Consumption Profiles for Various Food Groups in Greece

Vassilis Mihalopoulos and Michael Demoussis*

Abstract
Adult Equivalent Scales (AES) in household consumption analysis are profoundly more appropriate and more revealing than the "average per capita" consumption, which treats every household member on an equal basis. This paper provides estimates of AES parameters for five important food groups of the typical Greek diet (meat, fish, fruits and vegetables, dairy products and legumes). Data from the 1993/94 Household Budget Survey were used and a Tobit limited dependent variable model was employed for estimation purposes. The results of the empirical analysis indicate that the age and gender composition of Greek households is a major determinant of food demand and consumption. In addition, the true household size varies substantially among the examined food groups and differs significantly from the "number of persons" measure of household size.

Key words: *Adult Equivalent Scales, consumption profiles, food expenditures, Tobit model*

Introduction

Empirical observation suggests that the age and gender composition of the household is a major determinant of its food consumption behavior. This most obvious relationship has two important practical implications for consumption analysis: First, the true household size may differ, and it usually does, from the "number of persons" in the household and, second, the same household is of different size for different commodities, i.e., household size is commodity-dependent. These profound implications are rarely taken into consideration in empirical studies of household consumption behavior and, as a rule, all household members are treated equally. The objective of this paper is to take into account in an explicit way the age and gender composition of Greek households and to estimate Adult Equivalent Scales (AES) for five major food groups (meat, fish, fruits and vegetables, dairy products and legumes), using cross-sectional data from the 1993/94 Household Budget Survey (NSSG, 1994) and the appropriate micro econometric methods.

An AE scale is an index representing household size and composition. When this index is introduced into expenditure functions, it shows the consumption behavior of household members belonging in different age-gender classifications. Furthermore, it measures the contribution of every household member to household expenditures for a particular product or group of products, relative to a standard "reference member". Adult Equivalent Scales can be stepwise discrete, (Prais and Houthakker, 1955; Price, 1971), or continuous (Blokland, 1976; Buse and Salathe, 1978; Tedford *et al.*, 1986). The stepwise discrete scales are characterized by a constant value over a period of years, which changes abruptly and sig-

* Vassilis Mihalopoulos is a Ph.D. candidate and Michael Demoussis is a Professor at the Department of Economics of the University of Patras. E-mail: micdem@econ.upatras.gr
The authors would like to thank an anonymous reviewer and Professor D. Damianos for helpful comments on an earlier draft of this paper.

nificantly when the household member under consideration enters the next period of his/her life. These sudden changes imply that there is lack of continuity in a person's biological and psychological growth. The continuous scales address exactly this problem of discontinuity and imply that changes in household consumption behavior are smooth and continuous functions of every household member's biological and psychological growth. In this paper continuous AES for five food groups and total food are estimated using the Tedford-Capps-Havlicek (TCH) model (Tedford *et al.*, 1986), which has been used extensively in recent studies for the calculation of continuous AES parameters (e.g. Gould, 1992 and 1994; Anderson and Senauer, 1994).

The paper is structured as follows: In the next section the TCH model is presented. Section three refers to the data sources and the estimation model. The results of the econometric estimation are presented in section four. The paper concludes with a synopsis of the major findings.

The TCH Equivalent Scale

The TCH Adult Equivalent Scale is based on the assumption that a person's life cycle is a sequence of developmental and transitional periods (Table 1).

