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THE PATTERN OF GREEK DEMAND: EVIDENCE FROM POOLED AND TIME SERIES DATA

PLAN

ABSTRACT

In this paper we analyze the pattern of Greek demand for consumers' goods in terms of the Ideal Demand System. We estimated, two demand systems and for both we used the same model and the same method of estimation.

For the first model we used time-series data to estimate a full demand system of seven equations, while for the second model we used pooled data, involving demographic characteristics of the household, to estimate a subsystem of four equations.

From our findings we could say that the first system fits the data better than the second one. The elasticities in this system are sensible and in line with other studies. Finally, both systems we estimated have minor misspecification problems.

1.1. INTRODUCTION

In this paper we analyze the pattern of Greek demand for consumers' goods in terms of the Ideal Demand System. First we estimate a full demand system of seven equations by using time series data for the period 1960-1987. Second we respecify the Ideal Demand System by incorporating individual characteristics to the cost function. We use this later specification to estimate a subsystem by using pooled time series of cross-section data for Greece. Finally we compare the findings of these two different specifications of the AI Demand System.

1.2. MODEL SPECIFICATIONS

Individual preferences of the AI demand system could be presented by the following cost functions.

$$\log c(u,p) = \alpha(p) + u\, b(p) \qquad (1.1)$$

where u denotes utility, while α(p) and b(p) are functions of prices which can be defined by:

$$\alpha(p) = \alpha_0 + \sum_k \alpha_k \log p_k + 1/2 \sum_k \sum_l \gamma^*_{kl} \log p_k \log p_l \qquad (1.2)$$

$$b(p) = \beta_0 \prod_k p_k^{\beta_k} \qquad (1.3)$$

where α, β and γ* are parameters. If (1.2) and (1.3) are substituted into (1.1), we can derive the budget shares w_i from:

$$\partial \log c / \partial \log p_i = w_i$$

and substituting for u, we get the budget shares w_i:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log (x/P), \tag{1.4}$$

where P is price index defined by

$$\log P = \alpha_0 + \sum_k \alpha_k \log p_k + 1/2 \sum_k \sum_l \gamma_{kl} \log p_k \log p_l$$

and the parameters γ_{ij} are defined by:

$$\gamma_{ij} = 1/2 (\gamma_{ij}^* + \gamma_{ji}^*) = \gamma_{ji}$$

and logP is usually approximated with a Stone price index. Adding up the above cost functions, requires for all j,

$$\sum_k \alpha_k = 0, \quad \sum_k \beta_k = 0, \quad \sum_k \gamma_{kj} = 0.$$

Homogeneity is satisfied if and only if for all j,

$$\sum_k \gamma_{ik} = 0,$$

while symmetry is satisfied provided that,

$$\gamma_{ij} = \gamma_{ji}$$

The negativity conditions are satisfied if the matrix C defined by:

$$c_{ij} = \gamma_{ij} + \beta_i \beta_j \log (x / P) - w_i \delta_{ij} + w_i w_j$$

is negative semidefinite, where δij is the Kronecker delta.

By incorporating individual characteristics into the above cost functions, we have the following cost functions, (Rossi, 1988),

$$\log C (u^h, p, a^h) = \alpha_0 + \sum_i \alpha_i \log p_i + 1/2 \sum_i \sum_j \gamma_{ij}^* \log p_i \log p_j +$$

$$\sum_i \sum_n n_{in} \log p_i a_n^h + u^h (\beta_0 \prod_i p_i^{\beta_i}), \tag{1.5}$$

where u denotes utility for the h-th household whose total expenditure is given by y, and whose socio-demographic characteristics are described by the n-vector a. The i-th commodity price is denoted by p. The household specific budget share equations, derived by applying Hotelling's lemma to (1.5), take the following form,

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log (y^h / P^h) + \sum_n n_{in} a_n^h$$

where $\gamma_{ij} = 1/2 (\gamma^*_{ij} + \gamma^*_{ji})$ (1.6)

Aggregate expenditure shares turn out to depend on the price vector, upon the distribution of expenditures over all consuming units and upon the joint distribution of expenditures and household characteristics. Also P^h is a price index defined by,

$$\log P^h = \alpha_o + \sum_i \alpha_i \log p_i + 1/2 \sum_i \sum_j \gamma_{ij} \log p_i \log p_j + \sum_i \sum_n n_{in} \log p_i a_n^h \qquad (1.7)$$

The aggragate budget share equations are given by,

$$w_i^h = \alpha_i + \beta_i (\sum_h y^h \log y^h / \sum_h y^h) - \beta_i \log P + \sum_h n_{ih} \sum_h y^h a_n^h / \sum_h y^h) + \sum \gamma_{ij} \log p_j \qquad (1.8)$$

and $$\log P = \sum_i \sum_h (y^h / \sum_h y^h) w_i^h \log p_i \qquad (1.9)$$

1.3. ESTIMATION OF THE SYSTEM USING TIME SERIES DATA

1.3. 1. Discussion of the Data

The empirical results refered to in this section rely on the original specification of the Ideal Demand System, (Deaton and Muelbauer 1980). First we estimate the system using time series data for the period 1960-1987. The data set which is used here was collected from the OECD's National Accounts (1975, 1987, 1989). According to this data consumer's expenditure is divided into eight broad commodity aggregates: Food, Alcoholic Drinks and Tobacco, Clothing and Footwear, Housing, Medical Care and Health Expenses, Transport and Communication, Education and Cultural Services. The notes for each commodity are accompanied by two graphs. The first graph illustrates purchases per head in 1970 prices, and the second graph illustrates the budget shares (in percentage) and the relative prices for each commodity from 1960 to 1987.

1.3.1.1. Food

The category food includes: bread, flour, cereal, meat, fish, oils and fats, dairy products and eggs, vegetables and fruits, sugar and confectionary, non alcoholic beverages and other food.

From Figure 1, we see that the food quantity purchased has increased from 47 to over 100 thousands over the period 1960-1982. But with minor fluctuations has moved little since. The relative price (Figure 2) rose very sharply between 1977 and 1987 following an apparent trend. From Figure 2, we can also see the change in food budget shares. The food quantity purchased as a percentage of total expenditure has fallen from 41.6 to 32.4 percent, about 10% fall over the period 1960-87.

1.3.1.2. Alcohol and Tobacco

The Alcohol and Tobacco category includes: alcoholic drinks (wines, spirits, beer, etc.), tobacco and tobacco products.

The consumption of alcohol and tobacco (at 1970 prices) is rising steadity (Figure 3), from 1964 till 1987, in spite of a similar movement in the relative price (Figure 4). From Figure 4 we can also see a fall in budget shares of this category for the period 1968-1980 while it is followed by a rising trend lasting up to 1987.

1.3.1.3. Clothing and Footwear

This category includes men's, women's, children's clothing and footwear as well as repair charges.

The purchases for clothing and footwear rose from 10 to almost 40 thousands drachmas over the period 1960 to 1979, while a sharp dip follows after 1979 (Figure 5), which can partially be explained by prices. The relative prices again rose very sharply from 1979 to 1987 while the budget shares (Figure 6), are falling from 1980 onwards.

1.3.1.4. Housing Services

The category housing services includes: rents, mortage interest and capital payments, minor repairs and decoration, purchase and construction dwelling, enlargements and improvements, water, gas and electricity, durable household goods, household supplies and services.

This is the first of the categories considered where some degree of durability may cause problems for a static interpretation. The expenditure on housing services rose from 25 to 95 thousand drachmas over the period 1960 to 1987 (Figure 7), in spite of a similar movement in relative prices after 1973 (Figure 8). The budget shares of this category have fallen at about 3.5 percent over the period 1960-87.

1.3.1.5. Medical Care and Health Expenses

The expenditure for medical care and health expenses is rising (Figure 9) from 2 to 13 thousand drachmas over the period, though a number of sharp dips and peaks appear which can only partially be explained by prices. The relative prices rose very sharply after 1972 while the budget shares of this category rose by only 1.4% (Figure 10).

