New Equivalence Scales for Romania

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1. Introduction: why is a new equivalence scale necessary?

Romania emerged from a communist regime with a relatively low standard of living and an economy with low performance and a great lack of equilibrium. This led to the long-term economic crisis and high inflation, that marked the transition from a centrally planned to a market economy, and consequently a continuing decrease in the standard of living.

The decrease of the standard of living, mainly caused by income losses and decrease of purchasing power, affected all categories of the population. Thus, the number of people unable to cover the expenditure required by a normal standard of living increased, the poverty status extended and the poverty feeling is present for the majority of the population[1]. In this general context, the situation of some categories of population worsened further, making it impossible for them to cover the basic necessities. The households affected by unemployment are included here as is a share of pensioners (especially the agricultural pensioners and survivors), families with many children, households living in disadvantageous areas (especially rural or those affected by the breaking down of some big, inefficient industrial enterprises).

The extent of unemployment and the limited employment opportunities led to the explosion of the number of persons being in the charge of social protection systems, especially the pension and unemployment compensation ones. The resources, which can be allocated, are very small[2], as they are also limited by severe budgetary constraints. Thus, the capacity and the level of protection offered by social security systems diminished, so that some of the people living off of social benefits are in great difficulty.

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[1] According to the pilot budget family survey, carried out in 2000, more than three quarters (76,9%) of households appreciate that they cannot deal with current expenditure with the income they have.

[2] Social security expenditure in Romania accounts for only a tenth of the GDP (11.3% in 1999).

In these circumstances, the tasks of the policies fighting poverty are extremely difficult. Maximum efficiency when using all the resources allocated for different protection measures is required as is a good targeting of the support to those people who really need it. Thus, the accurate assessment of poverty that affects different categories of the population and the correct identification of those who need help is of great importance.

However, as well known, poverty measurement is, still, not an easy task, and the measurement instruments must be adequate in meeting the characteristics and peculiarities of the society for which the poverty is measured. The choice of one or another methodological solution must take into consideration the characteristics of the economic and social environment and the economic and behavioural pattern of households. This is very important in the case of Romania, because the Romanian pattern, essentially European, is marked also by characteristics of a low standard of living.

The choice of the equivalence scale is one of the most difficult methodological issues, but a very important one for defining the poverty profile. This is a major concern for the Romanian experts dealing with poverty measurement from the point of view of defining a national methodology for measurement and analysis of this phenomenon. Welfare comparisons across households, in order to estimate the poverty and inequality parameters, needs a specific equivalence scale, suitable for the consumption structure in Romania.

The need of a specific equivalence scale derives, firstly, from the fact that the OECD modified scale – the most frequently used in European countries, and recommended by Eurostat – is set up taking into account a structure of the consumption characteristic to a much higher standard of living than the one presently recorded in Romania. The equivalence coefficients - equal to 1 for the first adult in the household, to 0.5 for each subsequent adult, and 0.3 for every child - presume very big economies of scale, that are possible only if expenditures for housing have a big share in the household consumption expenditures. But in the consumption structure of Romanian households, the expenditure made for those consumption elements, which are the object of the economy of scale, represents less than one fifth (18.2% in 1999). Moreover, even a part of this expenditure (which counts for 3.6% of total consumption expenditure) is correlated to the number of household members. In blocks of flats the payment for some utilities – water supply, including hot water, natural gas and sewerage installation - is made depending on the number of persons living in each flat. Also, as a result of housing policy, in the former regime the dwelling size was strongly determined by the household size. To some extent, this relationship is also maintained at present. The economies of scale exist, no doubt, in the household consumption in Romania, too, but their sizes are much smaller than those in the countries with higher standard of living.

The OECD modified scale is too flat for Romania's conditions. If we presume the existence of such a low elasticity of the cost of living in respect to household size, the scale underestimates the needs of numerous households and their poverty situation.

From this point of view, the Oxford (OECD) scale - which gives 1.0 coefficient for the first adult in the household, 0.7 for the subsequent adults, and 0.5 for children - is more appropriate for the Romanian model.