Table 1. Adult Scale Functions of the TCH Model

Period of Life Cycle	Age	Adult Scale Function $S(a_j, s_j)$
A. Males		
Birth(Males & Females)	0	M_1
Developmental childhood and adolescence	$0<\alpha_j\leq 17$	$M_1+E_{11}.\alpha_j-[0.11764.E_{11}+0.01037.(M_1-M_2)].\ \alpha_j^2+$ $+[0.00346.E_{11}+0.000407.(M_1-M_2)].\ \alpha_j^3$
Early adult transition	$17<\alpha_j\leq 22$	M_2
Developmental early adulthood	$22<\alpha_j\leq 40$	$M_2+E_{21}.(\alpha_j-22)-[0.11111.E_{21}+0.009258.(M_2-1)].\ (\alpha_j-22)^2+$ $+[0.003086.E_{21}+0.000343.(M_2-1)].\ (\alpha_j-22)^3$
Middle adult transition	$40<\alpha_j\leq 45$	1
Developmental middle adulthood	$45<\alpha_j\leq 60$	$1+E_{31}.(\alpha_j-45)-[0.13332.E_{31}+0.01333.(1-M_4)].(\alpha_j-45)^2+$ $+[0.004444.E_{31}+0.000592.(1-M_4)].\ (\alpha_j-45)^3$
Late adult transition	$60<\alpha_j\leq 65$	M_4
Developmental late adulthood	$65<\alpha_j\leq 80$	$M_4+E_{41}.(\alpha_j-65)-[0.13332.E_{41}+0.01333.(M_4-M_5)].(\alpha_j-65)^2+$ $+[0.004444.E_{41}+0.000592.(M_4-M_5)].\ (\alpha_j-65)^3$
Late late adult transition	$\alpha_j>80$	M_5
B. Females		
Developmental childhood and adolescence	$0<\alpha_j\leq 17$	$M_1+E_{12}.\alpha_j-[0.11764.E_{12}+0.01037.(M_1-F_2)].\ \alpha_j^2+$ $+[0.00346.E_{12}+0.000407.(M_1-F_2)].\ \alpha_j^3$
Early adult transition	$17<\alpha_j\leq 22$	F_2
Developmental early adulthood	$22<\alpha_j\leq 40$	$F_2+E_{22}.(\alpha_j-22)-[0.11111.E_{22}+0.009258.(F_2-F_3)].(\alpha_j-22)^2+$ $+[0.003086.E_{22}+0.000343.(F_2-F_3)].\ (\alpha_j-22)^3$
Middle adult transition	$40<\alpha_j\leq 45$	F_3
Developmental middle adulthood	$45<\alpha_j\leq 60$	$F_3+E_{32}.(\alpha_j-45)-[0.13332.E_{32}+0.01333.(F_3-F_4)].(\alpha_j-45)^2+$ $+[0.004444.E_{32}+0.000592.(F_3-F_4)].\ (\alpha_j-45)^3$
Late adult transition	$60<\alpha_j\leq 65$	F_4
Developmental late adulthood	$65<\alpha_j\leq 80$	$F_4+E_{42}.(\alpha_j-65)-[0.13332.E_{42}+0.01333(F_4-F_5)].(\alpha_j-65)^2+$ $+[0.004444.E_{42}+0.000592.(F_4-F_5)].\ (\alpha_j-65)^3$
Late late adult transition	$\alpha_j>80$	F_5

Events and activities, which occur during the developmental periods, shape the character of a person's life. In particular, during the developmental periods of infancy, childhood and adolescence, a dependent child experiences biological, psychological and social growth. The developmental period of early adulthood is the most dramatic because it encompasses years of intellectual development, contradiction and stress. The developmental period of middle adulthood is characterized by some loss of youthful vitality and the response to this loss may alter behavioral patterns. The developmental period of late adulthood is characterized by numerous biological, psychological and social changes and individuals are more concerned with health issues, serious illnesses and death. The transitional periods constitute times of reassessment and planning, last three to six years and link the developmental periods with each other, providing continuity to the changes which occur in the outgoing and incoming developmental phases, (Levinson *et al.*, 1978). Both, developmental and transitional periods influence an individual's consumption behavior, shaping thus life cycle consumption profiles.

For the jth household member of age a_j and gender s_j, the AES value is given by:

$$AES_j=S(a_j,s_j) \quad (1)$$

This function takes the value of 1 when the household member is male between the ages of 41 and 45 (reference household member). Cubic functions, i.e., continuous functions of age and gender, are used to estimate the equivalence scale values during the developmental periods. During the transitional periods these values remains constant (Tedford *et al.*, 1986). Table 1 shows that the scale function consists of 8 cubic functions, 4 for males and 4 for females. The unknown parameters M_1, M_2, M_4, M_5, F_2, F_3, F_4 and F_5 measure in adult equivalence terms the effects of adding a member, (male or female) belonging in a transitional period, to the household, relative to the reference household member ($M_3=1$). The parameters E_{11}, E_{21}, E_{31}, E_{41}, E_{12}, E_{22}, E_{32} and E_{42}, correspond to the cubic functions of male and female developmental periods.