1.3.1.6. Transport and Communications

This category includes: purchase of motor vehicles, maintenance and running of motor vehicles, cycles and perabulators, and expenses for postage, telephone and telegraph.

The expenditure of this commodity is rising from 8 to 60 thousands drachmas between 1960 and 1985 (Figure 11), and is declining slowly since 1985 while the relative prices follow a rising trend after 1972 which becomes very sharp after 1980 (Figure 12). From Figure 12 we see that the budget shares of this category have more than doubled from 6% to 13% over the period 1960-87.

1.3.1.7. Recreation, Entertainment, Education and Cultural Services

This category includes: Recreation, Entertainment, Education and Cultural Services. The expenditure on this category is rising steadily over the period 1960-87 with some small dips in 1979, 1983 (Figure 13), in spite a similar increase in the relative prices (Figures 14). The budget shares rose from 4.6% to 6.5% over the whole period (Figure 14).

1.3.1.8. Miscellaneous Goods and Services

This category includes: Personal care expenses, expenditure in restaurants, cafes and hotels, gifts, charities and contributions, legal expenses and licences, christenings, weddings, funerals, and goods, services, payments not elsewhere coded.

The expenditure for this category rose from 100 to 400 thousand drachmas, (Figure 15), and the same is happening to the prices, especially after 1980, (Figure 16). As far the budget shares of this category is concerned, they have increased considerably form 5.8% to 10.1%.

1.3.2. Method of Estimation

Some times it is possible to obtain a better estimator than the OLS estimator by viewing the equation as part of a system. This implies no contradiction with the BLUE property of the OLS, in a single equation, since extra information is being used in constructing the estimator.

There are basically two ways in which a gain in efficiency can occur when a single equation is considered as part of a system. The first arises when the disturbaces in a particular equation are contemporaneusly correlated with the disturbances in other equations. Such systems are known as seemingly unrelated regression equations, SURE, devised by Zellner, (1962). Secondly, models are sometimes formulated with constraints across differ-

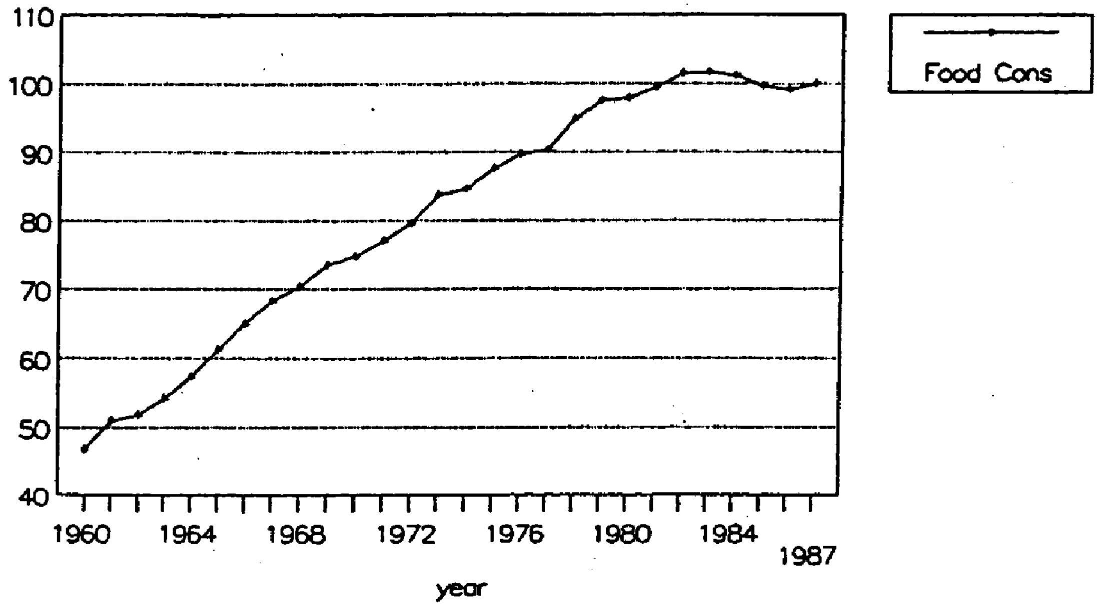

Figure 1. Food Consumption (000's).

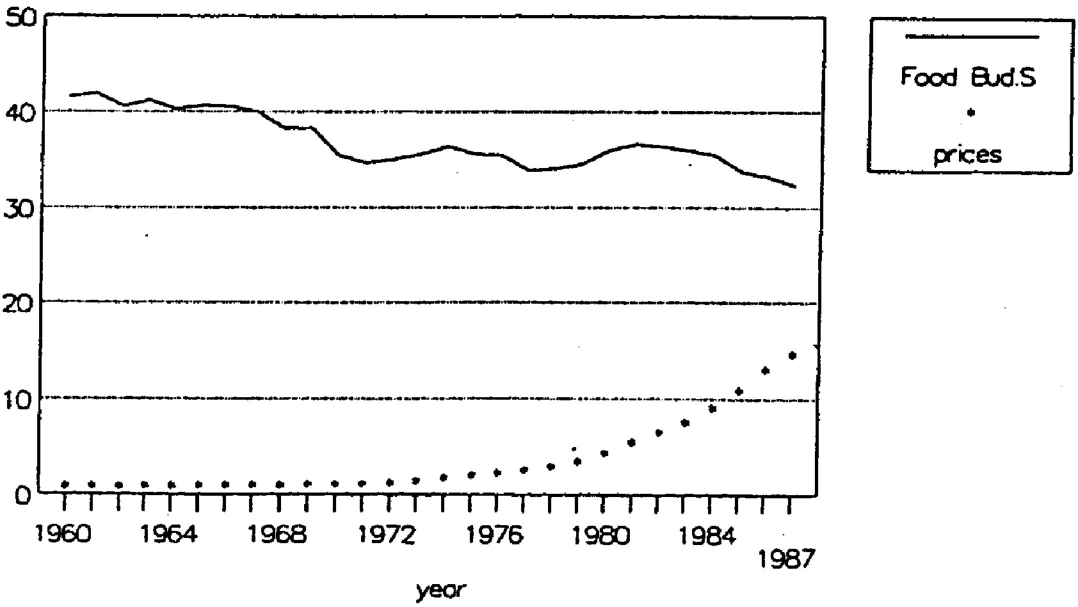

Figure 2. Food Budget Shares (%) / Prices.

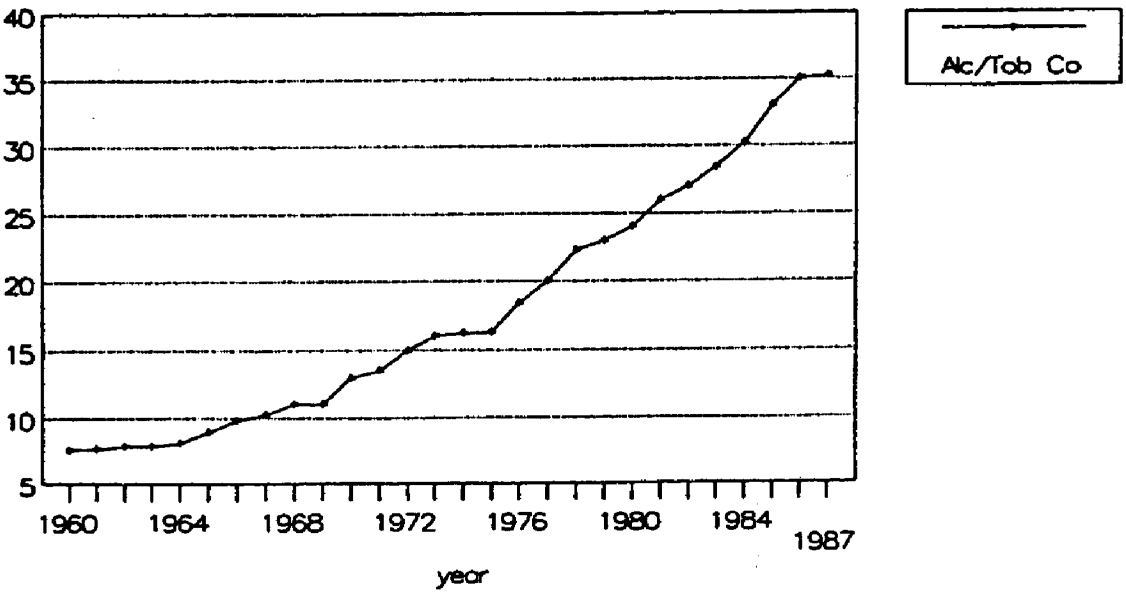

Figure 3. Alc / Tobacco Consump. (000's).