However, the use of this scale, and of the modified OECD scale also, raises another problem related to the fact that these scales do not take into consideration the differences between the cost of adults and children of different ages. In Romania, these differences are important and must be taken into consideration, because food consumption expenditure, which is significantly different depending on the age, has a very high share in the consumption expenditure of households (56.2% in 1999). There are also, important differences regarding the expenditure for buying clothes and footwear for children of a different age, and also there are different needs for clothes, durable goods replacement and transport services in the case of elderly inactive persons, compared with active ones. A more precise differentiation of the equivalent coefficients is necessary in order to be able to assure a better welfare comparability between households of different size and composition.

The Romanian National Institute of Statistics used up until now an equivalence scale that was established on the basis of the food consumption need expressed in calories, determined by Romanian nutritionists, by age groups and gender. The coefficients of this scale were calculated as the ratio between the calories needs corresponding to each category and the highest caloric consumption, corresponding to the boys 16–20 years old (Table 1).

While a better scale, based on the consumption pattern, was not available, the use of this equivalence scale is justified by the preponderance of food in the household consumption expenditure. The share of food is higher than two thirds at the bottom of households distribution by per capita income (77.7% in the first and 71.0% in the second decile group), being pretty high at the top of the distribution also (50.3% in the ninth and 37.7% in the tenth decile).

Table 1: NIS equivalence scale established on the basis of calories needs

	The daily calories need	Equivalence scale
Children (0-1 years old)	1000	0.28
Children (2-3 years old)	1300	0.36
Children (4-6 years old)	1700	0.47
Children (7-9 years old)	2100	0.58
Children (10-12 years old)	2500	0.69
Boys (13-15 years old)	3100	0.86
Boys (16-20 years old)	***3600***	***1.00***
Girls (13-20 years old)	2800	0.78
Men (21-65 years old)	3500	0.97
Women (21-56 years old)	2900	0.81
Men (66 years old and more) and women (57 years old and more)	2100	0.58

Even if this equivalence scale reflects the differences between the needs referring to the most important component of consumption, it can introduce biases in the comparison of the living standard of households.

On the one hand, it ignores the differences in terms of other important individual needs and, on the other hand, the economies of scale. For example, the elderly counts for 0.58, meaning that, whether the person lives alone or in a household with other people, the cost of an old person represents only 60% of the cost of a man 21-65 years. At the same time, a 16-20 year old boy is weighted with 1.0, which means that this boy's cost is a little higher even than a 21-65 year old man (the eventual head of the household), even if he lives with his parents, which is very common in the majority of cases. Thus, the use of this scale leads to a certain overestimation of the poverty dimensions among households with children of this kind and to the underestimation of poverty in the case of the elderly living alone and of old couples.

The definition of an equivalence scale taking into account the economies of scale becomes more and more necessary because the cost of utilities record an increasing trend, making greater, in this way, the share of "public" / collective consumption in the household budget. Equally important is that the equivalence scale must reflect the differences between the cost of meeting the elementary individual needs of the household members, as far as the consumption which records levels at which to meet basic needs (mainly food) requires a significantly lower fraction of consumption expenditure.

This paper therefore aims at estimating a new set of equivalence scales that takes into account all the considerations described above. In order to do this we aim at utilising the most updated methods of evaluating equivalence scales existing in recent literature.

The paper is made up of four sections. After the present introduction regarding the need for new equivalence scales in Romania, section two presents several theoretical approaches to the evaluation of equivalence scales: these include the estimation of complete demand systems and the estimation of Engel curves by means of non-parametric regression.

In section three these methods are applied to the Romanian Household Budget Survey for the year 1999, while section four summarises the results and concludes the paper.

2. Several approaches for the estimation of equivalence scales

Three different methodologies for setting equivalence scales can be distinguished according to Buhmann *et al*. (1988) and Hagenaars *et al*. (1994):

a. normative and social security equivalence scales,

b. equivalence scales based on consumption or expenditure,

c. equivalence scales based on direct welfare measurement.

a. Normative and social security equivalence scales.

