ECONOMETRIC SCALES OF EQUIVALENCE, THEIR IMPLEMENTATIONS IN ALBANIA

Msc. Evgjeni Xhafaj
Department of Mathematics, Faculty of Nature Sciences, University of Tirana, Tirana, Albania
PhD, Ines Nurja
General Director of INSTAT, Albanian National Institute of Statistics
PhD, Alban Xhafaj
Analyst at Centrale Attività Finanziarie, Rome, Italy

Abstract
        Econometric scales are, by one consent, considered a necessary tool in poverty analysis, welfare comparison and income distribution analysis. The calculation of equivalence scales based on a food ratio applied as a welfare measure is well known as the Engel's method. In this paper, the aim is to calculate the econometric scales based on a food ratio applied as a welfare measure; parametric regression is used for the estimation of the Engel curves. The Engel method is based on the observation that, for any given household composition, the share of food expenditures on total expenditures is inversely related to income. That is to say, two household with different number of members but that have the same food expenditure achieve the same level of welfare even if they have different incomes (major to the larger household). The method is applied to the data set of Household Budget Survey in Albania in 2008. The economic resources to achieve a given level of welfare are not directly proportional to the household size. The poverty line is estimated using the method of expenditure of consumption mediana. As the same methodology is applied two times, introducing as single element of diversification in the analytical process, two different equivalent scales, the final result can be considered a sort of a 'analysis of sensibility'.

Keywords: Equivalence scales, econometric scales, parametric regression, Engel curves, poverty line

Introduction
        For the development of poverty line and the use of an economic variable which could be an income or expenditure consumption, the key is to choose the reference unit, that is to say, to evaluate the welfare of a single individual or the hole household. There are different reasons that the household is preferred: in general the statistical institutions and the banks often refers to the household balance data, the multiple relation of economic scales related to expenditure for residence and durable goods. There are two more aspects that influence the analysis:

• Usually the household is considered made of all the members that lives in the same residence and are connected by blood, emotional relationship or marriage.

• It is pretended that all the members of the household have the same level of welfare.

If we choose the unit of household, the question is how to make comparable incomes (expenditure consumption) of household that change among them for the demographic characteristics that influence the economic variables. In general, in order to compare the

incomes of two heterogenic households among them, in amplitude and composition, we should use the equivalent scales.

Formally, an equivalent scale can be defined as a ratio of the expenditure of one household with certain demographic characteristic to achieve welfare level and the expenditure of another household taken as reference that achieve the same welfare level.

Equivalence scales are indexes that measure the relative cost of living of households of different sizes and compositions. They are made up of two elements: the "consumer unit equivalence", which takes account of the needs of the household members according to their characteristics, and "economies of scale", which mean that the marginal cost goes down with the addition of new members to the household. Even if from the operative point of view there are easier procedures to make equivalent scales, one uncertain thing is that in literature there are many equivalent scales, and we have to choose which one to use. Some of those are described below:

Equivalence scales
1.   Econometric scales
2.   Subjective scales
3.   Budget standard scales
4.   Social assistance benefit scales
5.   Pragmatic scales
6.

Econometric scales

The strength of modern econometric derivations of equivalence scales is that they draw on well - developed models of households behavior which characterize the relationships between household welfare (utility) and household characterize and expenditure**.**

Subjective scales

The subjective scale is based on the data of the surveys in which different household with different demographic characteristics are asked for different welfare levels (low, medium, high).

Budget standard scales

In the budget standard approach equivalence scales are derived from judgments of experts, standards of living are described by first producing a specific sets of goods and services, pricing the components and then aggregating the budgets. Moreover budget standard scales are defined with reference to a subsistence or poverty standard of living**.**

Social assistance benefit scales

The 'social assistance benefit scales' are scales adopted by the public institution in order to establish which household have the right to access certain public services and/or to facilitated rates.

Pragmatic scales

Pragmatic scales adopt easy calculated schemes and are implemented in studies related to inequalities and the study of poverty among different countries.

