A TEST OF LESER'S MODEL OF HOUSEHOLD CONSUMPTION EXPENDITURE IN MALAYSIA AND SINGAPORE

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INTRODUCTION

Econometric studies of household consumption expenditure date back to Engel's pioneering work based on Belgian household budget data.[1] Later, the subject came to occupy an important place not only in the applied econometric literature but also in the field of development planning and public policy formulations.

Estimates of expenditure elasticities have proved useful in economic planning models[2] because planners often set up consumption growth as a goal and want to know the growth patterns of the different components of consumption expenditure. For the successful implementation of development programmes, it is necessary to have some idea about the changes in consumption that are likely to occur with the rising income level.[3]

For the purpose of projecting consumption, ideally the time series data should be used. In most developing countries, however, reliable time series data on consumption are not usually available. Moreover, in most cases, available time series data do not have detailed commodity classifications. In order to avoid these problems, most of the studies in developing countries use cross-section data in analysing consumption patterns.

The present study which also uses cross-section data presents an investigation of the household consumption patterns in Malaysia[4] and

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1 E. Engel, "Die Productions- und Consumptionsverhältnisse des Königreichs Sachsen," *Bulletin de l'Institut International de Statistique* 9 (1895).

2 See, inter alia, Hollis B. Chenery and W.J. Raduchel, "Substitution in Planning Models," in Hollis B. Chenery et al., eds., *Studies in Development Planning* (Cambridge: Harvard University Press, 1971); Hollis B. Chenery and H. Uzawa, "Non-Linear Programming in Economic Development," in Kenneth J. Arrow et al., eds., *Studies in Linear and Non-Linear Programming* (Stanford, California: Stanford University Press, 1958); L. Johansen, "Savings and Growth in Long-Term Programming Models. Numerical Examples with a Non-Linear Objective Function," mimeo. (Oslo: Oslo Institute of Economics, 1964).

3 H.S. Houthakker, "An International Comparison of Household Expenditure Patterns Commemorating the Centenary of Engel's Law," *Econometrica* 28 (1957).

4 Malaysia here refers to West Malaysia or Peninsular Malaysia. As far as we are aware, no cross-section study of household consumption expenditure has been done for Malaysia.

Singapore.[5] The Malaysian study is broken down into rural and urban patterns since in dualistic economies the need to identify "rural-urban dualism" of consumption has been fully appreciated.[6] The model used in this study is the one advocated recently by Leser.[7] The time series counterpart of Leser's model, known as the "Almost Ideal Demand System" model, was developed by Deaton and Muellbauer.[8]

Other models of the Engel function where consumption expenditure on a particular item is put as a dependent variable and aggregate household consumption expenditure is put as an independent variable, that is, linear, semi-log, log-inverse, semi-log inverse, double-log, hyperbolic and double-log inverse, are tested in a larger work   which is now under preparation.

The organization of the study is as follows. First, we give a description of data sources and the concepts and definitions used in the data base. Next, we outline the model adopted and the procedure used for its estimation. Following this, we present the empirical results of the parameter estimates of the model, together with the interpretations of these results. Finally, we offer the conclusions of the study and the policy implications of the findings.

I: THE DATA

Malaysia

The Household Expenditure Survey of 1973, published by the Department of Statistics, Malaysia, is the basis for this study. This survey provides information

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5 A cross-section and time series studies of household consumption expenditure for Singapore based on 1972/73 household budget survey were conducted by Hank Lim et al. See Hank Lim et al., *A Study of Consumer Demand Patterns in Singapore 1960-1976* (Singapore: Institute of Economics and Statistics, Nanyang University, 1979).

6 See, for example, A.C. Kelley et al., *Dualistic Economic Development* (Chicago and London: University of Chicago Press, 1972).

7 See C.E.V. Leser, "Income, Household Size and Price Changes 1953-1973," *Oxford Bulletin of Economics and Statistics* 38, No.1 (February 1976): 1-10.

8 See A.S. Deaton and J. Muellbauer, "An Almost Ideal Demand System" (paper presented at SSRC Econometrics Study Group, London School of Economics, June 1978).

on average consumption expenditure on various consumption items by household expenditure class and average household size for various households corresponding to various expenditure classes. These sets of data are useful for the model of household consumption expenditure behaviour formulated in the next section of this paper.

Following is the classification of household consumption expenditure class, according to average monthly household consumption expenditure in Malaysian dollars.

Expenditure Class	Average Monthly Consumption Expenditure (in M$)
1	49 and below
2	50 -- 99
3	100 -- 149
4	150 -- 199
5	200 -- 299
6	300 -- 399
7	400 -- 499
8	500 -- 599
9	600 -- 699
10	700 -- 799
11	800 and above

This expenditure class applies to rural and urban areas, as well as to Malaysia as a whole.