Normative equivalence scales are based on some norms set by experts in defining a minimum level of consumption or basket of goods for households of different composition and size.

Sometimes these norms directly define the set of the scale, such as the Oxford or OECD-scale; this is equal to one for the first adult, 0.7 for each of the following adults and 0.5 for each child younger than 14 years.

Hagenaars *et al.* (1994) introduce a modified OECD-scale, which presents lower elasticity of family size: this scale gives value 0.5 for each adult except the first and 0.3 for each child; this scale has been fully adopted by Eurostat.

Other sets of scales can be calculated implicitly by social security regulations. For example in the United Kingdom the scale implicit in the Social Benefit Scale (for families with head below 65 years) is equal to 1 for the first adult, 0.6 for any additional adult and between 0.33 and 0.5 for any child according to age[3].

b. Equivalence scales based on consumption or expenditure.

This is the most widely used methodology in economic literature; equivalence scales are derived using data sets on household expenditures.

Engel (1895) presents the first important work on equivalence scales, based on the assumption that the household welfare, or standard of living of adults, is strongly related to the share of the budget devoted to food. For a fixed characteristic household set the food share is inversely related to total expenditure (Engel's law) and, for a fixed level of total expenditure, the food-ratio is a direct function of the number of children. To restore the food share after the birth of a child the reference household (couple) would reach a higher level of total expenditure or income.

An interesting model proposed by Van Ginneken (1982) considers a double logarithmic function for the explanation of the Engel curve, as follows:

$$\log A_i = \alpha + \beta \log C_i + \gamma \log N_i + \nu_i \qquad (1)$$

where A_i is the expenditure devoted to food, C_i is the total consumption expenditure and N_i is the family size. When the consumption elasticity is fixed with respect to the family size, $\varepsilon = \frac{\beta}{1-\gamma}$, it is possible to obtain the equivalence scale in a recursive way:

$$\begin{cases} e_1 = 1 \\ e_{n+1} = e_n\left(1+\frac{\varepsilon}{n}\right) \end{cases}$$

The development in constructing models suitable for equivalence scale calculation, has mainly focused on the definition of complete demand systems that generalise Engel's approach, as well as on the introduction of demographic variables into those demand systems.

Recently attention has also been paid to the estimation of the Engel curves, implicitly included in the complete demand systems, by means of non-parametric regression.

[3] In Romania, the implicit scale of the Guaranteed Minimum Income scheme is equal to 1 for a person living alone, 1.8 for a two-person family, 2.5 for three persons, 3.1 for four persons, 3.7 for five persons, and 0.25 for each additional person in families with more than five members.

c. Equivalence scales based on direct welfare measurement.

A different approach, which is explicitly based on welfare measurement, has been developed at Leyden University in the Netherlands: the subjective approach on poverty lines and equivalence scales by Van Praag (1968) and Kapteyn and Van Praag (1976).

The concept is that of asking the households some evaluation questions with respect to income levels (IEQ); on the basis of the IEQ an individual welfare function of income is calculated for each household; the derivation of the subjective equivalence scales is well described in Kapteyn and Van Praag (1976).

2.1 Complete demand systems and demographic variables

For the purpose of our analysis, we start from the Almost Ideal Demand System (AIDS) of Deaton and Muellbauer (1980), whose indirect utility function is defined as follows: $v(x,\mathbf{p}) = \frac{\ln x}{b(\mathbf{p})}$, where $x = \frac{\mu}{a(\mathbf{p})}$ is the total consumption expenditure in real terms; $\ln a(\mathbf{p}) = \alpha_0 + \sum \alpha_k \ln p_k + \frac{1}{2}\sum\sum \gamma_{kj} \ln p_k \ln p_j$ and $\ln b(\mathbf{p}) = \sum \beta_k \ln p_k$ are price indices.