The number of adult equivalents in each household, which is usually called the "true" household size, is obtained by summing equations (1) over all household members. Household equivalent scales are aggregates of the adult equivalent scales and may be expressed as explicit functions of the adult scale parameters:

$$AES = M_1.\Phi_A+M_2.\Phi_B+\Phi_\Gamma+M_4.\Phi_\Delta+M_5.\Phi_E+F_2.\Phi_Z+F_3.\Phi_H+F_4.\Phi_\Theta+F_5.\Phi_I+E_{11}.\Phi_K+E_{21}.\Phi_\Lambda+$$
$$+E_{31}.\Phi_M+E_{41}.\Phi_N+E_{12}.\Phi_\Xi+E_{22}.\Phi_O+E_{32}.\Phi_\Pi+E_{42}.\Phi_P \quad (2)$$

where, the variables Φ_A through Φ_P represent 17 (age-gender dependent) weighted variables, which are presented in Table 2.

Table 2. Expressions for the Weighted Sum Variables in the TCH Model

$$\Phi_A = n_1 + n_9 - 0{,}010381 \sum^{n_1} a_j^2 + 0{,}00407 \sum^{n_1} a_j^3 - 0{,}010381 \sum^{n_9} a_j^2 + 0{,}000407 \sum^{n_9} a_j^3$$

$$\Phi_B = n_2 + n_3 - 0{,}010381 \sum^{n_1} a_j^2 + 0{,}000407 \sum^{n_1} a_j^3 - 0{,}009259 \sum^{n_3} (a_j - 22)^2 + 0{,}000343 \sum^{n_3} (a_j - 22)^3$$

$$\Phi_\Gamma = n_4 + n_5 + 0{,}009259 \sum^{n_3} (a_j - 22)^2 - 0{,}000343 \sum^{n_3} (a_j - 22)^3 - 0{,}013333 \sum^{n_5} (a_j - 45)^2 + \\ + 0{,}000593 \sum^{n_5} (a_j - 45)^3$$

$$\Phi_\Delta = n_6 + n_7 + 0{,}013333 \sum^{n_5} (a_j - 45)^2 - 0{,}000593 \sum^{n_5} (a_j - 45)^3 - 0{,}013333 \sum^{n_7} (a_j - 65)^2 + \\ + 0{,}000593 \sum^{n_7} (a_j - 65)^3$$

$$\Phi_E = n_8 + 0{,}0133333 \sum^{n_7} (a_j - 65)^2 - 0{,}000593 \sum^{n_7} (a_j - 65)^3$$

$$\Phi_Z = n_{10} + n_{11} + 0{,}010381 \sum^{n_9} a_j^2 - 0{,}000407 \sum^{n_9} a_j^3 - 0{,}009259 \sum^{n_{11}} (a_j - 22)^2 + 0{,}000343 \sum^{n_{11}} (a_j - 22)^3$$

$$\Phi_H = n_{12} + n_{13} + 0{,}009259 \sum^{n_{11}} (a_j - 22)^2 - 0{,}000343 \sum^{n_{11}} (a_j - 22)^3 - 0{,}013333 \sum^{n_{13}} (a_j - 45)^2 + \\ + 0{,}000593 \sum^{n_{13}} (a_j - 45)^3$$

$$\Phi_\Theta = n_{14} + n_{15} + 0{,}013333 \sum^{n_{13}} (a_j - 45)^2 - 0{,}000593 \sum^{n_{13}} (a_j - 45)^3 - 0{,}013333 \sum^{n_{15}} (a_j - 65)^2 + \\ + 0{,}000593 \sum^{n_{15}} (a_j - 65)^3$$

$$\Phi_I = n_{16} + 0{,}0133333 \sum^{n_{15}} (a_j - 65)^2 - 0{,}000593 \sum^{n_{15}} (a_j - 65)^3$$

$$\Phi_K = \sum^{n_1} a_j - 0{,}117647 \sum^{n_1} a_j^2 + 0{,}003460 \sum^{n_1} a_j^3$$

$$\Phi_\Lambda = \sum^{n_3} (a_j - 22) - 0{,}111111 \sum^{n_3} (a_j - 22)^2 + 0{,}003086 \sum^{n_3} (a_j - 22)^3$$

$$\Phi_M = \sum^{n_5} (a_j - 45) - 0{,}133333 \sum^{n_5} (a_j - 45)^2 + 0{,}004444 \sum^{n_5} (a_j - 45)^3$$

$$\Phi_N = \sum^{n_7} (a_j - 65) - 0{,}133333 \sum^{n_7} (a_j - 65)^2 + 0{,}004444 \sum^{n_7} (a_J - 65)^3$$

$$\Phi_\Xi = \sum^{n_9} a_j - 0{,}117647 \sum^{n_9} a_j^2 + 0{,}003460 \sum^{n_9} a_j^3$$

