FARMERS' EXPENDITURE IN GREECE: AN APPLICATION OF TRANSFORMATION OF THE VARIABLES

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SUMMARY

This paper examines Farmers' expenditure patterns in Greece for eight major categories of goods and services that together taken exhaust a large percentage of their total expenditure. The analysis is based on the Greek survey of expenditures in 1982. Barten's (1964) general model for the per capita Engel curves is specified over four traditional functional forms. The transformation of variables analysis of Box and Cox (1964) has been used in order to search for the «best» functional form for each category of goods and services considered. Results show Engel relationships to require different functional forms for different expenditures. These forms are not the frequently employed linear or log - inverse ones. Expenditure elasticities estimated at mean values of the variables in each best functional form indicate a considerable change in the allocation of total expenditure in a stated per centage increase of Farmers income.

1. INTRODUCTION

A number of studies have been made to analyse the variation in the pattern

of household expenditure across different occupational groups in an empirical context of actual observed behaviour not only to test theoretical hypothesis, but also because of the importance of and interest in the topic.

Certainly, Farm households differ in many aspects from other occupation households. These differences include income stability, its level and distribution as well as other demographic aspects, such as household size and composition. Because then of these differences it is often claimed that there are remarkable differences in expenditure patterns of households of different occupations.

The purpose of this paper is to present empirical evidence on Farmers' expenditure behaviour in Greece. Spesifically, expenditure behaviour is analysed by reference to income effects only. Other variables that determine household expenditure behaviour in cross - section data such as household size, composition and geography are treated ceteris paribus.

In section two the theoretical model that has been adopted in the study, namely Barten's (1964) model, is properly specified in order to deal well only with income effects on household expenditures. Given this theoretical model, four traditional algebraic functional forms of the reduced in the model per capita Engel curves are specified and analysed in detail.

Section three refers to the statistical material used in the analysis of Farmers' expenditures whereas in section four the empirical results obtained are described from the point of view of the variables used, the estimation technique employed the regressions and the selection of the «best» ones and finally with respect to expenditure patterns of Farm households obtained. At the final section Farmers' expenditure patterns are summarized from the point of view of the evidence received and its limitation.

2. THE NUTS AND BOLTS OF ENGEL RELATION

Barten (1964) incorporates the effects of demographic variables in household demand as following. Let the following utility function refer to the household head

1. See Prais - Houthakker (1955), Lee and Philups (1971), Coondoo, et al. (1979) and Pratschke (1984) among others.

$$U = U(Q_1, Q_2, \ldots, Qn) \tag{1}$$

With his/hers budget constraint being

$$X = \sum_{i=1}^{n} p_i q_i \tag{2}$$

Then, maximization of the utility function in (1) subject to the equation in (2) results the following demand functions of the household head

$$Q_i = q_i/m_i = D_i\ (p_1 m_1,\ p_2 m_2, \ldots, p_n m_n; X) \tag{3}$$

for $i = 1, 2, \ldots, n$ goods and services and the following definitions

$Q_i = q_i/m_i$

q_i = the quantity of the i^{th} good,

p_i = the price paid on the i^{th} good,

$m_i = m_i(N_i) = m_i(N_1, \ldots, N_T)$ being specific scales in consumption of the ith good,

N_t = the number of persons in the given household of the t^{th} age and sex group, $t = 1, \ldots, T$, and

X = total household expenditure as a proxy to income.

The demand functions in (3) in the case of cross - section data that refer to a single period and under the hyporhesis of «homogeneous» household compo-

sition [2], where $m_1 = m_2 = \ldots m_n = N$ by assumption, results the following function that took the name of the German statistician Ernst Engel who was the first to use the relation. That is, under the above assumptions the demand function in (3) yields the following per capita (N) specification of the Engel relation.

$$E_i/N = F\,(X/N) \tag{4}$$

with E_i to represent specific expenditure ($p_i\, q_i$) on the i^{th} good and N household size.