The associated cost function which results is:

$$\ln C(u,\mathbf{p}) = \alpha_0 + \sum \alpha_k \ln p_k + \frac{1}{2}\sum\sum \gamma_{kj} \ln p_k \ln p_j + \prod p_k^{\beta_k} u$$

and from Roy's identity one can obtain the budget shares:

$$w_i = \frac{\partial \ln a(\mathbf{p})}{\partial \ln p_i} + \frac{\partial \ln b(\mathbf{p})}{\partial \ln p_i} \ln x = \alpha_i + \sum \gamma_{ij} \ln p_j + \beta_i (\ln \mu - \ln a(\mathbf{p})) \qquad (2)$$

This simple Engel curve can be extended in two different directions, introducing non-linearity in the Engel curves and socio-demographic variables.

Evidence from recent parametric (Banks, Blundell and Lewbel, 1997) and non-parametric (Bierens and Pott-Buter, 1990, Betti, 1999a) approaches to curve estimation suggests a quadratic specification for the Engel curves. The following indirect utility function is therefore chosen:

$$v_t(c_t, \mathbf{p}_t, \mathbf{z}_t) = \left(\frac{b_t(\mathbf{p}_t, \mathbf{z}_t)}{\ln x_t} + \phi_t(\mathbf{p}_t, \mathbf{z}_t) \right)^{-1}$$

This is a special case of the Quadratic Almost Ideal Demand System (QUAIDS) proposed by Banks, Blundell and Lewbel (1997), whose equation in budget shares is the following:

$$w_i = \sum \gamma_{ij} \ln p_j + \beta_i (\ln x_t - \ln a_t(p)) + \frac{\phi_i}{b_t(p)} (\ln x_t - \ln a_t(p))^2 .$$

The demand systems introduced so far assumes that households behave in the same manner in choosing the basket of goods, in order to maximise their economic utility. But households differ in size and composition; for example, it is easy to imagine that preferences of a young couple differ a lot from those of an elderly one.

For this reason over the last four decades economic modelling has aimed at introducing demographic variables into the utility and, indirectly, into the cost function. Barten (1964) considers the utility function associated with the household demographic characteristic to be:

$u = v\left(\frac{q_1}{m_1(\mathbf{z})}, \frac{q_2}{m_2(\mathbf{z})}, \ldots., \frac{q_n}{m_n(\mathbf{z})} \right)$, which corresponds to the cost function:

$$C^1(u, \mathbf{p}, \mathbf{z}) = C[u, p_1 m_1(\mathbf{z}), p_2 m_2(\mathbf{z}), \ldots, p_n m_n(\mathbf{z})]$$

where $\mathrm{m_i}(\mathbf{z})$ is the equivalence scale for the particular good i; all the $m_i(\mathbf{z})$ are equal to unity in the case of the reference household.

This model is known in the literature as Demographic Scaling.

Although the model is more general than those without demographic variables are there is a problem in the evaluation of equivalence scales in goods that are not consumed in the reference household (for example child food when the reference household is the couple).

Gorman (1976) modifies the previous model by introducing a new term directly into the cost function:

$$C^2(u, \mathbf{p}, \mathbf{z}) = C[u, p_1 m_1(\mathbf{z}), p_2 m_2(\mathbf{z}), \ldots, p_n m_n(\mathbf{z})] + \sum p_k d_k(\mathbf{z})$$

where the added last term on the right side represents the fixed cost associated with the demographic characteristic vector $\mathbf{z}$.

Pollak and Wales (1978) propose a simpler method, termed Demographic Translating, which corresponds to the cost function:

$$C^3(u, \mathbf{p}, \mathbf{z}) = C(u, \mathbf{p}) + \sum p_k d_k(\mathbf{z})$$

The authors state that the Gorman is the general model and it includes the Demographic Translating specification (when the $m_i(\mathbf{z})$ are unity) and the Demographic Scaling specification (when the $d_k(\mathbf{z})$ are all zero). The Gorman model consists of the following operations of scaling and translating of the original demand system (the one without demographic characteristics).

