

SOME ESTIMATES OF THE ENGEL FUNCTION FOR VARIOUS COMMODITIES IN MALAYSIA*

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SINOPSIS

Enam model Engel telah digunakan untuk menganggar pola-pola penggunaan isirumah di Malaysia berdasarkan data-data Kajian Perbelanjaan Isirumah 1973. Sejumlah 18 kumpulan item-item penggunaan telah dipilih untuk penganalisaan termasuk beras, roti, daging, ikan, gula dan lain-lain lagi. Kajian ini mendapati bahawa kesesuaian tiap-tiap model adalah berbeza mengikut kumpulan item-item penggunaan tertentu.

SYNOPSIS

Six models of the Engel function were used to estimate household consumption patterns in Malaysia based on the data of the Household Expenditure Survey of 1973. A total of 18 groups of consumption items were analyzed including rice, bread, meat, fish, sugar and others. The study found that the suitability of each model varies according to identified product groups.

INTRODUCTION

This study presents an investigation of the household consumption patterns in Malaysia based on the recent household budget survey conducted by the Department of Statistics.

*Malaysia here refers to West Malaysia or Peninsular Malaysia.

The results of the study might be useful to business decision makers since they offer an understanding of the market demand for various groups of commodities and services consumed in Malaysia.

Six alternative forms of the Engel function are considered in this study which can be listed as linear, semilog, double-log, log-inverse, semi-log inverse and double-log inverse. The organization of the study is as follows: First, we outline the models considered and the procedure used for their estimation. Next, we present a description of data sources and the concepts and definitions used in the data base. It is followed by the presentation of the empirical results together with the interpretation of these results.

THE MODELS AND ESTIMATION PROCEDURE

The following six models of the Engel function are chosen for the purpose of estimating the expenditure elasticities:

1. Linear

$$Y_i = a_1 + b_1 X + u_i$$

2. Semi-log

$$Y_i = a_1 + b_1 \log_e X + u_i$$

3. Double-log

$$\text{Log}_e Y_i = a_i + b_i \log_e X + u_i$$

4. Log-inverse

$$\text{Log}_e Y_i = a_i + b_i \frac{1}{X} + u_i$$

5. Semi-log inverse

$$Y_i = a_i + b_i \log_e X + c_i \frac{1}{X} + u_i$$

6. Double-log inverse

$$\text{Log}_e Y_i = a_i + b_i \log_e X + c_i \frac{1}{X} + u_i$$

Where Y_i denotes the expenditure on i -th item, X is the aggregate household consumption expenditure and u_i is the residual error terms. a_i , b_i and c_i are the parameters to be estimated.

Since the observations used are household budget data of household belonging to various expenditure (income) classes, and the fact that the sample size taken from each class is rather different from each other, the weighted least squares technique is used. The weights are the proportion of sample size of the total sample size taken from each class of household. Transforming the original data into the weighted data is done by multiplying each class expenditure by the square root of the corresponding relative frequency of households in the class.

The arithmetic means within each expenditure class are used as proxy for the geometric means. The fact that the six forms of the Engel functions considered here are not strictly comparable, the distance function rather than R^2 is used as a criterion for selecting the most suitable form of the Engel function for any commodity group.

The distance function is expressed as follows:

$$d_i^2 = \frac{1}{q-m} \sum_{i=1}^q f_i (Y_{ij} - \hat{Y}_{ij})^2,$$

where Y_{ij} is the observed level of consumption expenditure on the i -th item in the j -th expenditure class, \hat{Y}_{ij} is the corresponding expenditure estimated from a given mathematical form, q is the number of expenditure class, m is the number of explanatory variable in the given function, and f_i is the relative frequency of expenditure on the i -th item in the j -th expenditure class.

The expenditure elasticities are derived using the following formulae:

Forms of the Engel Function	Expenditure Elasticity at Means
(1) Linear	$e_i = \frac{\bar{X}}{\bar{Y}_i} b_i$
(2) Semi-log	$e_i = \frac{b_i}{\bar{Y}_i}$
(3) Double-log	$e_i = b_i$
(4) Log-inverse	$e_i = -\frac{b_i}{\bar{X}}$
(5) Semi-log inverse	$e_i = \frac{b_i}{\bar{Y}_i} - \frac{c_i}{\bar{X} \bar{Y}_i}$
(6) Double-log inverse	$e_i = b_i - \frac{c_i}{\bar{X}}$

An item is classified as "luxury" if $e_i > 1$. Conversely, an item is an "inferior" item if $e_i < 0$. Between these two extremes, an item is the "necessity" if $0 \leq e_i \leq 1$.