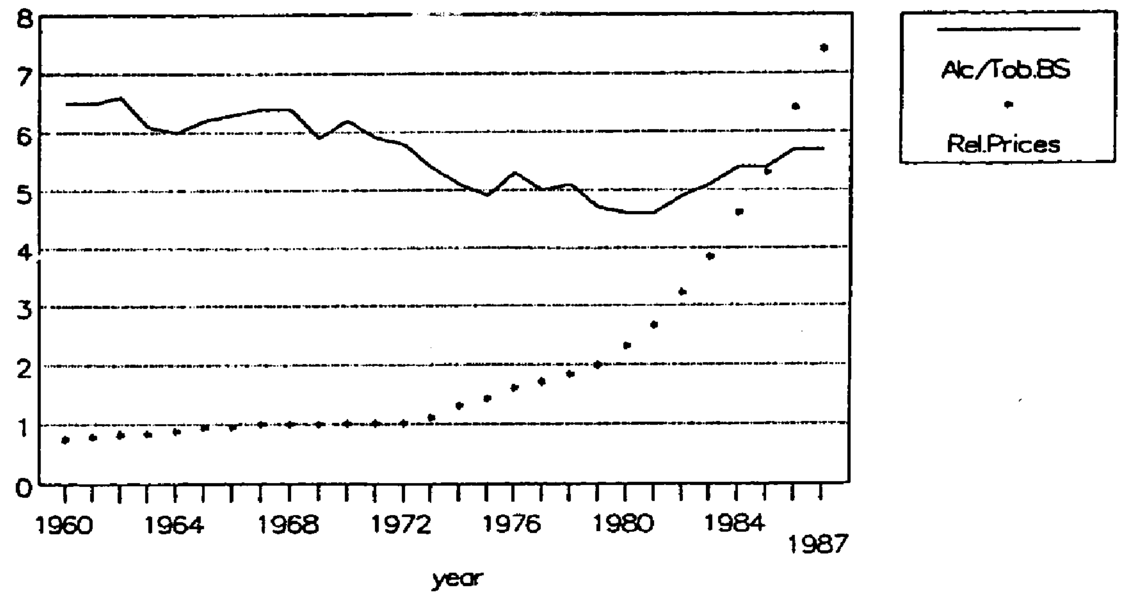

Figure 4. Alc / Tobacco Budg. Sh. (%) / Prices.

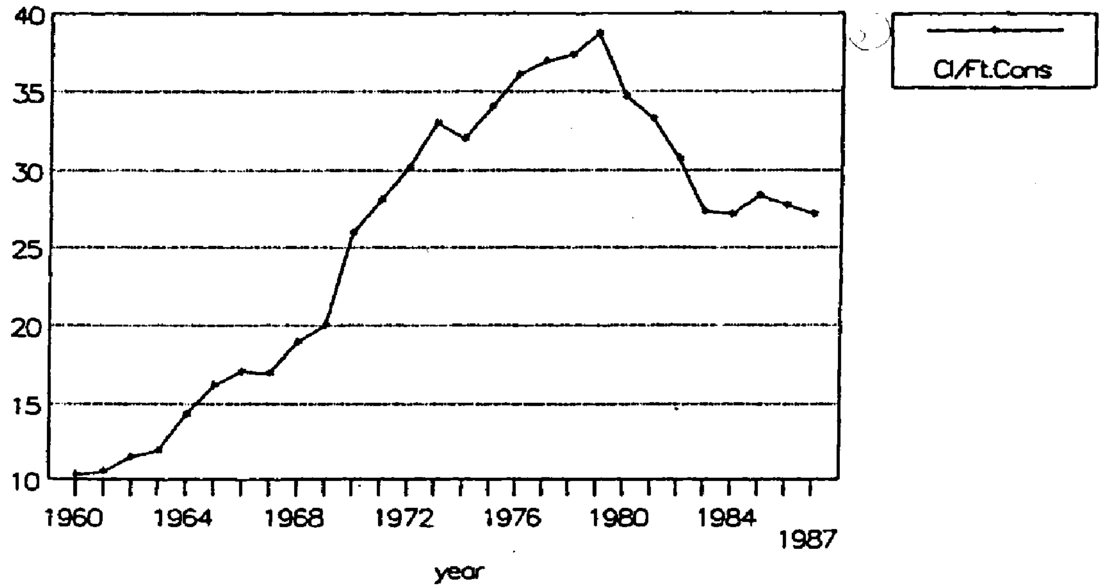

Figure 5. Cloth / Ftw. Consumption (000's).

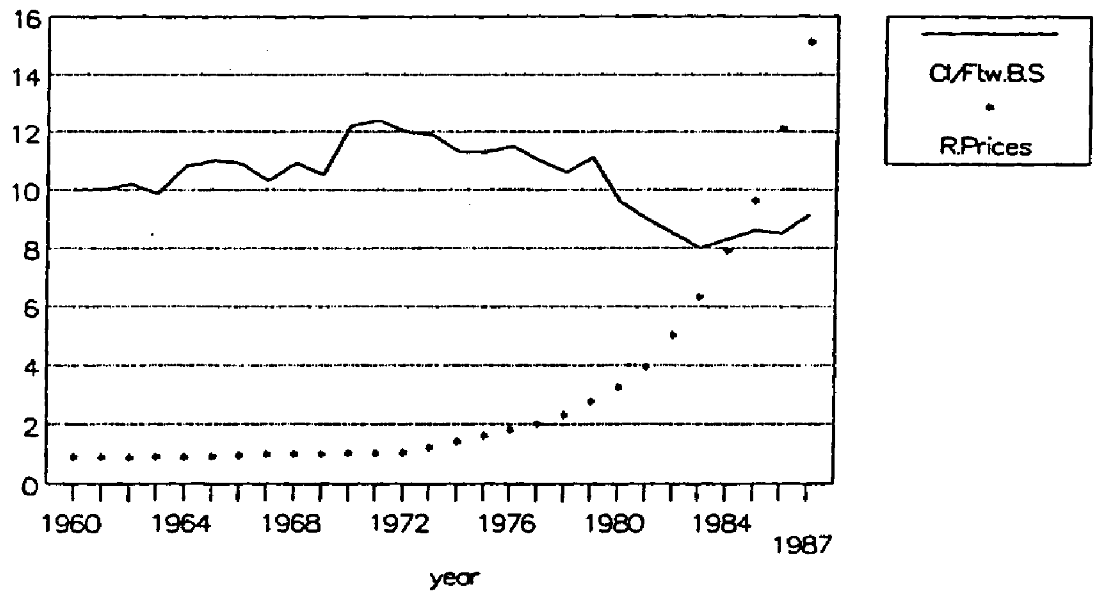

Figure 6. Cloth / Ftw. Budg. Sh. (%) / Prices.