For the purpose of our analysis, the following groups of consumption expenditure items are used:

Group 1: Rice
Group 2: Bread and Other Cereals
Group 3: Meat
Group 4: Fish
Group 5: Milk, Cheese and Eggs
Group 6: Oils and Fats
Group 7: Fruits and Vegetables
Group 8: Sugar
Group 9: Coffee, Tea and Cocoa
Group 10: Other Foods
Group 11: Beverages and Tobacco

Group 12: Clothing and Footwear
Group 13: Rent, Fuels and Power
Group 14: Furniture, Furnishings and Household Equipment
Group 15: Medical Care and Health Expenses
Group 16: Transport and Communication
Group 17: Recreation, Education and Services
Group 18: Miscellaneous Goods and Services

Concepts and Definitions

The concepts and definitions adopted in Household Expenditure Survey, 1973, with regard to households, household members, consumption expenditure, location of household and consumption expenditure groups, are given below.

Household and Household Members. A household is defined as a unit where a group of persons normally live together, pool their financial resources and have common eating arrangements. Nonfamily members such as servants are included as members of the household. Persons are considered as members of a household if they have stayed in that household for more than 15 days in the month in which the household was surveyed.

Consumption Expenditure. All consumption expenditure data recorded in the survey are those on the acquisition basis. Goods on hire-purchase are considered to have been bought at the time when the hire-purchase contracts are signed; or where there are no contracts, when the goods are delivered.

Consumption expenditure includes items purchased as well as those produced on own account and used in final consumption. Imputed rentals of owner occupied dwellings, consumption from own production or stocks, goods and services furnished to employees free of charge or at reduced rates, and goods received as wages in kind and as gifts are included in the estimation of household consumption expenditure.

Purchase of goods and services by households from government bodies is also considered as consumption expenditure if there is a clear link between the payment and the acquisition of the services or goods and if the decisions to make such payments are voluntary.

Items which are regarded as financial and capital transactions are not part of household consumption expenditure. The main items in this category are income taxes, disbursements in the nature of investments, gambling losses, cash grants and donations.

Location of Household. The designation of the place of residence as rural or urban in Peninsular Malaysia is based on population size and the occupations of the population. Urban areas have been defined as:

(a) towns having a population of more than 75,000 in 1957;

(b) towns having a population between 10,000 and 75,000 in 1957;

(c) towns having a population of at least 7,670 but under 10,000 in 1957;

(d) areas which do not fall into any of the above categories but have urban characteristics and where the population dependence on nonagricultural occupations is likely to be more than 60%.

All other areas are considered rural.

Consumption Expenditure Groups. The eighteen consumption expenditure groups mentioned earlier are defined as follows:

(1) Rice: rice of various qualities and types;

(2) Bread and Other Cereals: flour, biscuits, bread and bakery products, other cereals, and other cereal products;

(3) Meat: fresh meat, frozen meat and processed meat;

(4) Fish: shellfish, fresh fish, iced, chilled or frozen fish and processed fish;

(5) Milk, Cheese and Eggs: fresh milk and cream, condensed milk, milk powder, cheese and other dairy products and eggs;

(6) Oils and Fats: butter, prepared animal oils and fats, vegetable oils and prepared vegetable oils;

(7) Fruits and Vegetables: fresh fruits, frozen fruits, berries, nuts, preserved fruits, fresh vegetables, preserved vegetables, potatoes and other tubers;

(8) Sugar: various types of sugar;

(9) Coffee, Tea and Cocoa: coffee, tea, spices, chocolate, sugar confectionery, jam, marmalade, honey and other sweet ingredients;

(10) Other Foods: foods not elsewhere classified;

(11) Beverages and Tobacco: mineral water and other soft drinks, beer, wines, spirits and liquors, cigarettes, cigars, tobacco and other tobacco products;

(12) Clothing and Footwear: shirts, dresses, blouses, suits, jackets, trousers, underwear, stocking, socks, bathing suits, hats, rain coats, fabrics, yarns, sewing thread and other sewing articles, tailoring, knitting, leather footwear, nonleather footwear and repairs for footwear;

(13) Rent, Fuels and Power: imputed rent, rent of leased dwellings (including subsidized and free housing), water charges, electricity, gas, liquid fuel, and other fuels;

(14) Furniture, Furnishings and Household Equipment: furniture, floor covering, sculptures, paintings and other art objects, household textiles, other furnishing, cooking appliances, room airconditioning units, washing machines, refrigerators and freezers, sewing machines, other electrical appliances, repairs, glassware, china ceramic tableware, other kitchen utensils, electric bulbs, tools, washing powder and other cleaning materials, laundry, dyeing, insurance of household property and domestic services;