Pollak and Wales (1981) invert the order of the above operations, obtaining a new model called Reverse Gorman, whose corresponding cost function is:

$$C^4(u,\mathbf{p},\mathbf{z}) = C[u, p_1 m_1(\mathbf{z}), p_2 m_2(\mathbf{z}),\dots, p_n m_n(\mathbf{z})] + \sum p_k m_k(\mathbf{z}) d_k(\mathbf{z})$$

A proposal, which is alternative to the previous ones, may be assigned to Ray (1983). In this model, called Price Scaling, the term including the demographic variables is multiplicative with respect to the original cost function:

$$C^5(u,\mathbf{p},\mathbf{z}) = C(u,\mathbf{p})m(\mathbf{p},\mathbf{z})$$

Lewbel (1985) presents a unifying approach incorporating demographic or other effect into demand systems; such an approach is based on the technique of cost function modification, using a general transformation $C^6(u,\mathbf{p},\mathbf{z}) = f[C(u,h(\mathbf{p},\mathbf{z})),\mathbf{p},\mathbf{z}]$. Lewbel gives a set of restrictions for proving that Barten, Gorman and both Pollak and Wales models are special cases.

Bollino and Rossi (1989) present an extension to the Reverse Gorman model, where the relative prices are strictly dependent on the scaling coefficients:

$$\mathrm{C}^7(\mathrm{u},\mathbf{p},\mathbf{z}) = \mathrm{C}(\mathrm{u},\mathbf{p}^*) + \sum \mathrm{p}_k{}^* \, \mathrm{d}_k(\mathbf{z})$$

where

$$p_k{}^* = p_k\left[m_k(\mathbf{z}) + \sum_{j\neq i} m_j(\mathbf{z})\left(\frac{p_j}{p_k}\right)\right]$$

An equivalence scale is defined exact (ESE, Equivalence Scale Exactness, Blackorby and Donaldson, 1989), when it is independent of the utility level. For this reason that property is also known in literature as IB (Independent from the Base, Lewbel, 1989).

Among the seven models $\mathrm{C}^1 - \mathrm{C}^7$ introduced so far, only the Price Scaling satisfies the ESE property, without imposing any a priori restrictions on the demand system specification.

2.2 Nonparametric regression estimation of Engel curves

This section closely examines the nonparametric regression theory, because it constitutes quite a new tool in Engel curves estimation.

The first contribution in estimating Engel curves by nonparametric regression is Bierens and Pott-Buter (1990); successively Banks *et al.* (1997) and Betti (1999b) have utilized this tool in explaining the non-linearity in the curves.

Non parametric regression theory is introduced here. Let $\{(x_i; y_i)\}_{i=1}^n$ be the values of the independent variable X and the response variable Y, observed on a set of n units; the usual regression function is: $y_i = m(x_i) + e_i$.

The non-parametric regression estimator is defined as a local average of the observations for the response variable found in a band around the point x in which the value should be estimated:

$\hat{m}(x) = \frac{1}{n}\sum_{i=1}^{n} w_{ni}(\mathbf{x})y_i$, where $\{w_{ni}(\mathbf{x})\}_{i=1}^n$ denotes a sequence of weights that depends on the independent variable vector **x**. This estimator is defined as *smoothing*, while the estimate is called *smoother*.

The nonparametric approach for the estimate of $m(x)$ has four main characteristics:

i) it is a very versatile method for exploring a general relationship between two variables;

ii) it provides predictions of observations without reference to particular or fixed parametric models;

iii) it constitutes an excellent means for analyzing the effects of isolated points or outliers;

iv) it turns out to be a flexible method for imputing missing data through interpolation with adjacent points.

Among the more important smoothing techniques (the manner in which succession of weights is calculated) one can list the kernel, the k_{th} closest point, the orthogonal series and the "spline smoothing" (Hardle, 1990). The most utilized of these is the kernel technique, adopted also in the present work. In kernel smoothing the sequence of weights is defined as:

$$w_{ni} = \frac{\frac{1}{h}K\left(\frac{x - x_i}{h}\right)}{\frac{1}{n}\sum_{i=1}^{n}\frac{1}{h}K\left(\frac{x - x_i}{h}\right)} \qquad (3)$$

Here K(.) is the kernel, a symmetric, limited, continuous function whose integral is equal to one on the interval for which it is defined; h is the bandwidth or *smoothing parameter*.