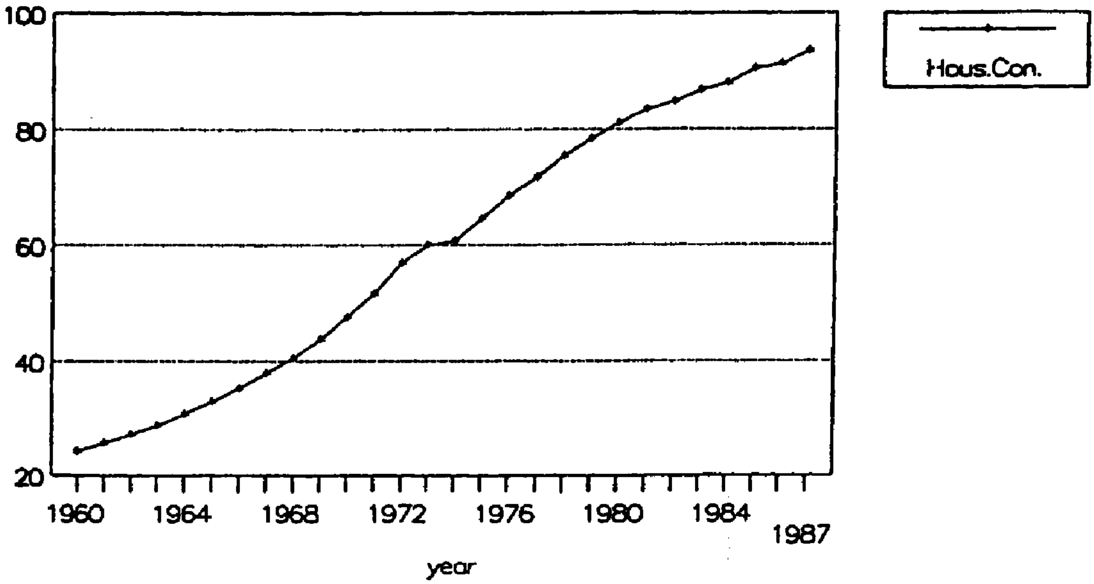

Figure 7. Hous. Consumption (000's).

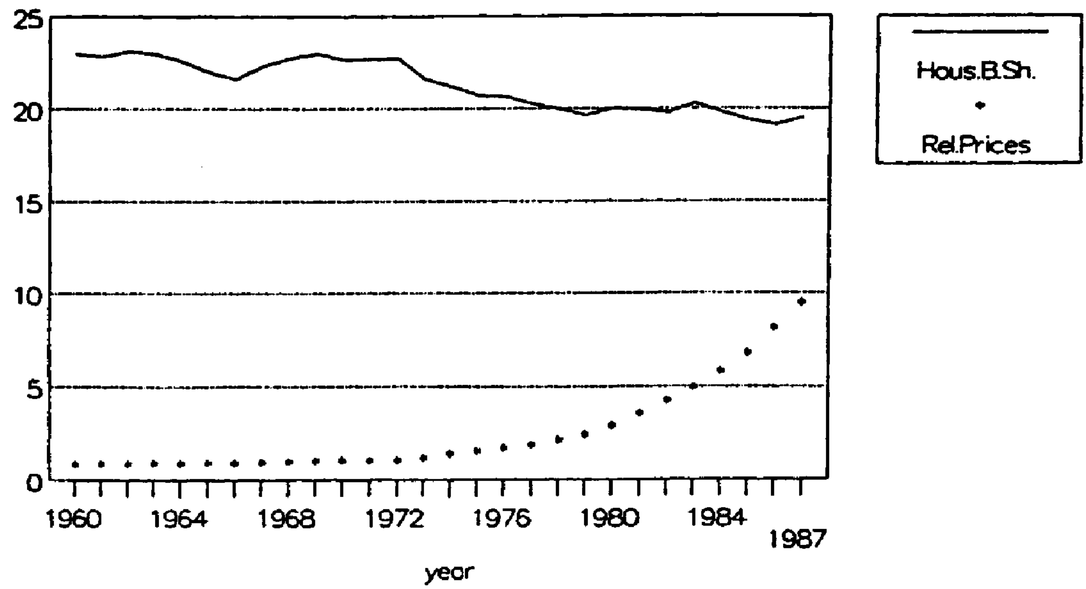

Figure 8. Hous. Budg. Sh. (%) / Prices.

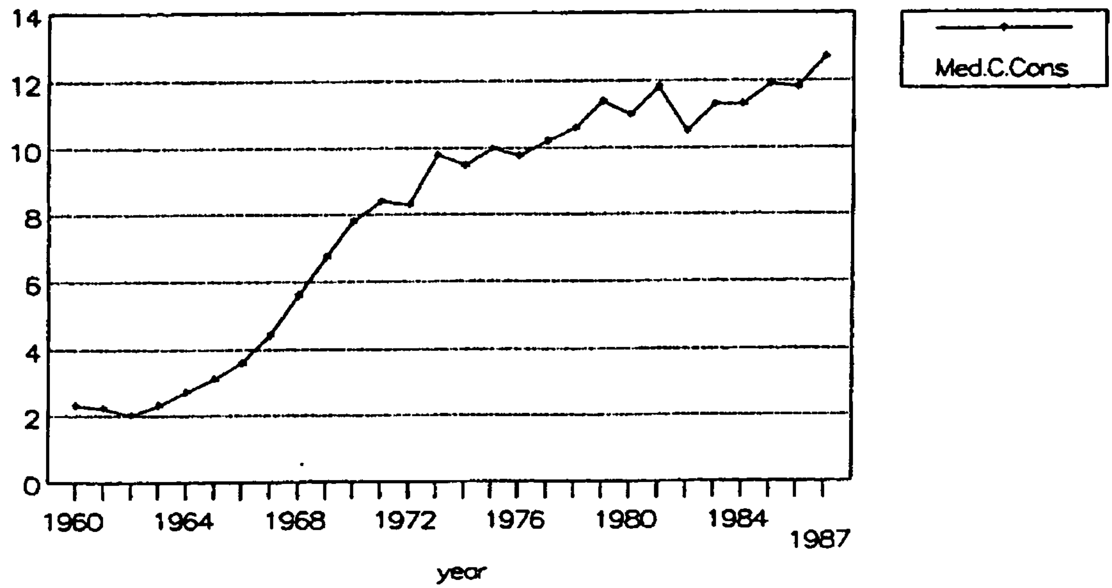

Figure 9. Med. Care Cons. (000's).

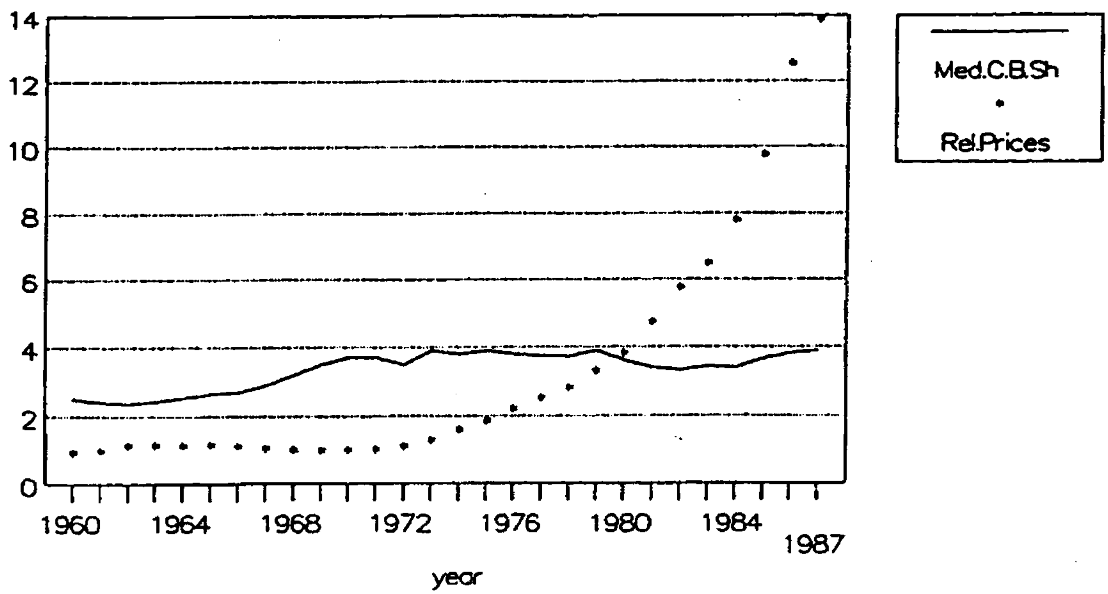

Figure 10. Med. Care Budg. Sh. (%) / Prices.

