

**Equivalence Scales in the European Integrated
System for Poverty Analysis (EURO-SIAP)**

Francesca Ballini, Gianni Betti, Federico Brogi and Michela Natilli

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Equivalence Scales in the European Integrated System for Poverty Analysis (EURO-SIAP)¹

Francesca Ballini*, Gianni Betti**, Federico Brogi** and Michela Natilli*

1. Introduction

In poverty analysis, income distribution or total consumption play a fundamental role. Whatever variable is chosen for welfare measurement, there is a need to derive a new variable to allow comparison among households; families vary in size and structure, and the per-capita income (or consumption) is not an adequate measure, since it ignores the economies of scale present in any household.

Equivalence scales are economic index numbers, which discount household income according to some household characteristics. Although equivalence scales are considered, by general consent, a necessary tool, there is no unanimity in the way they have to be calculated. Buhman *et al.* (1988) and Hagenaaers *et al.* (1994) present a broad classification: i) normative or social security scales; ii) subjective scales; iii) scales based on demand models.

This paper aims at introducing the utilisation and estimation of several equivalence scales of the above categories i to iii into the European Integrated System for Poverty Analysis (EURO-SIAP). EURO-SIAP was created in order to provide flexible instruments of analysis, as a renewed interest in poverty analysis needs to conciliate the requirements of measurement and practicality, in adapting a wide increase in approaches used for measuring poverty.

This work is made up of five sections; after this introduction, section two presents an extensive and detailed description of the most widely used method for calculating equivalence scales. Section three describes the EURO-SIAP and introduces the sub-sections devoted to equivalence scales; that part of SAS program is presented and commented. In section four a sensitivity analysis is conducted using the information from the data set of the European Community Household Panel (ECHP) for the first three waves. Conclusions are made in section 5, the final section of the paper.

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*ORC International, London, United Kingdom.

**University of Siena, Italy.

2. Equivalence Scales

Equivalence scales represent a prerequisite in every study of well-being carried out using measures of income distribution, inequality and poverty; moreover, they constitute a suitable economic tool for incorporating the impact of demographic changes into models of spending allocation for aggregated consumption. In this way they become necessary for comparing the welfare and poverty of individuals living in different household types.

Recent research has pointed out what a big difference the choice and the definition of a particular equivalence scale can make in these kinds of studies. In any case no consensus exists on the theoretical basis of an equivalence scale, looking for one optimal equivalence scale is not very fruitful.

It is possible to distinguish three different methodologies for setting an equivalence scale 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.

2.1. 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.

A particular set has been introduced for the purpose of statistical analysis, without being based on specific budget norm. It is usually referred to as the OECD-scale, known also as the Oxford 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) proposed a modified OECD-scale, which presents lower elasticity of family size: this scale gives value 0.5 for each adult but the first and 0.3 for each child.

Other sets of scales can be calculated implicitly by social security regulations. For example in the United Kingdom the implicit scale in the Social Benefit Scale (for family with head of household under 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.

2.2. Equivalence scales based on consumption or expenditure.

This is the most widely adopted methodology in economic literature; equivalence scales are

derived using data set on household expenditures. The search for equivalence scales is essentially a comparison of welfare of households of different size and type.

Now we are going to present the description of the various ways in which data on consumption behaviour can be used to define equivalence scales:

b1. Utility maximization or cost minimization

Almost all equivalence scales based on this methodology depend on the utility level chosen as a reference point (an exception is the equivalence scale based on the linear expenditure system). Some models imply increasing, other decreasing scales with increasing utility level (Deaton and Muellbauer, 1986). A specific aspect of this method is the identification of the equivalence scale. For every good a separate equivalence factor is to be estimated, resulting in a total of n unknown variables for n different demand functions. Weighted with the appropriate prices, the total budget is found. However there is not enough information in a demand system for all identification of all equivalence factors.

b2. Budget distribution methods

This category refers to the work by Rothbarth (1943) and Nicholson (1949). Now household expenditure is divided into collective expenditure, private expenditure for adults, and private expenditure for children. A basic assumption of this method is that adult expenditure level should be the same whether they have children or not.