(15) Medical Care and Health Expenses: medical and pharmaceutical products, therapeutic appliances and equipment, medical services, service charges on accidents and health insurance;

(16) Transport and Communication: cars, motorcycles, bicycles, tyres, tubes, parts and accessories, repairs, petrol, motor oil, grease, insurance premiums, other expenditure in operation of personal transport equipment, railway fares, ship fares, airline fares, bus fares, taxi fares, other expenditure on purchased transport, postal services, telephone and telegraph services;

(17) Recreation, Education and Cultural Services: boats and other major durables, television sets, radios, record players, tape recorders, cassettes, musical instruments, photographic equipment, sports equipment, play equipment and toys, gramaphone records, films, other recreational goods (semidurables), parts and repairs, other recreational goods (durables), cinemas, theatres and other public entertainment, television and radio licenses, lotteries and other gambling, books, newspapers, magazines and periodicals, school and study fees, boarding fees, and other recreational, education and cultural services;

(18) Miscellaneous Goods and Services: services of barbers, beauty shops, goods for personal care, jewellery, rings and precious stones, watches, other personal goods, writing and drawing equipment and supplies, expenditure on food and beverages away from home, packaged tours, expenditure abroad, financial services and other miscellaneous services.

Singapore

The 1977/78 Household Expenditure Survey published by the Department of Statistics, Singapore, is used as the data base for this study. It contains information on household expenditure for various consumption items by expenditure

class. The classification of the expenditure class expressed in average monthly household consumption expenditure in Singapore dollars is as follows:

Expenditure Class	Average Monthly Consumption Expenditure (in S$)
1	Less than 300
2	300 -- 399
3	400 -- 499
4	500 -- 599
5	600 -- 799
6	800 -- 999
7	1,000 -- 1,499
8	1,500 -- 1,999
9	2,000 and over

For each household expenditure class, data on household consumption expenditure for a number of expenditure items are given. For the purpose of our analysis, we reclassified the various household consumption expenditure items into the following expenditure groups:

Group 1:   Rice and Other Cereals

Group 2:   Meat and Poultry

Group 3:   Fish

Group 4:   Dairy Products and Eggs

Group 5:   Vegetables and Vegetable Products

Group 6:   Fruits

Group 7:   Other Foods

Group 8:   Clothing

Group 9:   Housing

Group 10:   Transport and Communication

Group 11:   Miscellaneous Expenditure

Group 12:   Nonassignable Expenditure

The Household Expenditure Survey provides data on percentage of households of different household sizes for each expenditure class from which the average household size for various expenditure classes can be derived.

Concepts and Definitions

The following are the concepts and definitions used in Singapore's Household Expenditure Survey.

Household. A private household is defined as a person living alone or a group of two or more persons living together in the same house and sharing common food arrangements or other essentials for living. A person who lives with others but has separate food arrangements constitute a separate household.

Household Members. Household members include boarders who pay food and lodging, visitors or guests who stay with the household for at least one month, live-in domestic servants who are provided with food and members of family temporarily absent from the household. Lodgers who pay for room or living space only and not for food, visitors or guests who stay with the household for less than one month, domestic servants who do not live in or have their own food arrangements and members of the family who are away for more than one year are excluded.

Consumption Expenditure. Consumption expenditure refers to actual payments made for goods and services during the survey month, irrespective of whether the goods and services paid for have been delivered or consumed. The exceptions are:

(1) goods acquired on credit such as those from provision shops, clubs, etc., in which case consumption expenditure refers to the value of the purchases as and when they are acquired;

(2) goods obtained by households from their own shops or farms which are valued at current market prices at time of withdrawal;

(3) the costs of vacation -- travel, purchases of consumer durables and major repairs and renovation to houses carried out during the past twelve months including the survey month for which one-twelfth is taken as the expenditure.

Definitions of Consumption Expenditure Groups. The consumption expenditure groups are further subdivided as follows:

(1) <u>Rice and Other Cereals</u>: rice, flour, bread, noodles, biscuits, cakes, pastries and other cereals;

(2) <u>Meat and Poultry</u>: fresh pork, fresh beef, fresh mutton, fresh poultry, frozen poultry, processed meat products, canned meat and prepared meat;

(3) <u>Fish</u>: fresh fish, dried and salted fish, canned fish, fresh and frozen sea products, dried and salted sea products and other fish preparations;

(4) <u>Dairy Products and Eggs</u>: milk, butter, cheese and eggs;

(5) <u>Vegetables and Vegetable Products</u>: fresh leafy vegetables, fresh fruit vegetables, fresh root vegetables, dried, salted and preserved vegetables, canned vegetables, beans, peas, nuts, soya bean and other vegetable products;