This parameter regulates the width of the interval around x. A local average for too wide an interval can lead to the consideration of observations that have little in common with x. On the other hand, consideration of a low number of observations can make the estimate $m(x)$ too irregular and can inflate the variability too much.

The shape of the kernel function regulates the way in which weights diminish as we move away from x. The denominator in formula (3) is set up to guarantee that the weights add up to one.

Substituting the weight formula (3) into the smoothing the following is obtained:

$$\hat{m}(x) = \frac{\frac{1}{n}\sum_{i=1}^{n}\frac{1}{h}K\left(\frac{x - x_i}{h}\right)y_i}{\frac{1}{n}\sum_{i=1}^{n}\frac{1}{h}K\left(\frac{x - x_i}{h}\right)} \qquad (4)$$

that is defined as the Nadaraya-Watson estimator.

The choice of the kernel function and the band parameter is intended to minimize the distortion and variability of the estimate of the function m(x). For this purpose two precision measures are considered: the mean integrated squared error (MISE) and the Kullback-Liebler distance, which is fully described in Betti (1999b).

3. Empirical analysis

The empirical analysis was conducted on the basis of the Romanian Household Budget Survey data collected during the year 2000. This consists of 31547 interviewed households representative of the whole Romanian population.

The analysis proceeded towards three different and complementary directions; first of all a very simple model for the Engel food curve was estimated, in order to have a first look of the economies of scale present in Romania. The second step consisted in the estimation of the complete demand system based on the Deaton and Muellbauer (1980) Almost Ideal Demand System (AIDS), while a final confirmatory analysis utilised nonparametric regression in order to estimate the Engel curves for children aged 0-5 years.

3.1 Economies of scale in Romania

The first model taken into account is model (1) proposed by Van Ginneken (1982), that considers a double logarithmic function for the explanation of the Engel curve, as follows:

$\log A_i = \alpha + \beta \log C_i + \gamma \log N_i + \nu_i$ where A_i is the expenditure devoted to food, C_i is the total consumption expenditure and N_i is the size of the family When the consumption elasticity remains fixed with respect to the size of the family, $\varepsilon = \frac{\beta}{1-\gamma}$, it is possible to obtain the equivalence scale in a recursive way: $\begin{cases} e_1 = 1 \\ e_{n+1} = e_n\left(1+\frac{\varepsilon}{n}\right) \end{cases}$.

This model is limited in that it considers the expenditure for food only, and does not allow any non-linearity in the Engel curves. On the other hand, its simplicity gives us an immediate glance of the real economies of scale in Romania.

The estimated parameters from model (1) lead to a quite large overall elasticity - $\varepsilon = 0.7794$ - pointing out that the economies of scale are relatively low as described above in section 1. Moreover, there is the need to distinguish the scales according to the age of adults and particularly the age of children.

The second step of the present analysis focussed on the estimation of a complete demand system incorporating demographic information.

3.2 The AIDS_PS complete demand system

The model utilised in this analysis consists in the Almost Ideal Demand System (AIDS) proposed by Deaton and Muellbauer (1980), whose specification of a generic Engel curve was reported in equation (2).

The model choice is completed with the introduction of demographic variables using the Price Scaling model proposed by Ray (1983), which leads to the AIDS_PS:

$$\ln C(u, \mathbf{p}, \mathbf{z}) = \ln m_0(\mathbf{p}, \mathbf{z}) + \ln a(\mathbf{p}) + ub(\mathbf{p}) \qquad (5)$$

In the specification of $\ln m_0(\mathbf{p}, \mathbf{z})$ five demographic variables are considered: number of children aged 0 – 5, number of children aged 6 – 14 and number of children aged 15 – 18, number of adults and number of elderly people:

$$\ln m_0(\mathbf{p},\mathbf{z}) = \ln\left(1+\sum_{i=1}^{5}\tau_i z_i\right) \qquad (6)$$

Table 2 reports parameter estimates for model (5). The estimates for parameters $\hat{\tau}_2$ to $\hat{\tau}_5$ are coherent with the model and with the theory of equivalence scales. Parameter $\hat{\tau}_1 = 0.0056$ (and clearly not significantly different from zero) suggests that the model does not capture the effects of babies on the household consumption pattern. For this reason, a further analysis, based exclusively on couples with or without babies, was carried out using non-parametric regression of Engel curves as proposed in section 2.2.