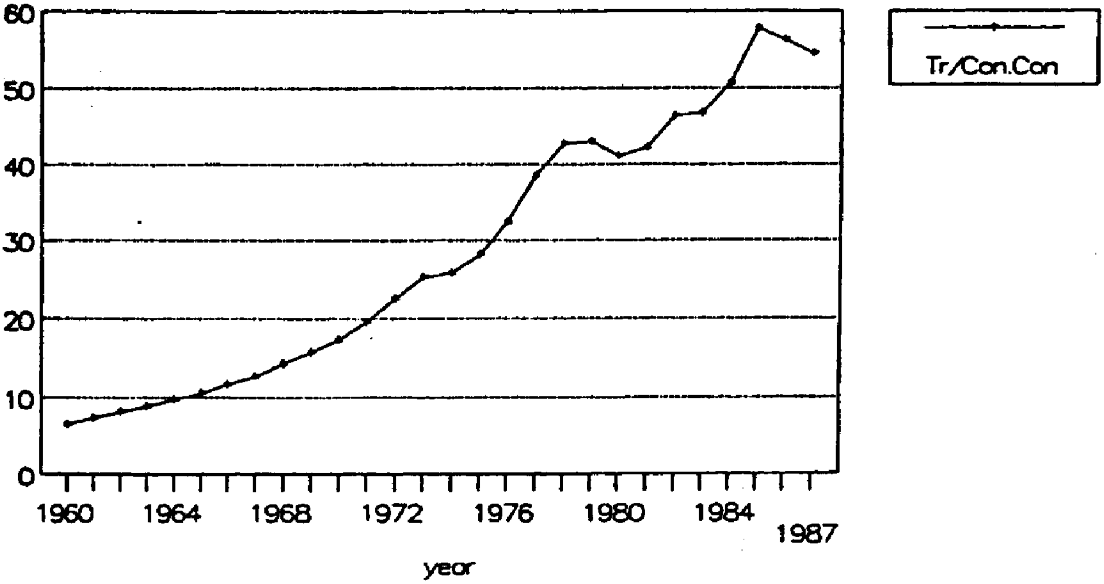

Figure 11. Tran / Com. Cons. (000's).

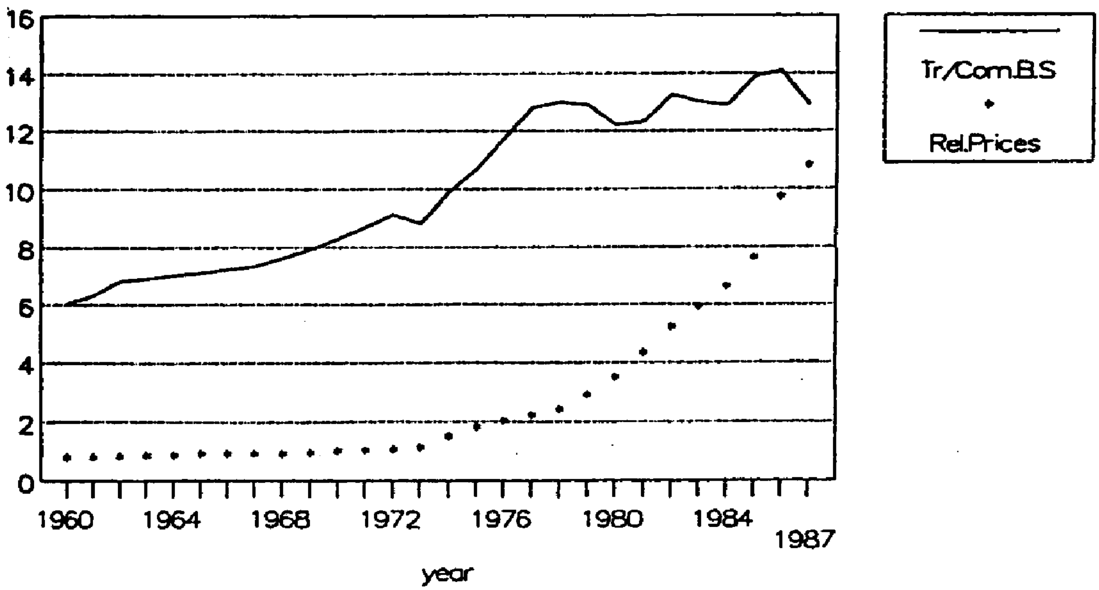

Figure 12. Tran / Com. Budg. Sh. (%) / Prices.

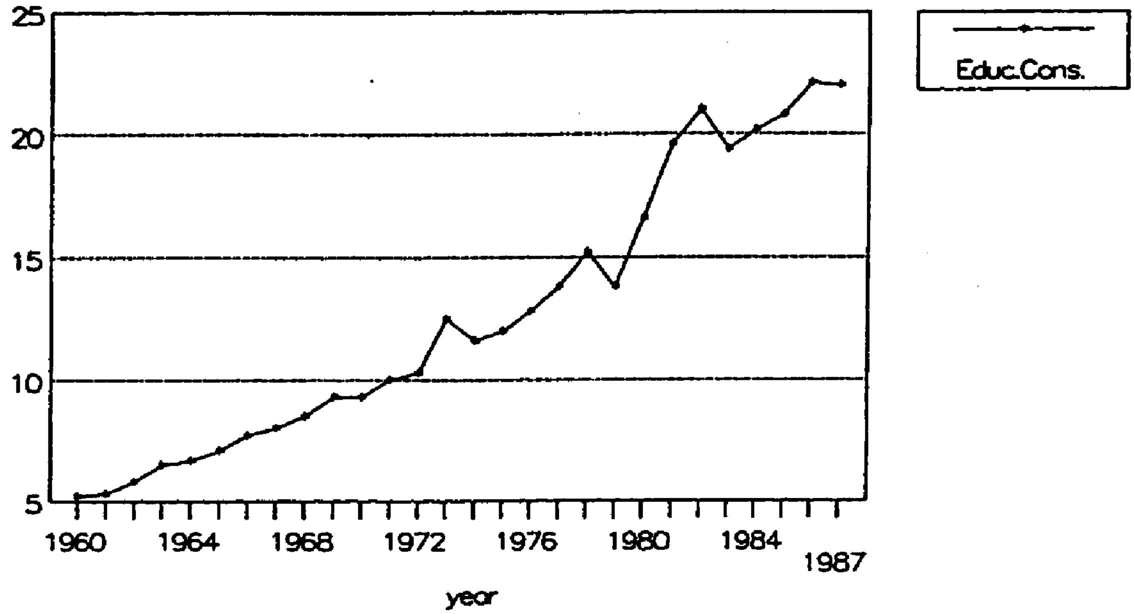

Figure 13. Educ. Cons. (000's).