(6) <u>Fruits</u>: tropical fruits, nontropical fruits, canned fruits and dried and preserved fruits;

(7) <u>Other Foods</u>: cooking oils and fats, sugar, sweets, chocolate, ice-cream, syrups, sugar preserves, coffee, tea, cocoa, soft drinks, sauces, salt and other condiments, spices and other related preparations, cooked food bought and consumed at home, cooked food bought from hawker stalls, meals taken at restaurants and other food not elsewhere classified;

(8) <u>Clothing</u>: men's outer clothing, men's underclothing, men's clothing accessories and hosiery, women's outer clothing, women's underclothing, women's clothing accessories and hosiery, boys' outer clothing, girls' outer clothing, infants' clothing, clothing materials, tailoring, haberdasheries, leather and travel goods, watches, men's footwear, women's footwear and children's footwear;

(9) <u>Housing</u>: rented accommodation, owner-occupied accommodation, minor repairs and maintenance, water, electricity and gas, hiring charges, other fuel, furniture, floor coverings, household furnishings, household appliances and equipment, radio and television, kitchen appliances and utensils, crockery and cutlery and other household durables;

(10) <u>Transport and Communication</u>: purchases of vehicles, repairs and maintenance of vehicles and other necessary costs of vehicles, public transport, other travel and transport, postage, telephone and telegram;

(11) <u>Miscellaneous Expenditure</u>: educational tuition and other fees, school textbooks, stationery, newspapers, magazines and periodicals, medical treatment, dental treatment, proprietary medicines and supplies, cinema and other entertainment fees, radio and television licences, sports goods and toys, optical and photographic goods, beer and stout, wines and spirits, cigarettes, other tobacco products, domestic services, laundry and cleaning, soap and detergents, other nondurable household goods, food for animals and pets, seeds, plants and flowers, stamp-collecting and other hobbies, holiday expenses and others.

(12) <u>Nonassignable Expenditure</u>: pocket money to children, personal expenses of members and other nonassignable expenditure.

II: THE MODEL AND ESTIMATION PROCEDURE

Lesser's model of household consumption expenditure is presented in the following forms:

$$(1) \quad \omega_i = \alpha_i + \beta_i \log C + \mu_i \quad \text{(Model I)}$$

$$(2) \quad \omega_i = \alpha_i + \beta_i \log C + \lambda_i \log Z + \mu_i \quad \text{(Model II)}$$

where ω_i is the budget share of the household for the i-th item, C is the aggregate household consumption expenditure, Z is the average household size and μ_i is the residual error term. α_i , β_i and λ_i are the parameters to be estimated.

A multivariate regression model representing the above forms of the Engel function can be written as:

$$(3) \quad y = \chi\beta + \mu$$

where y is a vector of η individual observations on the dependent variable of the particular Engel function, χ is the η x Ω matrix of η observations on the Ω independent variables. Ω being equal to 2 for the first model and 3 for the second model. β is the coefficient vector and μ is a vector of η disturbances.

It is assumed in this model that the disturbances have zero mean and constant variance and are independently distributed, which implies

$$(4) \quad E\mu = o, \quad E\mu\mu' = \sigma^2 I .$$

If the η individual observations were available, we could apply the Ordinary

Least Squares (OLS) method to (3) in order to obtain the best linear unbiased estimates of α_i , β_i and λ_i . In Malaysia and Singapore, the household expenditure surveys do not provide us with such data. Because of this, we have to estimate these parameters of the Engel function using the grouped data.

In the context of grouped data of household consumption expenditure, the original η observations are assumed to be grouped into κ expenditure classes giving arithmetic means of different expenditures in each expenditure class. The regression model depicted by equation (3) in terms of grouped means can then be written as

$$(5) \quad \bar{y} = \bar{\chi}\beta + \bar{\mu}$$

where $\bar{y} = Gy$, $\bar{\chi} = G\chi$, and $\bar{\mu} = G\mu$, G being the Prais-Aitchison's grouping matrix.[9] This grouping matrix is such that

$$(6) \quad (GG')^{-1} = \begin{bmatrix} f1 & & & 0 \\ & f2 & & \\ & & & \\ 0 & & & f\kappa \end{bmatrix}$$

where f1, f2, ..., fκ are the relative frequencies. Multiplying equation (5) by $(GG')^{-1/2}$ we obtain

$$(7) \quad y^* = \chi^*\beta + \mu^*$$

where $y^* = (GG')^{-1/2}\bar{y}$, $\chi^* = (GG')^{-1/2}\bar{\chi}$, $\mu^* = (GG)^{-1/2}\bar{\mu}$.

9 See S.J. Prais and Aitchison, "The Grouping of Observations in Regression Analysis," *Review of International and Statistical Institute* 22, No. 1 (1954): 1-22.