Econometric scales
Rothbarth method

A rather similar to Engel method has been advanced by **Rothbarth, 1941**. This method assumes «adult goods» as the appropriate welfare indicator. Adult goods are those goods that are consumed only by adults and not by children (e.g. alcoholic drinks, tobacco,

etc.). In this context, two households are at the same level of welfare if they have the same *absolute* level of expenditures on those goods. The intuitive reason is that when a child arrives it is likely that consumption of adult goods falls for a given level of income. Lower levels of adult goods would mean lower levels of welfare for adults.

Engel method

The Engel method is based on the observation that, for any given household composition, the *share of food expenditures on total expenditures* is inversely related to income. From this empirical regularity, Engel derived that the share of food expenditures could be assumed as an appropriate welfare indicator to compare households of different compositions. In this way, two households of different sizes or composition but with the same share of food with total expenditures could be thought of as having the same level of welfare. An interesting model proposed by Van Ginneken (1982) considers a double logarithmic function for the explanation of the Engel curve, as follows.

$$\log A_i = \alpha + \beta \log Y_i + \gamma \log N_i + u \qquad (1)$$

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

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

Implementation of Engel method in Albanian population

Using the data related to the expenditure of a sample of households, it is possible to estimate the parameters of the model. The data are collected from household budget survey in Albania in 2008. This consists of 3599 interviewed households' representative of the whole Albanian population. 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 Albania that take into account the model proposed by Van Ginneken (1982). Parametric Engel regression curve is estimated for several types of households, distinct in accord with household size. The consumption expenditure for households of different size is made equivalent to that of a two member household using equivalent coefficients which take into account different needs and scale economies that occur as the number of household members increase. Dividing household consumption expenditure by the coefficient referred to the household size, the equivalent consumption expenditure is obtained which can be directly compared to that of a two-member household.

The analysis begins with an exploratory phase of sample data regarding the food ratio and the total spending for each of the six typologies.

$$\log A_i = \alpha + \beta \log Y_i + \gamma \log N_i + u$$

The coefficient calculated α=0,914 β=0,727, γ=0,106

And then the coefficient $\varepsilon = \dfrac{\beta}{1-\gamma}$

$$e_1 = 1$$

$$e_{n+1} = e_n(1 + \frac{\varepsilon}{n})$$

$$e_2 = e_1(1 + \frac{0.8}{1})$$

$$e_2 = 1,8$$

$$e_3 = e_2(1 + \frac{0,8}{2})$$

$$e_3 = 2,52$$

$$e_4 = e_3(1 + \frac{0.8}{3})$$

$$e_4 = 2,85$$

In the table below the equivalence coefficient are calculated taking into account the household with one member and the household with two members.

Tab.1. Equivalent coefficients estimated according to the one member and two members household.

Number of members	Household with one member (equivalent coefficient)	Household with two members (equivalent coefficient)
1	1	0,55
2	1,8	1
3	2,52	1,4
4	2,85	1,73
5	3,42	2,076
6	3,97	2,4

Comparison of headcount poverty in Tirana estimated according to the expenditure of consumption mediana in the absence and presence of econometric scales

Looking at first to the expenditures data's per consumption of the households resident in Tirana 2008, it has been decided to estimate the *equivalent* expenditure of the individuals dividing the amounted expenditure per consumption in every household unit to the number of the correspondent components. That is to say, each single individual of the sample (taking part in the selected household under study) will be associated with an 'equivalent expenditure', and a household expenditure per member. A similar procedure, give arise to the hypothesis that in a household can not be realised a 'economical scale'. Even though, that hypothesis is considered less realistic, at exploration matters, can offer point of

reflection and lead to interpretational results under the 'sensibility' of the methodology of analysis against the different operative choices. As the same methodology is applied two times, introducing, as single element of diversification in the analytical process, two different equivalent scales, the final result can be considered a sort of a 'analysis of sensibility'.

After associating the 'equivalent expense', the distribution of this variable is sorted on an increasing scale and each element (that is to say, each value of 'equivalent expense') is given as a weight result of the number of the members of the household and the household weight. It will be consolidated by defining the position of the median and the consumer expenditure according to which the individual can be considered poor. Naming this product as frequency, there has been estimated the cumulated frequencies in order to have for each value of the equivalent per member expenditure, the number of the individuals that represents an amount of expenditure per consumption minor or equal to that given in consideration. The next step is individualizing the 'median position', dividing in half the total of the cumulated frequencies. Equivalent consumption expenditure correspondent to the median position is been assumed as median per-capita consumption expenditure. It has been preceded with an estimation of the incidence assuming the poverty line of the consumption expenditure 'median'. The threshold of the relative poverty is estimated measuring the 50% of the expenditure of consumption mediana. That is to say, in base of the process made above, an individual may be considered 'poor' if represents a consumption (equivalent) expenditure of import, minor or equal to 4846.5 Lek per month.