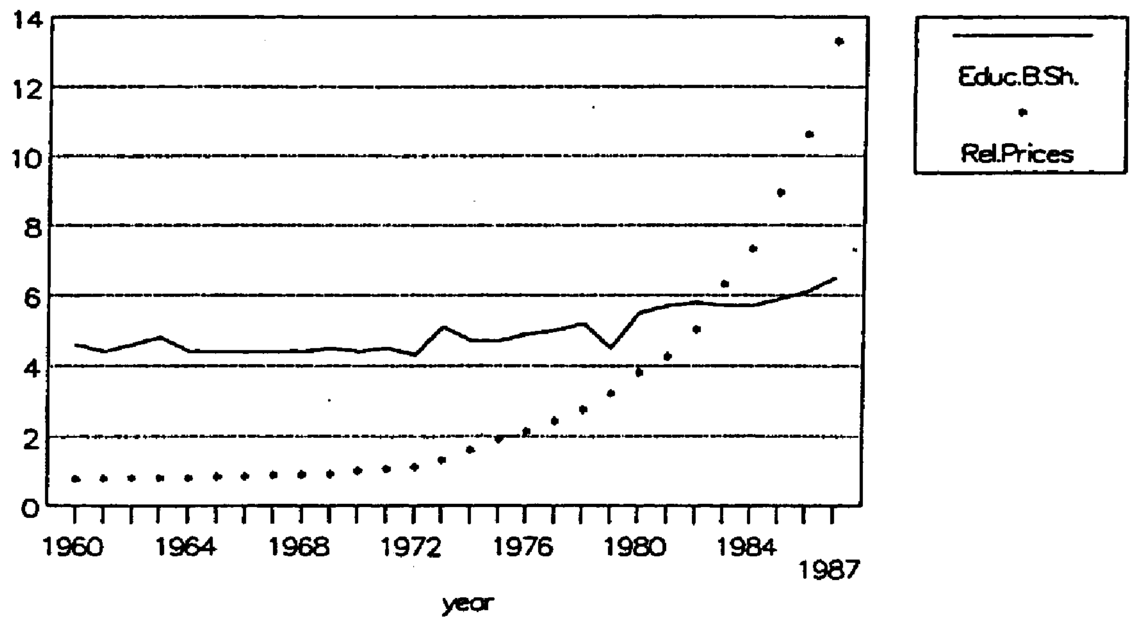

Figure 14. Educ. Budg. Sh. (%) / Prices.

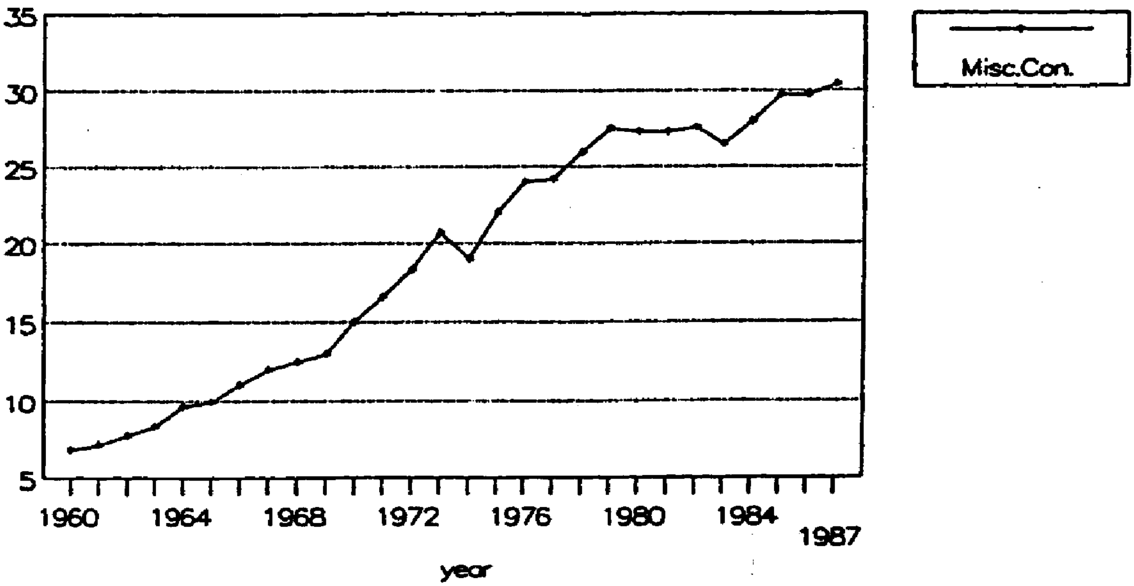

Figure 15. Miscell. Cons. (000's).

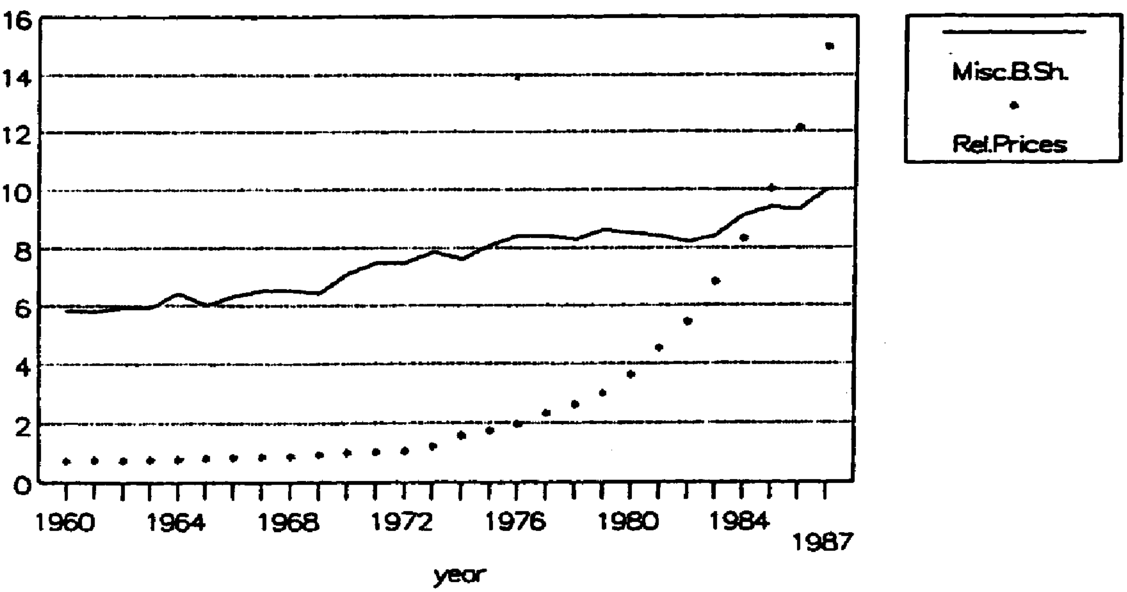

Figure 16. Miscell. Budg. Sh. (%) / Prices.

ent equations. The need to consider equations together is rather more obvious in this case, see Harvey, (1981), Pindyck and Rubinfeld, (1984).

In the case of a demand system, the correlation arises because of the restriction (by definition), that the sum of the individual budget shares is a 100% or unit. On the other hand, the imposition of cross equation restrictions (symmetry), when we estimate a demand system, necessitates the use of system estimation.

Zellner suggests that efficiency in estimation can be gained, if one views the system of seemingly unrelated equations as a single large equation to be estimated. Estimation of this single (system) equation is accomplished efficiently through the use of Generalised Least Squares, GLS, estimation.

The application of GLS necessitates obtaining estimates of the error covariances between equations. These estimates are obtained by first estimating each single equation using OLS. The variances and covariances of the estimated residuals then provide consistent estimators of the error variances and covariances.

1.3.3. Empirical Results and Diagnostics

In this section we estimate the AI Demand System using annual Greek data from 1960 to 1987, inclusive on seven groups of consumers' expenditure, namely, food, alcohol and tobacco, clothing and footwear, housing services, medical care, transport and communications, and education-entertainment.

We estimated the unrestricted form of the AI Demand System (1.4) by setting $\log P = \Sigma w_i \log p_i$, which is the usual procedure, for each year and estimate the system by GLS.

Table 1 reports the estimates of the AI Demand System without any constraints on the parameters save additivity which is automatically satisfied.