Table 2: Estimating the AIDS_PS model

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
α_i	-1.5892 (<.0001)	-0.3196 (<.0001)	0.1632 (<.0001)	1.8485 (<.0001)	0.3814 (<.0001)	0.1558 (<.0001)
β_i	0.1442 (<.0001)	0.0218 (<.0001)	-0.0043 (<.0001)	-0.1288 (<.0001)	-0.0232 (<.0001)	-0.0003 (0.6705)*
$\gamma_{1,i}$	0.0596 (0.3360)*	-0.4199 (<.0001)	0.0444 (0.5951)*	0.1668 (<.0001)	0.1743 (<.0001)	0.1570 (0.0027)
$\gamma_{2,i}$	0.0094 (0.5892)*	-0.0485 (0.0974)*	-0.1124 (<.0001)	0.0135 (0.0566)*	0.1773 (<.0001)	-0.0006 (0.9663)*
$\gamma_{3,i}$	0.0306 (0.3519)*	0.0107 (0.8462)*	-0.0203 (0.6482)*	-0.0071 (0.5927)*	-0.0642 (0.0022)	0.0536 (0.0540)*
$\gamma_{4,i}$	-0.2437 (<.0001)	0.2024 (0.0182)	0.1891 (0.0063)	-0.1261 (<.0001)	0.1195 (0.0002)	-0.1740 (<.0001)
$\gamma_{5,i}$	0.0848 (0.0067)	-0.0451 (0.3885)*	-0.1039 (0.0139)	-0.0408 (0.0013)	0.0201 (0.3156)*	-0.1338 (<.0001)
$\gamma_{6,i}$	-0.1234 (0.0002)	0.1661 (0.0032)	0.0942 (0.0384)	0.0125 (0.3619)*	-0.1584 (<.0001)	-0.0492 (0.0847)*
	$\hat{\tau}_1 = 0.0056$ (0.8285)*	$\hat{\tau}_2 = 0.0820$ (<0.0001)	$\hat{\tau}_3 = 0.1472$ (<0.0001)	$\hat{\tau}_4 = 0.1481$ (<0.0001)	$\hat{\tau}_5 = 0.1119$ (<0.0001)	

(*) The corresponding parameters are not significant since the p-value is larger than 0.05.

3.3 Equivalence scales for children aged 0-5

The aim of this section consists in adequately estimating the equivalence scale for children aged 0-5; non parametric regression is adopted in order to estimate the Engel food curves for two different types of households:

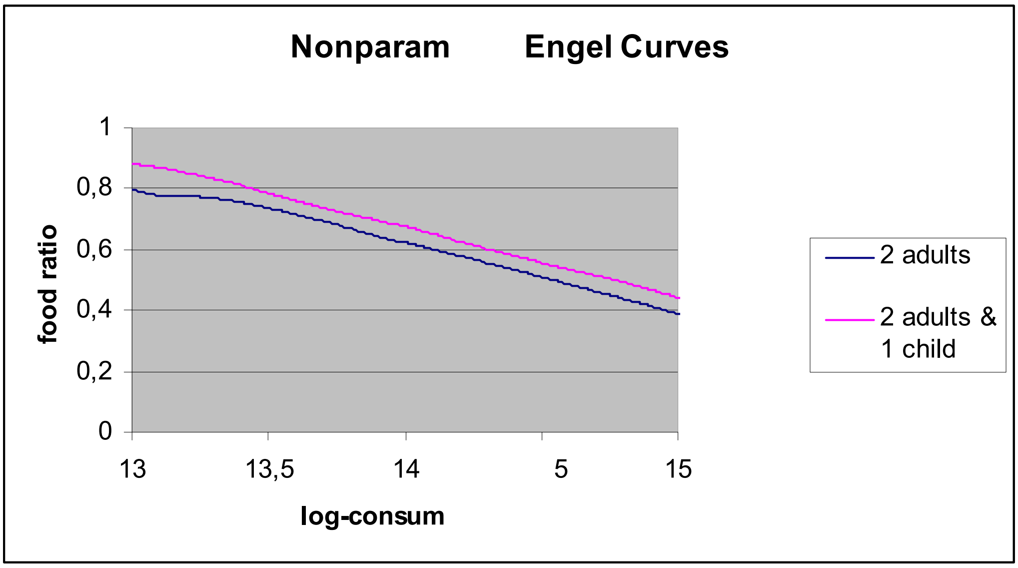
a) couples (both adults aged less than 65) without children;