Given the general function in (4), four algebraic functional forms have been specified in the present exercise. That is, the Linear (L), Semilog (SL), Double - Log (DL) and Log - Inverse (LI) forms being as following

$$E_i/N = a + b\,(X/N) \qquad (L) \tag{5}$$

$$E_i/N = a + b \ln (X/N) \qquad (SL) \tag{6}$$

$$\ln (E_i/N) = a + b \ln (X/N) \qquad (DL) \tag{7}$$

$$\ln (E_i/N) = a + b\,(X/N)^{-1} \qquad (LI) \tag{8}$$

The above listed functional forms have been used by a number of investigators of family budgets [3] after the pioneering work of Allen and Bowley (1935) and Prais - Houthakker (1955). The economic plausibility and statistical implications of the forms are worth mentioning.

The Linear form (L) in (5) according to Allen and Bowley (1935) is explicitly

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2. See Muellbauer (1980) and elsewhere.

3. See Barten, et al. (1962), Bojer (1977), Brown and Deaton (1972), David (1962), Forsyth (1960), Houthakker (1952), Leser (1963), Nicholson (1957), Podder (1971), Prais (1952 - 53), Ramsey (1972), Salathe (1979) among others.

derived from maximization of an additive quadratic utility function [4]. On the other hand Pollak (1971) has shown that the form in (5) can be derived from Stone - Geary utility function. The Linear Engel curves satisfy «statistically» the adding - up criterion of specific expenditures to total expenditure [5] for values of the estimated coefficients such as $\sum_{i=1}^{n} ai = 0$ and $\sum_{i=1}^{n} bi = 1$. Furthermore, the L form in (5) provides an initial level of total expenditure (income) that is necessary to stimulate expenditure on the good in question ($-a_i/b_i$) and a constant marginal propensity to spend (b_i) at all levels of income. The expenditure (income) elasticity in the L form (b_iX/E_i) approximates the unit value from above (luxury good) for having total expenditure (X) to approximate its upper value, $+\infty$. The L form is easily aggregated over hoouseholds in grouped data of expenditures.

The Semilog form (SL) in (6) is an empirical one and is formulated implicitly from the per capita specification of the Engel relation in (4). The marginal propensity to spend in the SL form (b_iN/X) varies inversely proportional with income levels. Because of this property, for the case of a necessity good ($b_i>0$) the marginal propensity to spend decreases at increasing rates of X/N and approximates the zero value from above for having $X/N \rightarrow +\infty$. Thus, the law of diminishing marginal utility of the good in question applies here. The form in (6) provides for minimum income that is required before spend and income elasticity declining to zero for the case of a necessity good ($b_i>0$) for X/N at its upper level. This is also a desirable property of the SL form when data on food expenditures are considered and reference is made to Engel's law. The SL form is easily estimated when fitted to micro - observations of expenditures. The logarithmic transformation of the variable X/N reduces the problem of heteroskedasticity of the error variance [6]. However, when data of incomes and expenditures are concerned, the specification of the SL form over average data of expenditures requires the knowledge of geometric means of incomes in each of the associated cells of expenditures. This information is not given in surveys of expenditures.

The DL form in (7) is an empirical approximation to the Engel relation in

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4. Properly modified by demographic scaling of quantities of goods in Barten's model in (4). See Pollak (1971) and Pollak and Wales (1979).

5. It has been prooved by Nicholson (1957) emplrically without reference to utility considerations.

6. See Scheffe (1964).

(4) and therefore is implicitly formulated. As in the case of SL form the adding-up criterion of specific expenditures to result total expenditures is not statisfied by the estimated values of the parameters a and b [7]. The marginal propensity to spend (b_iX/E_i) increases for $b_i > 1$ with increase in X/N whereas it decreases for $0 < b_i < 1$. In the case of $b_i < 0$ the marginal propensity to spend is negative and approximates the zero value from below for having X/N at its upper limit of increase ($X/N \to \infty$). Income elasticities of goods are constant (b_i) at all levels of income [8]. As far as estimation of the DL Engel curve is concerned, the occurence of zero observations on specific expenditures in micro - observations and in, but a lesser degree, grouped data makes its estimation cumbersome. Finally, as in the case of the SL form, the DL form in (7) requires the geometric means rather than the arithmetic ones of specific and total expenditure per capita for each of household groups in the cells of grouped data of household expenditure surveys.