TABLE 1

Parameter Estimates of the AI Demand System (sd-values in parentheses)

	Food Eq.	Alc/Tob Eq.	Cl/Ftw Eq.	Hous. Eq.	Med.C. Eq.	Tr/Com Eq.	Educ. Eq.
Intercept	1.27	0.09	-0.08	0.21	-0.06	-0.31	-0.13
	(.107)	(.029)	(.075)	(.053)	(.027)	(.085)	(.040)
Log (pr.Fd.)	0.28	-0.03	-0.06	-0.10	-0.01	-0.05	-0.03
	(.044)	(.012)	(.031)	(.022)	(.011)	(.035)	(.016)
Log (pr.A.T.)	0.03	0.03	0.02	-0.02	0.01	-0.01	-0.06
	(.030)	(.008)	(.022)	(.015)	(.008)	(.025)	(.010)
Log (pr.C.F.)	-0.08	0.03	0.11	-0.04	0.02	-0.03	0.07
	(.054)	(.015)	(.039)	(.027)	(.014)	(.043)	(.015)
Log (pr.Hs.)	-0.04	-0.01	-0.20	0.18	-0.05	-0.04	0.16
	(.083)	(.022)	(.059)	(.041)	(.021)	(.067)	(.020)
Log (pr.M.C.)	-0.01	-0.01	0.01	-0.03	-0.02	0.04	0.02
	(.020)	(.005)	(.014)	(.010)	(.005)	(.016)	(.008)
Log (pr.T.C.)	-0.05	-0.003	0.02	-0.003	0.01	0.07	-0.04
	(.081)	(.002)	(.006)	(.004)	(.002)	(.006)	(.002)
Log (pr.Edc.)	-0.12	0.004	0.05	0.02	0.03	0.04	0.02
	(.029)	(.008)	(.021)	(.015)	(.008)	(.023)	(.012)
Log (Y/P)	-0.13	-0.01	0.06	-0.01	0.02	0.05	0.02
	(.021)	(.006)	(.015)	(.010)	(.005)	(.017)	(.007)

The estimates of β classify food, alcohol/tob., and housing as necessities while the rest categories, appear to be luxuries. Five out of seven β coefficients are significantly different from zero and a large number of Y coefficients, twenty one out of forty nine, have t-values absolutely larger than two. Even so, very few have any detectable effect on the value share of alcohol/tob. and transport/commun. Similarly, the price of alcohol/tob., clothing/ftw. and education, have little effect anywhere, (except, of course, through the price index and the value share itself), while the prices of food, housing and medical care, and transport/commun. appear with considerable regularity.

Table 2 presents misspecification diagnostics for all the seven equations. All these misspecification diagnostics are based on auxiliary regressions on the residuals, (Spanos, 1986).

TABLE 2
Misspecification Diagnostics

	Food Eq.	Alc/Tob Eq.	Cl/Ftw Eq.	Hous. Eq.	Med.C. Eq.	Educ. Eq.
R^2	0.96	0.95	0.91	0.96	0.95	0.97
SER	.006	.001	.004	.003	.001	.001
SSR	.0008	.0001	.0004	.0002	.0001	.0002
DW	1.61	2.2	1.89	1.5	2.0	1.9
		x^2-type				
Aut (1)	0.10	0.01	0.00	0.41	1.2	2.0
Aut (2)	0.25	5.10	0.07	1.70	3.1	1.9
ARCH (1)	0.00	0.70	0.40	1.13	0.24	0.0
Heter (2)	0.15	0.09	3.10	0.31	8.9	1.9
NonLin (1)	0.00	0.10	1.20	2.00	0.1	0.5
Norm (2)	1.50	1.70	0.90	9.47	0.5	0.4

TABLE 3
Total Expenditure and Price Elasticities

equations	price elasticities							Expenditure
	Food	Al/T	Cl/Ftw	Hous.	M.C.	Tr/Com	Educ.	Elasticities
Food	-0.18	0.01	0.16	-0.03	-0.01	-0.09	-0.28	0.67
Al/T	-0.42	-0.55	0.51	-0.13	-0.16	-0.03	0.07	0.84
Cl/Ftw	0.75	0.15	-0.12	-1.91	0.07	0.12	0.42	1.54
Hous.	-0.42	-0.08	-0.17	-0.21	-0.13	-0.01	0.09	0.96
M.C.	-0.06	0.31	0.62	-1.26	-1.46	0.34	0.86	1.56
Tr/Com	0.10	-0.07	-0.23	-0.29	0.43	-0.33	0.42	1.48
Educ.	-0.45	-1.20	1.45	3.21	0.42	-0.77	-0.62	1.42

As we see from Table 2, equations food, alcohol/tob., clothing/

ftw., transport/commun. and education, are well specified. For the housing equation normality is rejected by a skewness-kurtosis test, (Bera-Jarque 1982), while for the medical care equation homoskedasticity is rejected at both 5% and 1% significance levels.

The total expenditure and own-price elasticities are shown in Table 3. From the own-price elasticities, it is worth noting the general inelasticity of demand. Only the category medical care and health expences appear to be price elastic. From the total expenditure elasticities, the categories food, alcohol/tob., and housing are classified as necessities while the remaining are luxuries.

1.4. ESTIMATION OF THE AI DEMAND SYSTEM WITH DEMOGRAPHIC EFFECTS USING POOLED DATA

The empirical results refered to in this paper rely on the aggregated version of the AI Demand System with Demographic Effects, (Rossi 1988). Aggregate expenditures shares turn out to depend on the price vector, upon the distribution of expenditures over all consuming units and upon the joint distribution of expenditures and household characteristics.

The aggragate budget share equations are given by,

$$w_i^h = \alpha_i + \beta_i \left(\sum_h y^h \log y^h / \sum_h y^h \right) - \beta_i \log P +$$

$$\sum_h n_{ih} \sum_h y^h a_n^h / \sum_h y^h) + \sum \gamma_{ij} \log p_j + \varepsilon_i \qquad (1.10)$$

$$\log P = \sum_i \sum_h \left(y^h / \sum_h y^h \right) w_i^h \log p_i \qquad (1.11)$$

where ε_i is a household specific error term which accounts for aggregation of individual commodoties into commodity aggregates (Lewbel 1987, Rossi 1988). According to Rossi (1988) "These aggregate budget shares define a system of demand equations adding up to a total expenditure, homogeneous of degree zero in prices and total expenditure, and symmetric in the substitution matrix under a specific set of parametric restrictions...'. Notice furthermore, that estimation of the parameters of equation (1.10), allows to recover the structure of individual household preferences thereby providing the basic instrument for applied welfare analysis".

Characteristics are presented by qualitative variables and for the purpose of the present paper the vector a^h, has been defined as follows,

a_1^h=type of residence (urban, rural areas of Greece).

a_2^h=professional status of the head of the household, (scientist/ self employed, executive, clerical worker, sales worker, occupied in the agriculture sector, labourer, service worker, others).

a_3^h=family size (1, 2, 3, 4, 5).

TABLE 4

Parameter Estimates of the AI Demand System (sd-values in parentheses)

	Food Equation	*Alc/Tob. Equation*	*Cloth/Ftw. Equation*	*Miscell. Equation*
Intercept	-5.40	1.75	2.48	2.17
	(0.97)	(0.61)	(0.786)	(0.779)
Urban Regions	-0.038	0.007	0.015	0.015
	(0.008)	(0.003)	(0.007)	(0.008)
Scient/self. empl.	-0.035	-0.017	0.049	0.003
	(0.015)	(0.005)	(0.012)	(0.016)
Adm/manag.work.	-0.056	-0.012	0.077	-0.009
	(0.016)	(0.006)	(0.014)	(0.017)
Clerical work.	-0.017	-0.004	0.025	-0.004
	(0.014)	(0.004)	(0.011)	(0.014)
Sales work.	-0.033	0.005	0.024	0.033
	(0.014)	(0.005)	(0.012)	(0.015)