THE DATA

The *Household Expenditure Survey of 1973*, published by the *Department of Statistic, Malaysia*, is the basis for this study. This survey provides information on average consumption expenditure on various consumption items by household expenditure class and average household size for various households corresponding to various expenditure classes.

The 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\$)
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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 a whole.

For the purpose of our analysis, the following groups of consumption 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
- 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, Entertainment, Education and Cultural 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. Non-family 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 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 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 above categories but have urban characteristics and where the population dependence on non-agricultural 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:

Rice: rice of various qualities and types;

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

Meat: fresh meat, frozen meat, and processed meat;

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

Milk, Cheese and Eggs: fresh milk and cream,

condensed milk, milk powder, cheese and other dairy products and eggs;

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

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

Sugar: various types of sugar;

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

Other Foods: foods not elsewhere classified;

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

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

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

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 bulb, tools, washing powder and other cleaning materials, laundry, dyeing, insurance of household property and domestic services;

Medical Care and Health Expenses: medical

and pharmaceutical products, therapeutic appliances and equipment, medical services, service charges on accidents and health insurance;

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, air-line fares, bus fares, taxi fares, other expenditure on purchased transport, postal services, telephone and telegraph services;

Recreation, Entertainment, 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, gramophone records, films, other recreational goods (semidurables), parts and repairs, other recreational goods (durables), cinemas, theatres and other public entertainments, 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;

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, packages tours, expenditure abroad, financial services and other miscellaneous services.

RESULTS AND CONCLUSIONS

Tables 1 – 3 show the selected Engel functions for each commodity and their respective expenditure elasticities.

We find out that the double-log inverse form is the most appropriate form of the Engel function for *Rice, Bread and other Cereals, Fish, Milk, Cheese and Eggs, Oils and Fats, Fruits and Vegetables, Coffee, Tea and Cocoa, Other Foods, Beverages and Tobacco, Clothing*

and Footwear, Rent, Fuels and Power, Medical Care and Health Expenses, and Recreation, Entertainment, Education and Cultural Services in Rural Malaysia; for *Rice, Bread and other Cereals, Meat, Fish, Milk, Cheese and Eggs, Oils and Fats, Sugar, Beverages and Tobacco, Rent, Fuels and Power, Furniture, Furnishing and Household Equipment, Medical Care and Health Expenses, and Transport and Communication* in Urban Malaysia; and for *Bread and other Cereals, Fish, Milk, Cheese and Eggs, Oils and Fats, Fruits and Vegetables, Coffee, Tea and Cocoa, Other Foods, Beverages and Tobacco, Clothing and Footwear, Rent, Fuels and Power, Medical Care and Health Expenses, Recreation, Entertainment, Education and Cultural Services, and Miscellaneous Goods and Services* in Malaysia as a whole.

The double-log form is the most suitable form of the Engel function for *Meat, Furniture, Furnishing and Household Equipment, Transport and Communication, and Miscellaneous Goods and Services* in Rural Malaysia; for *Other Foods, Clothing and Footwear, Recreation, Entertainment, Education and Cultural Services, and Miscellaneous Goods and Services* in Urban Malaysia; and for *Meat, Furniture, Furnishing and Household Equipment, and Transport and Communication* in Malaysia as a whole.

The semi-log inverse form is found most suitable for *Sugar*, in Rural Malaysia, for *Fruits and Vegetables, and Coffee, Tea, Cocoa* in Urban Malaysia, and for *Rice and Sugar* in Malaysia as a whole.

An examination of the calculated expenditure elasticities indicate that *Meat, Clothing and Footwear, Furniture, Furnishings and Household Equipment, Medical Care and Health Expenses, Transport and Communication, Recreation, Entertainment, Education and Cultural Services, and Miscellaneous Goods and Services* are considered as "luxuries" in Rural Malaysia. In Urban Malaysia the luxury items are *Clothing and Footwear, Furniture, Furnishings and Household Equipment, Medical Care and Health Expenses, Transport and Communication, Recreation, Entertainment, Educa-*

tion and Cultural Services and Miscellaneous Goods and Services fall under the category of "luxuries" in Malaysia as a whole.

Since the comparison of expenditure elasticities based on different types of the selected Engel functions may not be very meaningful for the reason that different Engel formulations make different assumption about marginal propensity to consume and about the behaviour of expenditure elasticity, we are constrained to choose a single type of Engel function. As double-log inverse form is more general than either double-log or semi-log inverse, for the purpose of our analysis, we show preference for the double-log inverse form to carry out comparisons. The elasticities based on double-log inverse form are presented in table 4.