The LI form in (8) is an empirical approximation which takes into consideration the fact that for some goods there is a satiety level of expenditires. The form does not satisfy the adding-up criterion [9]. The marginal propensity to spend and income elasticity— the latter defined by b_iN/X— approximate the zero value for X/N at its upper value for the case of a necessity good ($b_i < 0$). The LI form for the Engel curve can be easily estimated, but one faces the problem of zero observations of the variable E_i/N as in the case of the DL and SL forms. When the LI form of the Engel curves is specified to grouped data of incomes and expenditures it requires the availability of harmonic and geometric means of the variables X/N and E_i/N, respectively.

The forms described above are generated by the following Generalized Box- - Cox Equation (GBCE) for proper values of the parameters r and s. That is, from the following equation

$$(K_i^r - 1)/r = a + b\,(L^s - 1)/s \qquad (9)$$

7. There have been some developments towards DL's economic plausibility and its proper specification for the satisfaction of the adding - up criterion. See Houthakker (1960a, 1960b).

8. Note that under the «homogeneous» household composition hypothesis expenditure (or income) elasticities estimated with values of specific and total expenditures per capita or per household are the same.

9. For Prais - Houthakker (1955) and Phlips (1974) the adding - up property of Engel curves and the presence of saturation levels in expenditures on some goods cannot coexist.

where

$K_i = E_i/N$, $L = X/N$ r and s are parameters that determine the degree and type of nonlinearity in (9) and a, b parameters to be estimated.

It is of interest of the present analysis that the packet of functional forms includes those which have been often applied in the analysis of household expenditures. Thus, the L form in (5) is the reduced form of the GBCE in (9) for $r = s = 1$. In a similar manner for $r \to 0$ and $s \to 0$ the GBCE in (9) approaches the DL form in (7). This is true when one observes that any finite and positive number say W, can be written as

$$W = e^{\ln W}$$

and that the product $e^{\ln W}$ can be expanded as

$$e^{\ln W} = 1 + \ln W + {}^1/_2! (\ln W)^2 + {}^1/_3! (\ln W)^3 + \ldots \qquad (10)$$

Given the expression in (10) the dependent variable in (9) can be expanded in a similar manner as following

$$K_i^r - 1 = 1 + r\ln K_i + {}^1/_2! (r\ln K_i)^2 + {}^1/_3! (r\ln K_i)^3 + \ldots - 1$$

or

$$(K_i^r - 1)/r = \ln K_i + {}^1/_2! \, r (\ln K_i)^2 + \ldots \qquad (11)$$

Thus, for $r \to 0$ the expression in (11) approximates [10] the $\ln K_1$ value. The same result holds true for the independent variable $(L^s - 1)/s$ in the GBCE in (9) for having $s \to 0$ in this case. Furthermore, it is true that for $r = 1$ and $s \to 0$ and for $r \to 0$, $s = -1$, the GBCE in (9) generates the SL and LI Engel curves in (6) and (8), respectively.

Before presenting the estimation technique and the results obtained for the possible size of expenditure elasticities of the eight major commodity categories for Farm households in the next section the statistical material used in this paper is described.

3. THE ANALYSIS OF DATA

The data used here is drawn from the Greek Household Budget Survey 1982 (HBS 1986). The HBS covered 6,035 households sampled between autumn 1981 and autumn 1982 in a stratified sample that covered households of different size and composition, geographical area and occupation. The survey refers to private households in Greece with households living in hotels, prisons and other collective establishments excluded[11].

The present paper is based on a special tabulation of the above described budget enquiry. This tabulation provides among other occupation group-wise estimates of average monthly per household cash, kind and total expenditure on each of the eight selected item - categories and the corresponding all - item cash and total expenditures. The occupational group of households that is of interest of the present paper refers to Farmers, Fishermen, etc. In the tabulation of expenditures of Farm households there is a cross - classification of the data by average monthly specific and total expenditures of these households. In each of the eight expenditure classes there is also information on average Farm household size and its composition. Other information of the table refers to the values of home and bussiness produced goods (in kind expenditures) for some of the eight categories of goods and services. However, the information on kind expenditures and on Farm household size and composition reported in the statistical material

10. For an exposition see Kmenta (1971).

11. The survey is comprehensively described in the official publications of the National Statistical service of Greece (NSSG, 1987).