	Food Equation	*Alc/Tob. Equation*	*Cloth/Ftw. Equation*	*Miscell. Equation*
Farm/fisherm.	-0.048	0.015	0.015	0.018
	(0.014)	(0.004)	(0.011)	(0.014)
Labourers	-0.001	0.012	-0.009	-0.004
	(0.013)	(0.004)	(0.011)	(0.014)
Service work.	-0.018	-0.003	0.022	-0.0001
	(0.013)	(0.004)	(0.011)	(0.014)
No hous. memb.1	-0.071	-0.02	-0.012	0.104
	(0.015)	(0.005)	(0.013)	(0.016)
No hous. memb.2	-0.021	0.0006	-0.027	0.048
	(0.014)	(0.004)	(0.012)	(0.015)
No hous. memb.3	-0.024	0.005	0.003	0.015
	(0.014)	(0.005)	(0.012)	(0.015)
No hous. memb.4	-0.021	0.003	0.011	0.006
	(0.014)	(0.004)	(0.011)	(0.014)
No hous. memb.5	-0.013	0.005	0.018	-0.01
	(0.013)	(0.004)	(0.011)	(0.015)
log (pr. food)	0.328	0.034	0.36	-0.723
	(0.53)	(0.179)	(0.45)	(0.562)
log (pr. alc/tob)	0.882	-0.45	-1.02	0.595
	(0.737)	(0.248)	(0.62)	(0.77)
log (pr. cloth/ftw)	1.90	-0.51	-0.977	-0.421
	(0.270)	(0.093)	(0.235)	(0.293)
log (pr. miscel.)	-2.61	0.762	1.36	0.489
	(0.38)	(0.129)	(0.324)	(0.4)
log (y/P)	-0.071	-0.005	0.006	0.069
	(0.009)	(0.003)	(0.007)	(0.009)

In this paper we concentrate into four broad commodity aggregates: food, alcohol/Tob., clothing/ftw. and miscellaneous. The refference household is other rural family with more than five children.

We estimate the system using pooled data for Greece. As far as the commodity expenditure and total expenditure is concerned, we have used the information contained in the four Greek family expenditure surveys, and for the commodity prices the National Accounts of O.E.C.D countries.

The parameter estimates as well as the standard errors are presented in table 4. The estimates of the coefficient of total expenditure β, classify food and alcohol/tob. as nessecities while the clothing/ftw. and miscellaneous are luxuries. Two of the β coefficients are significantly different from zero, while a large number of the price coefficients are signifiant too. Seven out of sixteen have t-values absolutely larger than two. Even so, very few of the variables have any detectable effect on the value share for the miscellaneous. From the quality variables twenty out of fifty two have t-values absolutely larger than two.

TABLE 5

Misspecification Diagnostics

	Food Equation	*Alc/Tob Equation*	*Cloth/Ftw Equation*
SER	0.027	0.009	0.023
SSR	0.065	0.007	0.047
	F-type		
Autocorrelation(1)	0.0006	0.72	1.15
	(2,64)	(2,64)	(2,64)
Heteroskedasticity	0.0011	0.13	0.80
	(2,64)	(2,64)	(2,64)
Non-Linearity	0.21	0.47	0.24
	(2,64)	(2,64)	(2,64)
	x^2-type		
Autocorrelation(2)	0.013	1.4	2.1
Heteroskedast.(2)	0.002	0.27	1.6
Non-linearity(2)	0.43	0.92	0.49
Normality(2)	12.1	33.3	10.1

Similarly, the prices of food and alcohol/tob. have little or no effect anywhere, while the prices of clothing/ftw. and miscellaneous appear significant with considerable regularity.

In Table 5, misspecification diagnostics are presented for departures from normality, linearity, homoskedastisity and sample independence of the residuals (Appendix B). Normality is not accepted for any of the three equations, but for the first and third the test is very close to the critical point at the 1% level of significance. Linearity and homoskedasticity are not rejected at 5% for either type of tests, F-type and x^2-type, and sample independence, (autocorrelation approach), has not been rejected for any of the three equations at the 5% level of significance.

TABLE 6

Total Expenditure and Price Elasticities

	Price Elasticities			
	Food	*Alch/tob.*	*Cloth/f.*	*Miscel.*
Food	-0.45	0.45	2.1	-5.3
Alcoh/tob.	-0.94	-7.18	-8.0	9.4
Cloth/footw.	0.52	-5.3	-5.1	4.7
Miscellan.	-1.80	-0.33	-1.4	-0.44
	Total Expenditure Elasticities			
Food	0.88			
Alcoh/Tob.	0.92			
Cloth/footw.	1.02			
Miscell.	1.07			

The results from the total expenditure and price elasticities are shown in Table 6. The price elasticities have the expected sign, but their values do seem unreasonable, possibly due to collinearity. From the total expenditure elasticities the categories, food and alcohol/tob. are classified as necessities while the rest are luxuries.

1.5. CONCLUSIONS

For both systems we estimated, we used the same model (with and without individuals characteristics), and the same method of estimation. The only differences are that for the first model we used time-series data to estimate a full demand system of seven equations, while for the second model we used pooled data (involving demographic characteristics of the household) to estimate a subsystem of four equations. Hence, we can only compare the findings of the three categories of goods and services since these three are included in both systems we have estimated. These categories are, food, alcohol/tob., clothing/ftw..

For both systems the categories food and alcohol/tob. appear to be necessities, while clothing/ftw. is considered luxury.

For the first system (time-series), all categories appear to be price inelastic, while for the second one (pooled data), food is price inelastic and the remaining are price elastic.

Concluding we could say that the first system fits the data better than the second one. The elasticities in this system are sensible and in line with other studies, while the price elasticities in the second system are unreasonable again due to collinearity.

Finally, both systems we estimated have minor misspecification problems. Normality is not accepted at the 5% lelel of significance for some equations, but it is very close to the critical point at the 1% level.

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APPENDIX A

The AI Demand System Elasticities

A convenient starting point to find the elasticities are the budget shares

(1) $w_i = p_i q_i / y$ where $y = \Sigma p_i q_i$

Taking logs and re-arranging terms

(2) $\ln q_i = \ln w_i - \ln p_i + \ln y$

so that the elasticity of demand for good i with respect to the price of good j is $e_{ij} = \partial \ln q_i / \partial \ln p_j$

The *uncompencated* elasticity is then calculated as

(3) $e^u_{ij} = \partial \ln w_i / \partial \ln p_j - \delta_{ij}$

and the *compensated* elasticity as

(4) $e^c_{ij} = \partial \ln w_i / \partial \ln p_j + (\partial \ln w_i / \partial \ln y)(\partial \ln y / \partial \ln p_j) - \delta_{ij} + \partial \ln y / \partial \ln p_j =$
$e^u_{ij} + (\partial \ln w_i / \partial \ln y)(\partial \ln y / \partial \ln p_j) + \partial \ln y / \partial \ln p_j$

where δ_{ij} is the Kronecker delta.

Assuming that the budget shares have the AI form

(5) $e^u_{ij} = (1/w_i)[\gamma_{ij} - \beta_i(\alpha_j + \sum_j \gamma_{ij} \ln p_j)] - \delta_{ij}$

In practice we may want to replace $\alpha_j + \Sigma_j \gamma_{ij} \ln p_j$ with $w_j - \beta_j (\ln y - \ln p)$ to use the (average) shares w_j rather than the a_j which are affected by the subsistence expenditure level assumed at the estimation stage. Also

(6) $e^c_{ij} = e^u_{ij} + w_j[1 + (\beta_i / w_i)] = e^u_{ij} + w_j e_i$

where $e_i = 1 + (\beta_i / w_i)$ is the budget elasticity of the ith good.

APPENDIX B

Misspecification Diagnostics

Autocorrelation (1) is the LM test for first order residual autocorrelation, based on an auxiliary regression of the residuals, on lagged residuals and the fitted values from the original regression.

Non-linearity is the RESET test for linearity, based on an auxiliary regression of the residuals on the fitted values from the regression and their squares.

Heteroskedasticity is the White (1980) test for homoskedasticity, based on an auxiliary regression of the squares of the residuals on the fitted values from the original regression and their squares.

Normality the Bera-jarque (1982) skewness-kurtosis test for normality, based on the third and fourth moments of the residuals.