A perusal of Table 4 indicates the same conclusions as those derived from the perusal of Tables 1-3 with regard to the classification of various items into "luxuries" and "necessities". Some rural-urban differentials are observed. *Meat* is considered a "luxury" in rural areas but a "necessity" in urban areas of Malaysia. *Miscellaneous Goods and Services* are also considered as "luxuries" in rural Malaysia whereas in urban Malaysia they are classified as "necessities". The expenditure elasticities for *Milk, Cheese and Eggs and Recreation, Entertainment, Education and Cultural Ser-*

vices are substantially higher in rural areas of Malaysia compared to urban areas which imply that the demand for these items will be higher in rural areas than in urban areas as household income in both areas increases. Similarly, a substantially higher expenditure elasticities for *Sugar, Coffee, Tea and Cocoa and Rent, Fuels and Power* in urban areas imply that the urban household in Malaysia will demand more of these items compared to their rural counterparts as their income rises.

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TABLE I
Selected Engel Functions and Expenditure Elasticities for
Various Items in Rural Malaysia

Item	Selected Engel Function	Expenditure Elasticity
1	Double-log inverse	0.3480
2	Double-log inverse	0.7048
3	Double-log	1.3793
4	Double-log inverse	0.5655
5	Double-log inverse	1.0322
6	Double-log inverse	0.7343
7	Double-log inverse	0.8165
8	Semi-log inverse	0.2566
9	Double-log inverse	0.5700
10	Double-log inverse	0.8735
11	Double-log inverse	0.7991
12	Double-log inverse	1.2336
13	Double-log inverse	0.7817
14	Double-log	1.3873
15	Double-log inverse	1.3550
16	Double-log	1.6197
17	Double-log inverse	1.6506
18	Double-log	1.2173

TABLE 2
Selected Engel Functions and Expenditure Elasticities For
Various Items in Urban Malaysia

Item	Selected Engel Function	Expenditure Elasticity
1	Double-log inverse	0.4771
2	Double-log inverse	0.6340
3	Double-log inverse	0.9406
4	Double-log inverse	0.6399
5	Double-log inverse	0.8017
6	Double-log inverse	0.7670
7	Semi-log inverse	0.8523
8	Double-log inverse	0.4351
9	Semi-log inverse	0.7961
10	Double-log	0.9537
11	Double-log inverse	0.7075
12	Double-log	1.3981
13	Double-log inverse	0.9196
14	Double-log inverse	1.4687
15	Double-log inverse	1.3742
16	Double-log inverse	1.5407
17	Double-log	1.3640
18	Double-log	0.9105

TABLE 3
Selected Engel Functions and Expenditure Elasticities
For Various Items in Malaysia

Item	Selected Engel Function	Expenditure Elasticity
1	Semi-log inverse	0.2875
2	Double-log inverse	0.6633
3	Double-log	1.3167
4	Double-log inverse	0.5813
5	Double-log inverse	0.9478
6	Double-log inverse	0.7018
7	Double-log inverse	0.7914
8	Semi-log inverse	0.2195
9	Double-log inverse	0.6430
10	Double-log inverse	0.8744
11	Double-log inverse	0.7806
12	Double-log inverse	1.1576
13	Double-log inverse	1.1140
14	Double-log	1.3991
15	Double-log inverse	1.3308
16	Double-log	1.5752
17	Double-log inverse	1.5742
18	Double-log inverse	1.1555

TABLE 4

Expenditure Elasticities Based On Double-log Inverse Form of Engel Function for Malaysia

Item	Rural	Urban	Rural + Urban
1	0.3480	0.4471	0.2585
2	0.7048	0.6340	0.6635
3	1.3792	0.9406	1.2509
4	0.5655	0.6399	0.5813
5	1.0322	0.8017	0.9478
6	0.7343	0.7670	0.7018
7	0.8165	0.8369	0.7914
8	0.2489	0.4351	0.2007
9	0.5700	0.7975	0.6430
10	0.8735	0.9738	0.8744
11	0.7991	0.7075	0.7806
12	1.2336	1.3012	1.1576
13	0.7817	0.9196	1.1140
14	1.3137	1.4687	1.3286
15	1.3550	1.3742	1.3308
16	1.6714	1.5407	1.5716
17	1.6506	1.4152	1.5742
18	1.3136	0.9174	1.1555