has been not utilized in the present paper. The variable of Farm household size is not considered here as an additional variable that explains the variation of specific expenditures, but is used as a deflator [12] of both specific and total expenditure variables in the forms of the Engel curves without also to any reference to specific scales of household size to be made. On the other hand the exclusion of kind expenditures from the present consideration is justified by the presence of some serious econometric problems that are associated with the inclusion of these expenditures [13]. The statistical material for Farm households reports average expenditures in each in a monthly basis on eight categories of goods and services in each of the eight cells of households of given total average monthly expenditure and refer to 1) Food, 2) Alcoholic Drinks and Tobacco, 3) Clothing and Footwear 4) Housing, Fuel and Light, 5) Durable Goods and Services, 6) Medical and Per. sonal Care, 7) Education and Recreation, and 8) Transport and Communications. The above categories of expenditures absorb 93.9 % of total Farm household expenditure.

4. EMPIRICAL RESULTS

A. The Variables Used

Because of absence of income data as well as due to some econometric problems that are associated with the use of current disposable income most studies of family budgets use total expenditure as the proper proxy to income variable [14]. As we mentioned in the previous section both specific and total expenditure variables are expressed in cash terms. Given the purpose of this paper, income effects

12. In other worlds, we assume that household members have similar even identical needs (Muellbauer, 1980) and that there is absence of economies of scale in Farm nouseholds expenditures. However, both assumptions need some elaboration.

13. The consideration of kind expenditures in the functional forms for the Engel curves requires special attention because of the bias that is introduced in the estimated parameters. See for instance Massell (1969). Furthemore, Becker's (1965) theoretical model of household behaviour is the appropriate one in such cases rather than Barten's (1964) that is adopted in this paper. However, when interpreting the results we have to remember that there are considerable expenditures in kind in most foodstuffs items as well as in Alcoholic Drinks - Tobacco.

14. See Summers (1959), Liviatan (1961), Friedman (1957).

on Farmer's expenditures are estimated whereas household size is used to deflate the variables E_i and X.

B. Estimation

If the structural disturbance u, that is added to GBCE in (9), is normally and independently distributed with zero mean and constant variance σ^2, Box and Cox (1964) have shown that, for given values of r and s, the maximized log likelihood function of the equation in (9) except for a constant, is given by the following compressed function

$$L(r, s) = -\frac{n}{2} \ln \sigma^2 (r, s) + (r-1) \sum_{i=1}^{n} \ln K_i \qquad (12)$$

where

$\sigma^2 (r, s)$ is the variance estimate for the structural disturbances constrained on the parameters r and s and n the number of observations on the variables K_i and L.

In the present paper a numerical search over the grid of the r, s values constrained in the interval (—1,1) has been employed. The pair of values r and s that yield the weighted least squares estimates [15] of the parameters a and b giving the smallest residual variance estimator then are considered as the maximum likelihood estimates of r and s [16]. The standard errors of the regression coefficients for any given value of r and s can be obtained from the usual regression programs. These will be conditional standard errors on the assumed values of r and s. Fi-

15. Because of the heteroskedasticity of the error variance in grouped data of expendidtures each observation of specific and total expenditures has been weighted by the variable of square root of the number of households in each cell of expenditures ($H^{1/2}$). By this method of estimation the constant term in the forms in (5), (6), (7)) and (8) appears as the slope coefficient of the above defined variable $H^{1/2}$. For an exposition , see Prais and Aitcison (1954).

16. According to Zarembka (1974).

nally, the standard error of confidence interval for r and s can be obtained by the inversion of the likelihood - ratio test statistic [17].

C. Results and Expenditure Patterns

In order to have some estimates of expenditure elasticities each of the two variables E_i/N and X/N was transformed according to the GBCE in (9) by values of r and s between —1 and 1 inclusive without the consideration of any decimal values of these parameters within the interval. The Weighted Least Squares (WLS) procedure was then used to obtain estimates of the parameters a and b. The value of L_{max} (r, s) was calculated for each regression by reference to equation in (12). Expenditure elasticities were then obtained from the parameter estimates at the sample mean values of the variables E_i/N and X/N and their associated standard errors have been estimated by using Mosak's (1939) formula. Estimated expenditure elasticities and related statistics for the adopted values of r and s are reported in Table 1. The estimated constants and slope coefficients of the «best» equation, as we will see below, are of the expected sign and statistically significant. The coefficients of determination in all almost of the estimated regressions [18] are of high values, given that grouped data of expenditures have been used and the method of WLS has been followed. The likelihood functions for each of the eight categories of goods and services considered are maximized at different values of r and s. The values of $r = 1$ and $s = 0$, i.e. the SL form, are the best ones yielding the maximum likelihood function for Food, Alcohocicl Drinks - Tobacco, Clothing - Footwear whereas the values of $r = s = 0$, i. e. the DL form, are considered the best ones for the remaining goods and services. The pairs of values $r = s = 1$ and $r = 0$, $s = -1$ have been found unsatisfactory in the analysis.