Table 2. Expressions for the Weighted Sum Variables in the TCH Model *(con.)*

$$\Phi_O = \sum^{n_{11}} (a_j - 22) - 0{,}111111 \sum^{n_{11}} (a_j - 22)^2 + 0{,}003086 \sum^{n_{11}} (a_j - 22)^3$$

$$\Phi_\Pi = \sum^{n_{13}} (a_j - 45) - 0{,}133333 \sum^{n_{13}} (a_j - 45)^2 + 0{,}004444 \sum^{n_{13}} (a_j - 45)^3$$

$$\Phi_P = \sum^{n_{15}} (a_j - 65) - 0{,}133333 \sum^{n_{15}} (a_j - 65)^2 + 0{,}004444 \sum^{n_{15}} (a_j - 65)^3$$

Where a_j = the age of the jth household member,

n_1 = the number of males 0 to 17 years of age,

n_2 = the number of males 18 to 22 years of age,

n_3 = the number of males 23 to 40 years of age,

n_4 = the number of males 41 to 45 years of age,

n_5 = the number of males 46 to 60 years of age,

n_6 = the number of males 61 to 65 years of age,

n_7 = the number of males 66 to 80 years of age,

n_8 = the number of males at least 81years of age,

n_9 = the number of females 0 to 17 years of age,

n_{10} = the number of females 18 to 22 years of age,

n_{11} = the number of females 23 to 40 years of age,

n_{12} = the number of females 41 to 45 years of age,

n_{13} = the number of females 46 to 60 years of age,

n_{14} = the number of females 61 to 65 years of age,

n_{15} = the number of females 66 to 80 years of age,

and n_{16} = the number of females at least 81years of age.

Data and estimation model

The data used in this paper have been obtained from the Household Budget Survey that was conducted by the National Statistical Service of Greece (NSSG) during the period of October 1993 to September 1994. The survey contains detailed information on household food use and expenditures during a fourteen-day period, as well as data on the socioeconomic and demographic characteristics of the household. The sample employed in this study contains 6751 households. A preliminary descriptive analysis of the survey data indicated that the proportion of households reporting zero expenditures for meat, fish, fruit and vegetables, dairy products and legumes, is 4.9, 28.8, 1.9, 3.2, and 34.9 percent, respectively.

Since a significant proportion of values of the dependent variables are clustered at zero, a straight forward application of OLS will yield biased and inconsistent estimates. This is because the linearity assumption of the OLS method is violated, (Amemiya, 1984). For this reason the Tobit model, which belongs to the family of limited dependent variable procedures, was used to carry out the estimation of the parameters M_1, M_2, M_4, M_5, F_2, F_3, F_4, F_5, E_{11}, E_{21}, E_{31}, E_{41}, E_{12}, E_{22}, E_{32} and E_{42} of the AES function. In addition, the Tobit model, which has been used in many food expenditure/consumption studies (e.g. Misra *et al.*, 1990; Cornick *et al.*, 1994; McDowell *et al.*, 1997), implies that: a) all zero observations represent corner solutions, which in turn implies that non-consuming households can become consuming ones under different economic conditions (i.e., different income and/or prices) and b) the decision to consume a food product and the decision on the level of consumption are influenced by the same set of explanatory variables (Blundell and Meghir, 1987).

The Tobit model can be formally presented as follows:

$$Y_i = X_i \beta + u_i \quad \text{if} \quad X_i \beta + u_i > 0$$

$$Y_i = 0 \quad \text{if} \quad X_i \beta + u_i \leq 0 \quad \mu\varepsilon \quad i = 1, 2, \ldots, N \tag{3}$$

where, N is the number of observations (households), Y_i is the dependent variable, X_i is a row vector of explanatory variables, β is a column vector of unknown coefficients and u_i is an independently distributed error term, assumed to be normal with mean zero and constant variance σ^2 (McDonald and Moffitt, 1980).

Given the sample of 6751 observations, the sample log-likelihood function corresponding to (3) may be written (Blundell-Meghir, 1987) as:

$$\log L = \Sigma_0 \log[1-\Phi(X_i\beta/\sigma)] + \Sigma_+ [-\log\sigma+\log\varphi((Y_i- X_i\beta)/\sigma)] \tag{4}$$

where, Σ_0 and Σ_+ refer to summations over zero and positive observations for Y_i, and where $\Phi(.)$ and $\varphi(.)$ refer to the standard normal cumulative and density functions, respectively, (Maddala, 1986). The term $\Phi(X_i\beta/\sigma)$ represents the probability of a non-zero observation and the 1- $\Phi(X_i\beta/\sigma)$ represents the probability of a zero observation. The dependent variable Y_i is the observed expenditure of household i for each food group. The explanatory variables in X_i are: a) social and demographic dummy variables, (urbanization, region of residence, season of survey, and meal planer's age, education and work profile), b) total expenditures by the ith household, and c) the variables Φ_A through Φ_P.