As the hypothesis to exclude econometric scales that are realized in correspondent to the most numerous household (and this can appear less 'realistic'), the procedure made by the determination of a poverty line based on the expenditure of consumption mediana is repeated to the given data using the 'per capita equivalent expenditure' with equivalent coefficients. So, for every member of the household in the sample, the equivalent expenditure per capita is determined dividing the expenditure of consumption of the members by the correspondent coefficient of equivalent, having the one member household as base.

From this elaboration it is obtained a poverty line per capita5756,2, i.e a little above that obtained by the equalization of the coefficients of the equivalence scales of different household size. In table 2 are listed the different compositions, in base of the household size, the proportions of household unit 'deprived' from the total of nucleus of identical size that make up the sample in examination. In this table, it can be observed the 'misbalance', at a structural level, produced by the method of construction of the poverty line, based in the expenditure of consumption mediana, supposing the absence of 'econometric scales' for the household nucleus with size bigger than unit.

Tab 2. The incidence of relative poverty calculated in different household sizes. Tirana – 2008. Vlerat ne %

Household size	Incidence of the relative poverty calculated in base of the mediana of the expenditure of consumption in absence of econometrical scales.	Incidence of the relative poverty calculated in base of the mediana of the expenditure of consumption in base of the equivalence coefficients.

1	3,09	5,3
2	6,82	11,8
3	11,27	10,6
4	14,95	12,5
5	21,85	14,7
6	36,56	16,08

Conclusion

Since the poverty threshold value, during the years, depends on the changes in the distribution of
household consumption expenditure, the estimate of relative poverty may rise even during periods of growth or greater wellbeing. In fact, if economic development produces a rise in consumption expenditure for all households, but this increase is stronger among households with the highest expenditure levels, inequality rises as far as the poverty line value. This produces an increase in the number of poor households, even though the households with the lowest levels of consumptions expenditure have really improved their standards of living.

The methodology used in the determination of poverty line by the expenditure of consumption mediana in absence of econometric scales, even thought has not a high accuracy due to the informal factors, it gives a general picture of the distribution of poverty in Tirana according to household size. With this study we can draw up and outline the concept and definition of the level of poverty in Tirana as a multidimensional phenomenon correlated with qualitative and quantitative variables. The calculated results shows an increased poverty corresponding to larger household size. We note an increasing poverty for the household size with more than 4 members. It is also observed the 'misbalance', at a structural level, produced by the method of construction of the poverty line, based in the expenditure of consumption mediana, supposing the absence of 'econometric scales' for the household nucleus with size bigger than unit. The headcount poverty based in expenditure mediana based in the equivalence coefficients is not directly proportional to the household size.

References:

SEN A., 1976. Poverty: an ordinal approach to measurement. Econometrica, vol.44, n. 2, pp. 219-231

Fiona A. E .Coulter, Frank A. Cowell and Stephen P. Jenkins. Differnces in needs and assessment of income distributions. Bulletin of Economic Research 44:2 1992

Gianni Betti , Maria Molnar, Filofteia Panduru. New Equivalence Scales for Romania. Working Paper n.39, December 2002

Xavier Mancero. Escalas de Equivalencia: resena de conceptos y metodos. ISBN: 92-1-321792-7

Lorenzo Giovanni Bellù, Paolo Liberati. Easypol, Equivalence scales, Genaral Aspects

Lorenzo Giovanni Bellù, Paolo Liberati. Easypol, Equivalence scales, Objective Methods

Evgjeni Xhafaj, Ines Nurja, Alban Xhafaj. Statistical Methods for the Study of poverty, analysis and applications for the Albanian reality. IWBCSM-2013. Volume 1 No. 1 pp. 0000 (2013) - IWBCSM-2013

Jonathan Haughton, Shahidur R. Khandker. Handbook on Poverty + Inequality. ISBN 978-0-8213-   7613