The 95 % confidence interval of r and s is also reported in Table for each of the eight categories of goods and services. As it can be seen only in the case of Food and Alcoholic Drinks - Tobacco the respective confidence intervals include all of the functional forms estimated.

Let us now examine the results of regression analysis more closely in an atttempt to rank Farmer's preferences in a descending order.

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17. See Maddala (1977), p. 316.

18. Available from the author on request.

TABLE 1

Farmers' Expenditure Patterns in Greece, 1982. Statistical Results of Box and Cox Transformation of Variables.

Functional Form	R	r	s	Elast.	LF	95% Conf. Interval
			1. FOOD			
L	.9531	1	1	.789 (.111)	-49.8	$-1 \leqslant r,s \leqslant 1$
SL	.9654	1	0	.852 (.012)	-35.2*	
DL	.9436	0	0	.978 (.062)	-48.5	
LI	.9501	0	-1	.763 (.105)	-45.4	
			2. ALCOHOLIC DRINKS - TOBACCO			
L	.9516	1	1	.895 (.109)	-69.2	$-1 \leqslant r, s \leqslant 1$
SL	.9524	1	0	.445 (.019)	-25.6*	
DL	.9474	0	0	.495 (.005)	-45.2	
LI	.9312	0	-1	.412 (.012)	-30.9	
			3. CLOTHING - FOOTWEAR			
L	.9431	1	1	1.103 (.452)	-15.4	$0 \leqslant r, s \leqslant 1$
SL	.9524	1	0	1.902 (.025)	-9.2*	
DL	.8867	0	0	1.557 (.153)	-49.4	
LI	.9349	0	-1	1.463 (.192)	-29.4	
			4. HOUSING - WATER SUPPLY - FUEL AND LIGHT			
L	.9862	1	1	.781 (.121)	-59.7	$0 \leqslant r, s \leqslant 1$
SL	.9731	1	0	.584 (.006)	-32.9	
DL	.9964	0	0	.984 (.063)	-10.6*	
LI	.9631	0	-1	.689 (.125)	-40.9	

TABLE 1 Continued

Functio-nal Lorm	R	r	s	Elast.	LF	95 % Conf. Interval
			5. DURABLE GOODS AND SERVICES			
L	.9831	1	1	1.105 (.257)	-56.4	$0 \leqslant r,s \leqslant 1$
SL	.9745	1	0	1.012 (.357)	-65.3	
DL	.9982	0	0	1.314 (.047)	-15.4*	
LI	.9012	0	-1	1.961 (.127)	-46.7	
			6. MEDICAL - PERSONAL CARE			
L	.9751	1	1	1.201 (.525)	-36.7	$-1 \leqslant r,s \leqslant 0$
SL	.9652	1	0	1.305 (.492)	-48.6	
SL	.9867	0	0	1.150 (.125)	-10.6*	
LI	.9741	0	-1	1.105 (.761)	-22.7	
			7. EDUCATION - RECREATION			
L	.9732	1	1	1.102 (.510)	-60.2	$-1 \leqslant r,s \leqslant 0$
SL	.9649	1	0	1.425 (.316)	-32.9	
DL	.9890	0	0	1.690 (.111)	-16.7*	
LI	.9542	0	-1	1.597 (.657)	-46.7	
			8. TRANSPORT - COMMUNICATIONS			
L	.8891	1	1	1.651 (.129)	-36.5	$-1 \leqslant r,s \leqslant 0$
SL	.9645	1	0	1.253 (.129)	-49.6	
DL	.9929	0	0	1.717 (.088)	-14.5*	
LI	.9741	0	-1	1.809 (.542)	-16.3	

Source : Estimations.