Results of Estimation

The econometric software LIMDEP 7 was employed to maximize the Tobit log-likelihood function (see Greene, 1997). Table 3, for the purposes of the present article, presents only the estimates of the adult scale parameters M_1, M_2, M_4, M_5, F_2, F_3, F_4, F_5, E_{11}, E_{21}, E_{31}, E_{41}, E_{12}, E_{22}, E_{32} and E_{42}, relative to M_3(=1). Using the estimated AES parameters and the AES functions $S(a_j,s_j)$, the male and female AES profiles for each food group can thus be calculated (Figures 1-6).

AES parameter estimates for the "meat" group are presented in Table 3. Six out of nine transitional coefficients and three out of eight developmental coefficients are statistically significant. The non significant transitional coefficient of a newborn baby (M_1) implies the obvious that is, newborns do not affect household meat demand and consumption. Similarly, the non significance of the transitional coefficients M_2 and M_5 imply that a male 18-22 years old or a male older than 80, do not significantly affect household meat demand. In contrast, the transitional coefficients M_4, F_2, F_3, F_4 and F_5, are statistically significant and their estimated values indicate that a male of age 61-65 and a female of age 18-22, 41-45, 61-65 and >80, spend on meat products 47% more, 48% less, 55% more, 5% more and 40% less than the "reference" member, respectively. The male and female AES profiles follow similar paths with maximum values occurring at the age of 55 (males) and 50 (females). The male profile lies above the female profile at the age groups 1-9, 25-30 and 52-69 (Figure 1).

Table 3. Tobit Model: Estimated Adult Equivalent Scale Parameters

Variable	Coefficient	Gender	Age – Period (years)	Meat	Fish	Fruits - Vegetables	*Dairy Products*	Legumes	Total Food
Φ_A	M_1	M&F	0 (Transitional)	$0.457^{\#}$	$0.175^{\#}$	1.011^{***}	0.378^{***}	$0.704^{\#}$	1.074^{***}
Φ_B	M_2	M	18-22 »	$0.153^{\#}$	0.278^{**}	$0.100^{\#}$	0.261^{**}	0.322^{**}	0.211^{***}
Φ_Γ	M_3	M	41-45 »	1.000^{***}	1.000^{***}	1.000^{***}	1.000^{***}	1.000^{***}	1.000^{***}
Φ_Δ	M_4	M	61-65 »	1.466^{***}	1.412^{***}	1.557^{***}	1.294^{***}	1.741^{***}	1.335^{***}
Φ_E	M_5	M	>80 »	$0.378^{\#}$	1.145^{***}	1.219^{***}	1.362^{***}	1.519^{***}	0.688^{***}
Φ_Z	F_2	F	18-22 »	0.517^{***}	$0.125^{\#}$	0.491^{***}	0.864^{***}	0.785^{***}	0.688^{***}
Φ_H	F_3	F	41-45 »	1.548^{***}	1.636^{***}	1.744^{***}	2.104^{***}	2.593^{***}	1.563^{***}
Φ_Θ	F_4	F	61-65 »	1.052^{***}	1.033^{***}	1.695^{***}	1.374^{***}	1.837^{***}	1.191^{***}
Φ_I	F_5	F	>80 »	0.596^{***}	0.450^{*}	0.959^{***}	1.181^{***}	0.748^{**}	0.866^{***}
Φ_K	E_{11}	M	1-17 (Developmn.)	0.203^{*}	$0.127^{\#}$	$0.053^{\#}$	-0.329^{***}	$0.122^{\#}$	0.108^{*}
Φ_Λ	E_{21}	M	23-40 »	0.195^{***}	$0.056^{\#}$	$-0.008^{\#}$	0.271^{***}	0.444^{***}	0.162^{***}
Φ_M	E_{31}	M	46-60 »	$0.157^{\#}$	$0.059^{\#}$	$0.079^{\#}$	0.217^{**}	$0.148^{\#}$	0.102^{*}
Φ_N	E_{41}	M	66-80 »	$-0.064^{\#}$	0.242^{**}	$-0.076^{\#}$	$0.020^{\#}$	0.322^{**}	$0.012^{\#}$
Φ_Ξ	E_{12}	F	1-17 »	$0.108^{\#}$	$0.113^{\#}$	$0.062^{\#}$	-0.537^{***}	$0.078^{\#}$	$0.016^{\#}$
Φ_O	E_{22}	F	23-40 »	-0.167^{**}	$-0.027^{\#}$	$-0.002^{\#}$	$-0.115^{\#}$	-0.430^{***}	-0.148^{***}
Φ_Π	E_{32}	F	46-60 »	$0.086^{\#}$	$0.180^{\#}$	$0.079^{\#}$	$0.005^{\#}$	$0.059^{\#}$	$0.058^{\#}$
Φ_P	E_{42}	F	66-80 »	$0.111^{\#}$	$-0.135^{\#}$	$0.059^{\#}$	$-0.056^{\#}$	$-0.081^{\#}$	$-0.002^{\#}$

