demographic change. In the model employed here, economic growth shifts budget shares away from necessities, e.g., food, and toward luxuries or goods with high income elasticities, e.g., transportation and communication. The impact of demographic change is more varied. First, the demographic compositions of households change. Because households are smaller or have different age compositions their consumption basket changes. Second, the kinds of households change. In particular, the number of households with older heads increases and, less importantly, the numbers of one-person, intact, and single-headed households change. Third, changes in the demographic composition of households affect per capita income. For example, the addition of a young member lowers per capita income which, in turn, induces a shift toward necessities and away from luxuries.

Analyses of forecasts demonstrate that expenditures are influenced more by economic growth than by demographic factors. In particular, the shift in expenditures on food, apparel, medical care, personal care, transportation and communication, recreation and reading, and miscellaneous items can be attributed almost entirely to overall economic growth. Increased expenditure on housing is about equally accounted for by demographic change and economic growth, whereas the decline in educational expenditure is a product of demographic change. The absence of change in the share devoted to alcoholic beverages is a result of demographic change and economic growth having offsetting effects.

These conclusions are based on a simple analysis made possible through repeated simulations. The impact of changes in household membership are assessed by forecasting expenditures allowing changes in household membership while holding the kinds of households and per capita income constant at the initial values used for 1980. A second simulation relaxes the restriction on the kinds of households allowing them to change as originally forecast. A third simulation allows for response in per capita income to demographic characteristics of the household, but assumes that exogeneous growth in per capita income will be zero.

The detailed decomposition of changes in budget shares is presented in Table 14. The dominance of the impact of economic growth is evident. The impact of demographic change is subdued because in most instances changes in consumption related to household membership are offset by changes in per capita income related to household membership. Changes in the kinds of households have only a negligible influence on budget shares.

Reliability

There are a number of different aspects of reliability to be assessed. Of course, the reliability of regression estimates, based on standard errors and the coefficient of determination, is one element of an overall assessment of reliability that is discussed above. There

are other important elements related to forecasting that should also be assessed.

Table 14. Decomposition of Budget Share Changes
Thailand, 1980 - 2005

Expenditure Category	Demographic Effects				Economic Growth	Total Change
	Household Membership	Age & Type of Households	Income Effects	Total		
Food	+0.011	-0.001	-0.036	-0.026	-0.147	-0.173
Alcohol & Tobacco	+0.002	-	-	+0.002	+0.002	-
Apparel	-0.006	-	+0.005	-0.001	+0.011	+0.010
Housing	+0.008	+0.001	+0.004	+0.013	+0.017	+0.030
Medical Care	-0.002	-	+0.002	-	+0.008	+0.008
Personal Care	+0.001	-	+0.000	+0.001	-0.003	-0.002
Transport & Communication	-0.007	-0.001	+0.010	+0.002	+0.043	+0.045
Recreation & Reading	-0.003	-	+0.003	-	+0.014	+0.014
Education	-0.003	+0.001	-	-0.002	-	-0.002
Miscellaneous	-0.002	+0.001	+0.012	+0.011	+0.060	+0.071

Summation Condition

One straightforward issue concerns the requirement that budget shares must sum to one. If the budget share equations are evaluated at the means of the independent variables, the calculated shares will automatically sum to one for any specification used. One advantage of the specification employed here is that the total of the budget shares equals 1 for all forecasts.

Analysis of Residuals

A second issue concerns the reliability of forecasts for particular groups. The specification of the expenditure functions employed assumes that sub-groups of the population are affected in the same way by changes in the independent variables. For example, the effect of changes in the age of head is the same for intact, female-headed, and one-person households. Income elasticity is the same irrespective of whether the household head is sixty or twenty, and so on. As a practical matter it is not possible nor is it desirable to allow for all possible interactions among the independent variables. However, if particular sub-groups are of special interest, it is important to insure that their budget shares are not systematically under or over estimated.

The forecasts presented here distinguish households by their type and by the age of their head. For each household group and expenditure category, the residual budget share is calculated as the difference between the calculated share and the observed share.

Dummy variables used in the statistical analysis insure that the budget share for any household type will not be systematically over or under predicted. But because a single age of head relationship is employed for all four household types, there may be systematic differences associated with age of head.

In general, the residual analysis shows that the age relationship for one-person households differs fairly consistently from that for family households. And, in particular, budget shares tend to be more sensitive to age for one-person households. This is not too surprising because family households usually consist of many members with differing ages and, in particular, adult members are not carefully distinguished according to their age in the specification employed.

A comparison of residuals also turns up additional "discrepancies." For example, for female type households expenditures on alcohol and tobacco products rise quite systematically with the age of the head, whereas for male type households this does not appear to be the case.

The corrective action required is very clear. When household types have distinctive age of head patterns, the statistical analysis should include age of head and its square interacted with dummy variables used to distinguish different types of households. As a general rule, different age patterns for one person households should be anticipated.

Negative shares

The specification employed does not preclude predicted negative shares and, hence, predicted negative expenditures. For some sub-groups of the household population instances of very small negative shares are encountered for two age categories of one person female households in 2005. In the particular case at hand, the values are so small that setting them to zero would have no noticeable effect. However, the existence of calculated negative shares is symptomatic of a mis-specification of the education share equation. As discussed above, the age pattern for one-person households is frequently quite distinct from that for other households and this is particularly true for education. Use of a more appropriate age specification for education expenditures by one-person households would address the negative share problem in a more rigorous and reliable manner. However, this should be accomplished while maintaining the same independent variables in all share equations.

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