Notes on the Table 1 : 1. Elast. denotes expenditure elasticity. 2. a* Indicates maximum likelihood estimate. 3. LF represents value of the likelihood estimate. 4. Standard errors in parentheses.

Food

According to the recordings of Table 2, Food absorbs the largest part of Farmer's total expenditure (38.2 %). The Box - Cox technique of transformation of variables suggests the SL Engel curve as the appropriate form for food expenditures. That is,

$$E_i/N = \underset{(762.7)}{-\ 5180.9} + \underset{(84.6)}{655.5}\ \ln (X/N) \qquad R^2 = .9654,\ F = 350.9$$

with standard errors in parentheses. The values of both t and F statistics show that for two regressors and $n = 8$ observations the estimated equation is overwhelmingly significant.

According to the classification of expenditure elasticities of each of eight groups of goods in Table 2, Food is considered as a basic good.

TABLE 2

Classification of goods and services according to their degree of urgency. Farm Households in Greece, 1982

Expenditure Category	Average Budget Shares	Expenditure Elasticity
1. Transport and Communications	7.6 %	1.7174 (.0885)
2. Education and Recreation	4.1 %	1.6909 (.1113)
3. Durable Goods	10.8 %	1.3146 (.0475)
4. Medical and Personal Care	5.9 %	1.1509 (.1215)
5. Clothing and Footwear	16.4 %	1.0921 (.0251)
6. Housing, Water Supply Fuel and Light	7.2 %	.9844 (.0632)
7. Food	38.2 %	.8521 (.0125)
8. Alcoholic Drinks and Tobacco	3.7 %	.4452 (.0196)

Source: Estimations and Household Budget Survey 1981/1982, NSSG (1987)
Note on the Table 2: Standard errors in parentheses.

Perhaps, if both kind and cash expenditures were included in the estimation of the relevant equation [19], expenditure elasticity of Food items should appeared even lower.

Alcoholic Drinks and Tobacco

Table 2 reveals that Alcoholic Drinks and Tobacco as a group absorbs the smallest part of total expenditure (3.7 %). The «best» equation has been found to be of the SL type. That is,

$$E_i/N = \underset{(142.9)}{-1137.2} + \underset{(15.8)}{166.4} \ln (X/N) \qquad R^2 = .9524 \quad F = 510.5)$$

The implied expenditure elasticity preserves a rise by 0.45% of expenditures in a stated increase of Farmer's income, say 1 %. In other words, Alcoholic Drinks and Tobacco constitute also a basic group of goods for Farm households and can be found at the far end of the descenting order of their preferences.

Clothing and Footwear

This expenditure category absorbs the second large proportion after Food of total expenditure (16.4 %). The expenditure elasticity estimated from the following SL Engel curve

$$E_i/N = \underset{(2232.6)}{-14664} + \underset{(247.6)}{440.61} \ln (X/N) \qquad R^2 = .9524 \quad F = 415.9$$

suggests a rather moderate preference of Farm households for Clothing and

19. Excluded for reasons we in footnote 13.

Footwear in an attempt to reach expenditure patterns of other «leading» groups of households in the Country (e. g. households of urban sector).

Housing, Water Supply, Fuel and Light

The «best» equation is of the DL form as following

$$\ln (E_i/N) = \underset{(.5704)}{1.2245} + \underset{(.0632)}{0.9844} \ln (X/N) \qquad R^2 = .9964 \quad F = 216.3$$

This expenditure category absorbs 7.2 % of total Farmer's expenditure and can be found with a low degree of need in Table 2. That is so can be explained by the fact that most — if all— Farmers have their own house and do not spend for repairs and construction [20].

Durgble Goods

The category absorbs 10.8 % of total Farmers' expenditure. The estimated DL form is for this case

$$\ln (E_i/N) = \underset{(.4279)}{-5.1834} + \underset{(.0475)}{1.3146} \ln (X/N) \qquad R^2 = .9982 \quad F = 719.6$$

The degree of urgency revealed by the size of expenditure elasticity in Table 2 is relatively high. One, thus, may conclude that Farmers will correspond promptly and buy goods such as floor coverings, household appliances and supplies, etc. [21], when circumstances do permit them to buy.