\# Insignificance   ** Significance at 5%
*** Significance at 1%   * Significance at 10%

Figure 1: Adult Equivalent Profiles for Household Meat Expenditures

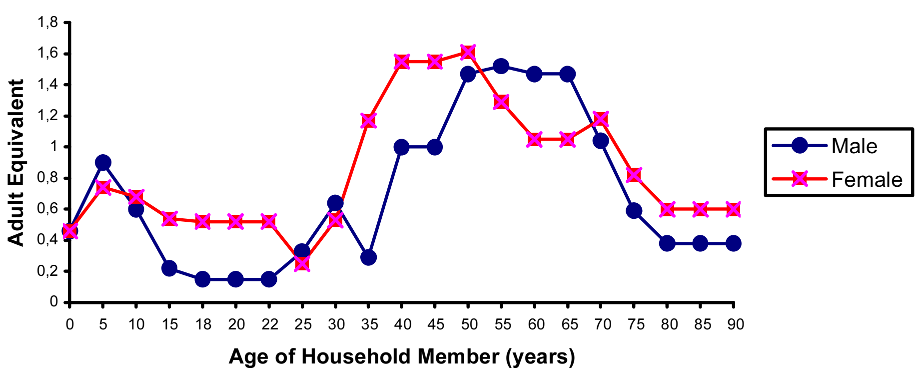


Figure 2: Adult Equivalent Profiles for Household Fish Expenditures

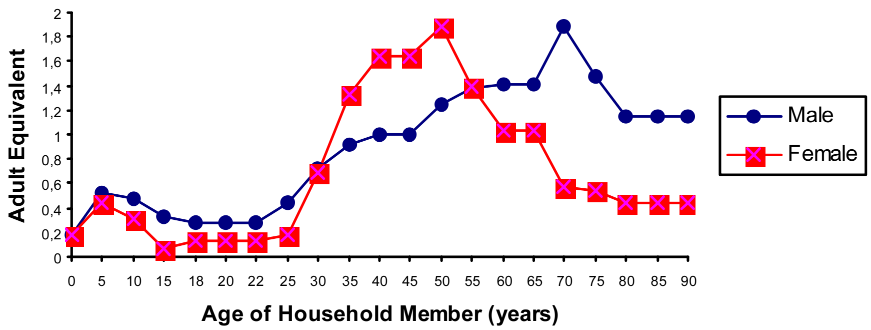


Figure 3: Adult Equivalent Profiles for Household Fruits-Vegetables Expenditures

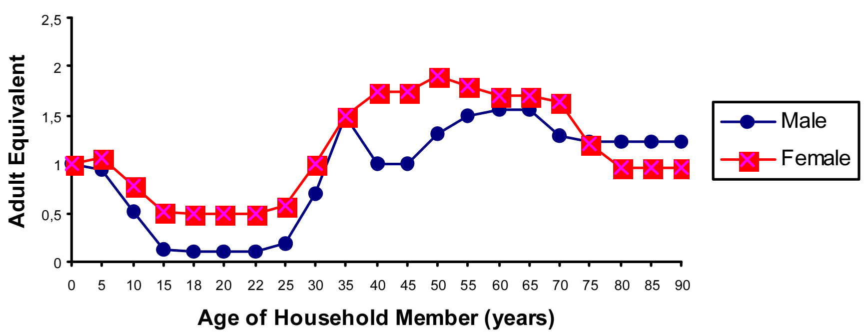


Figure 4: Adult Equivalent Profiles for Household Dairy Expenditures

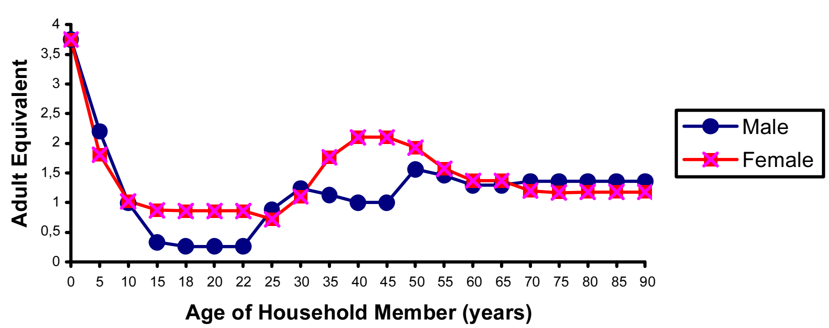


Figure 5: Adult Equivalent Profiles for Household Legumes Expenditures

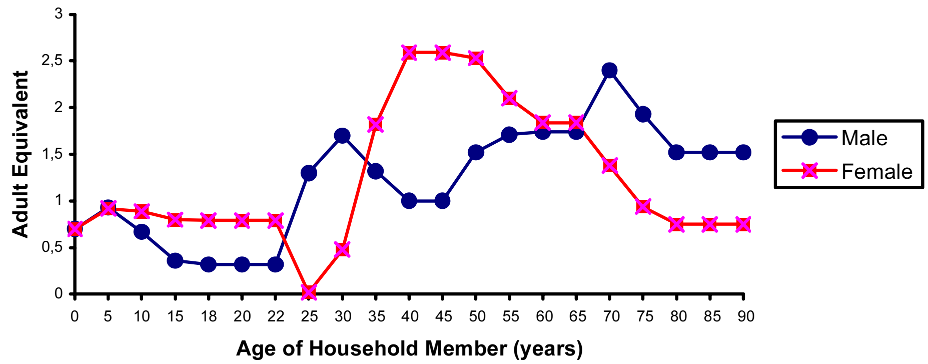
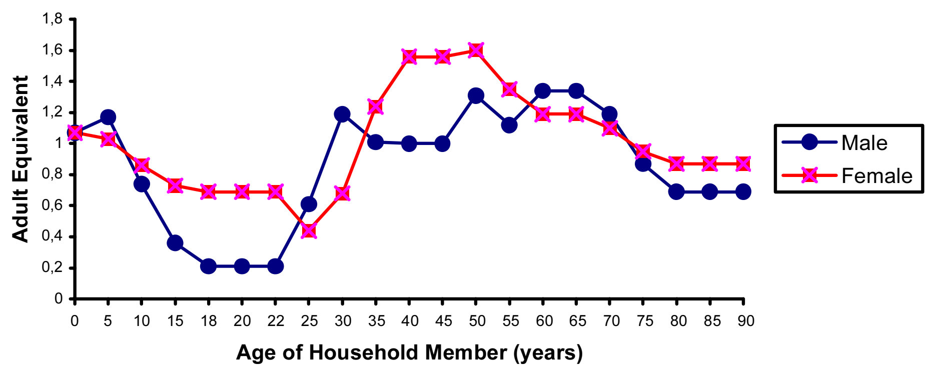


Figure 6: Adult Equivalent Profiles for Household Food Expenditures



The results in Table 3 and figures 2-5 for the others food groups are interpreted in a similar manner. In addition, the following points are worth making. With the exception of “legumes”, the male and female profiles for the other food groups follow similar paths. For the “fish” group, the female profile lies above the male profile between the ages of 30 and 55, with maximum expenditure values occurring at the age of 75 for males and 50 for females. The wide gap between the male and female profiles after the age of 80, in the fish group, is due to a dramatic decline of the female profile after the age of 50 (see Figure 2). In the “fruits and vegetables” group the female profile appears above the male profile during the entire life cycle, except for the ages over 75. The largest distance between the two profiles occurs in the transitional period between 41 and 45 years of age where, females consume 74% more than males (Figure 3). For the dairy products the female profile appears above the male one between the ages 10 and 55, with the widest gap (101%) occuring at the 41-45 age class (Figure 4). In the “ legumes” group the male profile peaks at the age of 70 while the female at the ages 41-45. For the “total food” category all transitional coefficients are significant, while the same holds for four out of eight developmental coefficients (Table 3). In Figure 6, the female profile appears to be above the male profile, except for the ages 0-8, 25-35 and 60-75, with maximum values occurring at the age of 60-65 for males and 50 for females.