Therefore this methodology doesn't consider the possibility that the choice of a particular household composition may be voluntary. Moreover, it ignores the fact that the presence of children changes the relative prices of certain household activities, i.e. the household changes its consumption behaviour towards what is cheapest. Then the resulting equivalence scales are in general higher than scales based on a utility economic model as in the previous category.

b3. Non parametric estimation

Bierens and Pott-Buter (1987) estimated the relationship between actual expenditure, household income and family composition by using expenditure functions, not cost functions. Extra expenditure at a particular level given by an additional household member is defined as extra cost. Betti (1999) focuses on this specific argument, estimating nonparametric equivalence scales for Poland.

b4. Allocation of income within the household

Lazear and Michael (1988) divide expenditure for children and for adults, this leads to an equivalence scale of $A + 0.38 K$, where A is the number of adults and K is the number of children. They assume that within a household all adults or children receive the same amount of resources; the expenditure ratio for observable adult goods is not influenced by the presence of

children. Additional assumptions on the functional form must be made in order to obtain estimates.

b5. Food-share method

Engel (1895) presented the first important work on equivalence scales. It is based on the assumption that household welfare, or the standard of living of adults, is strongly related to the proportion 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. The reference household (couple) would reach a higher level of total expenditure or income in order to keep its welfare after the birth of a child.

The model defined for this method is known in literature as the Van Ginneken model (1982): if A_i represents the food expenditure of the generic household i , C_i is the total consumption and N_i is the household size, then the double logarithmic function for the Engel curves of food goods is $\log A_i = \alpha + \beta \log C_i + \gamma \log N_i + v_i$; keeping constant the elasticity of consumption in respect of the household size $\varepsilon = \frac{\beta}{1-\gamma}$, we can obtain the equivalence scale from the

following recursive definition:

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

We can also extend this simple Engel curve by introducing:

- nonlinearities in the Engel curves;
- transformation of the price kernel concavity of CES;
- socio-demographic variables.

2.3. 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: it is the subjective approach on poverty lines and equivalence scales by Van Praag (1968) and Kapteyn and Van Praag (1976). The concept is asking the households some evaluation questions with respect to income levels (IEQ):

“Please try to indicate what you consider to be an appropriate amount of money for each of the following cases: very bad, bad, insufficient, sufficient, good and very good”.

A potential problem may be the international comparison because of the translation of precise wording in different languages.

This method supposes that parents may change their consumption behaviour when children are born, without necessarily experiencing a reduction in welfare. The resulting scales (that vary with income) are in general lower than the ones based on expenditure.

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).

3. The Integrated System for Poverty Analysis – SIAP

3.1 Introduction

SIAP (*Integrated System of Poverty Analysis*) was created in order to conciliate the requirements of renewed interest in poverty analysis and measurement and the practicality of having flexible instruments of analysis, which could be used in adapting the wide increase of approaches to poverty measurement:

- Poverty as a multidimensional phenomenon;
- Dynamic analysis of poverty (transition, persistence, duration).

The first version of SIAP (D'Agostino, Ghellini and Neri, 1996) was developed in Dos environment, using SAS/AF module for the management of menu of oriented choices.

With this version poverty analysis followed the traditional approach. Unfortunately in this first version the user interface wasn't user-friendly at all. The first substantial modification on SIAP was the conversion from a Dos environment into a Windows environment, in order to simplify its usage and the user interface programming, employing more flexible instruments typical of SAS ambience, version 6.12.

Further developments concentrated on the implementation of new methodologies of analysis such as the fuzzy approach and the multidimensional set of the poverty analysis and after that the implementation of techniques for dynamic poverty analysis.

3.2 Programs in SAS environment

The SAS System is made up of specific modules for a particular aspect of the data analysis. In this chapter we refer to the module called SAS/AF software by the *Build Procedure*, which allows the managing of user interface menu. The frame entries are the specific object used by the AF module which permits an environment of development for interactive applications to be created within the SAS System; these applications can incorporate objected oriented

methodologies of programming (OOP). A *Screen Control Language* (SCL) program is created for managing every specified object for setting off the frame entry.