b) couples (both adults aged less than 65) with one child aged 0-5.

Figure 1 reports the two non-parametric estimations of the model $\hat{m}(x) = \frac{1}{n}\sum_{i=1}^{n} w_{ni}(\mathbf{x})y_i$, where variable y is the food ratio and variable x is the logarithm of total consumption expenditure. If we fix the economic utility to the mean level of food ratio for couples without children (value equal to 0.5598), it is possible to find out the two corresponding levels of total expenditure ($e^{14.285}$ for couples and $e^{14.480}$ for couples with one child).

The ratio of the two total consumption expenditure can be seen as the relative cost of one child aged 0-5: this value is equal to 1.218 and it constitutes a good proxy for proposing the value for the corresponding equivalence scale.

Figure 1: Non parametric Engel food curves for two household types.



4. Conclusions

In this paper we aim at estimating new equivalence scales for Romania; the empirical analysis was carried out on the basis of the Romanian Household Budget Survey data for the year 1999, and proceeded towards three different and complementary directions.

First of all, a simple regression model representing an Engel food ratio curve was estimated *a là* Van Ginneken. This produced an overall elasticity, of the consumption expenditure with respect to the size of the family, very high ($\varepsilon = 0.7794$): this result can allow us to define the equivalence scale of a subsequent adult aged 18-64 to be at least equal to the value 0.8. In order to estimate the cost of any elderly person or child, an AIDS complete demand system was estimated. The parameters are significantly different from zero, with the exemption of the parameter corresponding to children aged 0-5 years.

According to the parameters, the scale for the first elder in the family, should be about 80% of the value of the first adult aged 19-64, while the scale of any subsequent elder should be about 60%of that value. The parameter for children aged 15-18 suggests that the cost of those children is very similar to any subsequent adult, while the scale for children aged 6-14 should be about half of the first adult. Finally, the analysis on non-parametric estimation of Engel curves for couples and couples with one child aged 0-5 has suggested that the corresponding scale should be equal to 0.3. Table 3 summarizes the results described above.

Table 3: New equivalence scales for Romania

Category	Scale
First adult aged 19-64	1.0
Any subsequent adult aged 19-64	0.8
First adult aged 65 or more	0.8
Any subsequent adult aged 65 or more	0.6
Children aged 15-18	0.8
Children aged 6-14	0.5
Children aged 0-5	0.3

In conclusion, it is very important to highlight that in this period of time, the consumption structure of households is in a continual and significant change, especially due to the modification of relative prices of the consumption components. For instance, over the last years, the utility prices grow considerably and determine the increase of their share in the total consumption, at the same time the incomes (and expenditures) do not change in the same proportion. This would imply, on one hand, the need to test the model used for the estimation of parameters for several years from the past (not only for 1999). On the other hand, it will not be possible to use this scale for a long period in the future, due to the need to re-evaluate the parameters after 2 -3 years.

Moreover, it is important to continue the research on the evaluation of the scale, i.e. to test other models too, in order to estimate by the same model all the coefficients, for all population categories / age groups which were taken into consideration. In this way, it wouldn't be necessary to use a different model for 0 –5 year old children

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