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20. According to Kanellopoulos (1985).
21. A disaggregated analysis shou should these results.

Medical and Personal Care

The share in total expenditure is 5.9 % and expenditure elasticity has been estimated by reference to the following DL Engel curve. That is from

$$\ln (E_i/N) = \underset{(1.0956)}{-4.2320} + \underset{(.1215)}{1.1509} \ln (X/N) \qquad \begin{matrix} R^2 = .9867 \\ F = 516.4 \end{matrix}$$

Undoubtely, Medical Care is needed and Farmers are willing to pay for having better quality of medical services as those provided by their own National Security Organisation (O.G.A.) are indeed poor. In a same manner, cosmetics, beauty treatment, etc., constitute a rather semiluxury expenditure and Farmers will pay on in an attempt to copy the expenditure behaviour of other Greek households.

Education and Recreation

This category of expenditure absorbs the smallest percentage of total expenditure (4.1 %) after Alcoholic Drinks and Tobacco. However, the degree of need is rather different. According to the following DL Engel curve

$$\ln (E_i/N) = \underset{(1.0042)}{-9.6578} + \underset{(.1113)}{1.6909} \ln (X/N) \qquad \begin{matrix} R^2 = .9890 \\ F = 319.6 \end{matrix}$$

and the implied Farmers' preference for the category in Table 2, Education and Recreation is strongly needed and Farmers are prepared to increase the share in total expenditure when income is large enough. In other words, the low degree of education of parents Farmers [20] will induce them to offer opportunities for education to their successors. Recreation goods (radios, etc.) and services (cinema, theatre etc.) industries definitely, will find a prosperous market for their products in rural areas.

Transport and Communications

The «best» equation for the Engel curve is of DL form

$$\ln (E_i/N) = \underset{(.7982)}{-9.3746} + \underset{(.0885)}{1.7174} \ln (X/N) \qquad R^2 = .9929 \quad F = 216.7$$

According to Table 2, the degree of urgency is high and Farmers are promptly to devote a larger portion of their total expenditure— not just 7.6 %— when this is feasible for cars and other goods and services included in the category.

5. SUMMARY AND CONCLUSIONS

This paper examined in some detail expenditure patterns of Farm households in Greece. The evidence supports the view that more have to be done in order to improve Farm households standard of living. This conclusion is drawn from the sign and size of expenditure elasticities of eight broad defined expenditures categories of goods and services.

The estimated expenditure elasticities are defined from Engel relationships hat are reduced algebraic forms of a general equation of Box - Cox type. The technique of transformation of the variables has been used as a basic tool of analysis for the selection of the «best» equation of the per capita Engel curve in each of the eight categories considered. Per capita Engel curves have been generated in the present exercise by a rather strict assumption imposed in Barren's (1964) model of household demand. As we are interested in economic plausible Engel

relationships, only four traditional functional forms of these relationships have been incorporated in the analysis[22].

The statistical results show that the frequently employed Linear (L) and Log - Inverse (LI) functional forms for the Engel curve are not the appropriate functions. On the other hand, the Semilog (SL) and Double - Log (DL) forms perform well in the context of transformation of the variables.

The estimated expenditure elasticities of Farm households are assumed invariant with respect to their size and composition. Also, the results *of* the analysis [2]3 are not consistent with equivalent adult scale interpretation that we sought to give the relationship. In fact, the basic data of the Greek survey that refer to Farm households expenditures remain reach in possibilities for further analysis. Nevertheless the pattern of Farmers' expenditures that emerges is quite consistent and it is possible to trace the effect of increase in their income on their expenditures. Given the size of expenditure elasticities, a future rise in Farmers' income will induce them to reallocate in a large extend their expenditures in favour of goods and services that have revealed with strong preference and are not enjoyed enough, because of the income constraint.

22. Other studies of expenditures patterns that make use of box - Cox transformation of the variables adopt a larger interval of variation of r and s. See Hassan and Johnson (1979), Chang (1977) and Gemmill (1980). However, only economic plausible values of r and s are considered in this paper. The latter values are plausible only when result certain known functional forms of the Engel relationship.

23. Given that 93.9% of Farmers' total expenditure is allocated to eight expenditure categories and that different forms have been used for these categories, neither Engel's nor Cournot's aggregation properties hold true in the results of Table 2.

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