Finally, using equation (1) and replacing the parameters M_1, M_2, M_4, M_5, F_2, F_3, F_4, F_5, E_{11}, E_{21}, E_{31}, E_{41}, E_{12}, E_{22}, E_{32} and E_{42} with their estimated values from the Tobit model (Table 3), the "true" household size, i.e., the total number of adult equivalents in the household, for each food group can be calculated. The average "true" household size for each food group is, as expected, different from the average number of members per household. In particular, the average number of persons per household is 2.94, while the average "true" household size for each food group is: 2.65 (meat), 2.45 (fish), 3.13 (fruits and vegetables), 2.80 (dairy products), 3.77 (legumes) and 2.86 (total food).

Concluding remarks

The use of Adult Equivalent Scales in consumption analysis is more appropriate and more revealing than the "average per capita" consumption. AES provide an accurate picture of food consumption patterns for individuals belonging in various age/gender categories. AES can also be used to obtain a more accurate measure of household size, which is more appropriate than the "number of persons" measure, used indiscriminately in consumption analysis. Furthermore, the AES measure of household size varies substantially among the various food groups implying that household size is commodity dependent.

The preceded microeconometric analysis revealed that the age and gender composition of Greek households affects significantly food demand and consumption. The estimated age and gender consumption profiles for the food groups examined exhibit great variability. Given that the demographic picture of our country is undergoing significant changes, the results of the above analysis have important implications for producers and marketers of agricultural products and food items. For example, total food expenditures peak at the age of 50 and then follow a decreasing trend. Given that the proportion of persons older than 50 years in the population increases steadily and assuming that the population remains constant then it is obvious that food consumption will decline. Another example: dairy consumption falls steadily from birth till the age of 22 for both, males and females. A marketing strategy designed to increase the consumption of dairy products should target primarily these ages.

References

Amemiya, T. (1984). Tobit Models: A Survey, *Journal of Econometrics*, 24: 3-61

Anderson, M. and Senauer, B. (1994). *Non-Purchasing Households in Food Expenditure Survey: An Analysis for Potatoes in Sweden*, Staff Paper P94-4, University of Minnesota.

Blokland, J. (1976). *Continuous Consumer Equivalence Scales*, The Hague: Martinas Nijhoff.

Blundell, R. and Meghir, C. (1987). Bivariate Alternatives to the Tobit Model, *Journal of Econometrics* 34: 179-200.

Buse , R. and Salathe, L. (1978). Adult Equivalence Scales: An Alternative Approach *American Journal of Agricultural Economics*, 60(3): 460-468.

Cornick, J., Cox, T. and Gould, B. (1994). Fluid Milk Purchases: A Multivariate Tobit Analysis, *American Journal of Agricultural Economics*, 62(1): 74-82.

Gould, B. (1992). At Home Consumption of Cheese: A Purchase-Infrequency Model, *American Journal of Agricultural Economics*, 74: 453-459.

Gould, B. (1994). The Demand for Cheese in the United States: The Role of Household Composition, *Agribusiness*, 10: 43-59.

Greene, W. (1997). *LIMDEP User's Manual and Reference Guide, Version 7.0*, Econometric Software, New York.

Levinson, D., Darrow, C., Klein, E., Levinson, M. and Mckee, B. (1978). *The Seasons of a Man's Life*, New York: Ballantine Book.

Maddala, G. (1986). *Limited Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, Cambridge (p.p. 151-156, 179-181).

McDonald, J. and Moffit, R. (1980). The Uses of Tobit Analysis, *Review of Economics and Statistics*, 62: 318-321.

McDowell, D., Allen, J. and McLean, P. (1997). Food Expenditures and Socioeconomic Characteristics: Focus on Income Class, *American Journal of Agricultural Economics*, 79(5): 1444-1451.

Misra, S., Huang, C. and Raunikar, R. (1990). The Demand for Food Away from Home in Georgia, *Journal of Agribusiness*, 8: 73-83.

National Statistical Servise of Greece (NSSG) (1994). *Household Budget Survey 1993/94*, Athens.

Prais, S. and Houthakker, H. (1955). *The Analysis of Family Budgets*, Cambridge: Cambridge University Press.

Price, D. (1971). Unit Equivalence Scales for Specific Food Commodities, *American Journal of Agricultural Economics*, 52: 224-233.

Tedford, J., Capps, O. and Havlicek, J. (1986). Adult Equivalent Scales Once More – A Developmental Approach, *American Journal of Agricultural Economics*, 68: 322-333.