The *Program Type* entries are another tool of interesting relevance typical of the SAS/AF module. These entries present a less artful user interface and they are more flexible for managing analysis programs.

In this case the link between the screen and the program is managed by particular screen variables, similar to *macro* variables, so that the user can insert directly on the screen what is requested and thanks to the program that controls the screen, data are recognized and read automatically by the application created. The entire creation of the objects occurs inside a catalogue taking the SC2 extension.

The construction of a catalogue is proceeded by the *Program Manager*, which defines the creation of a new catalogue within each frame; program entries are successively created.

```
Libname lib 'c:\siap\path';  
proc build  
cat=lib.cataloguename;
```

3.3 The SIAP program

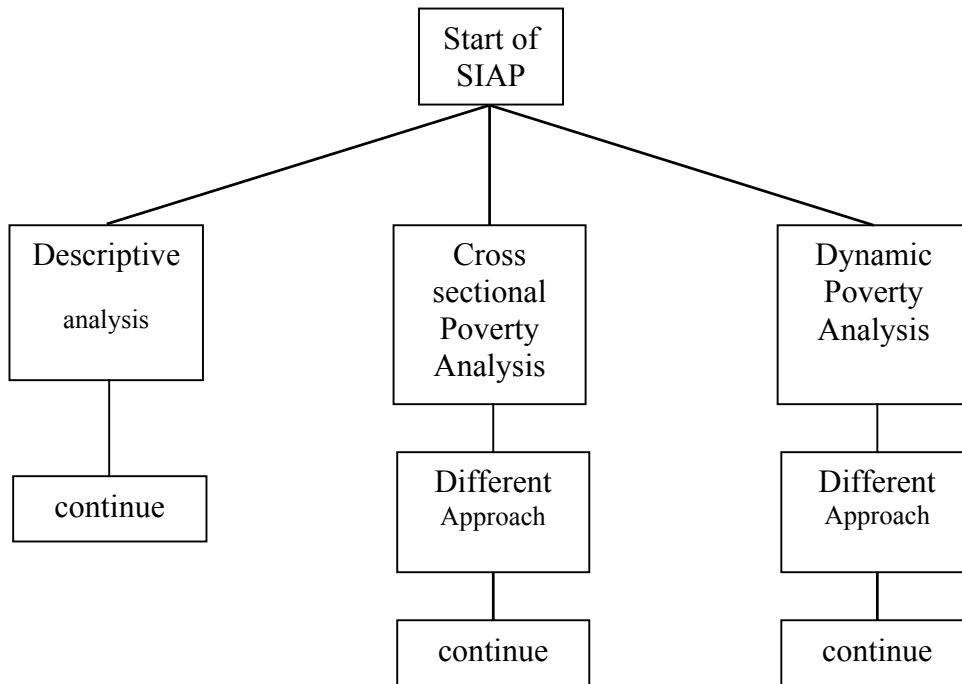
The SIAP program follows a complex hierarchical structure. To point out its characteristics, a summary tree diagram of this framework is included and shown in the next page.

The general conduction of the package given to frame entries that operate as switch menus among the various options of analysis is suggested by SIAP. Such entries work together with *program* type entries, which are really flexible for the management of data analysis programs.

The outputs produced are sent directly to the SAS output window; closing that window the user goes back automatically to the SIAP package. Statements such as *back* (which visualises the previews window), *end* (to leave SIAP) and *endsas* (to end the SAS session) are present in every window. The installation of SIAP is extremely easy, it is sufficient to copy the entire catalogue in a specific directory, previously named SIAP, and to create two sub-directories, one necessary for saving the data that will be used during the applications, the other one necessary for saving the output files created by the program itself.

The directory and the output sub-directory must necessarily take specific names, i.e. respectively *SIAP* and *OUT*. The statement to open SIAP is reported below:

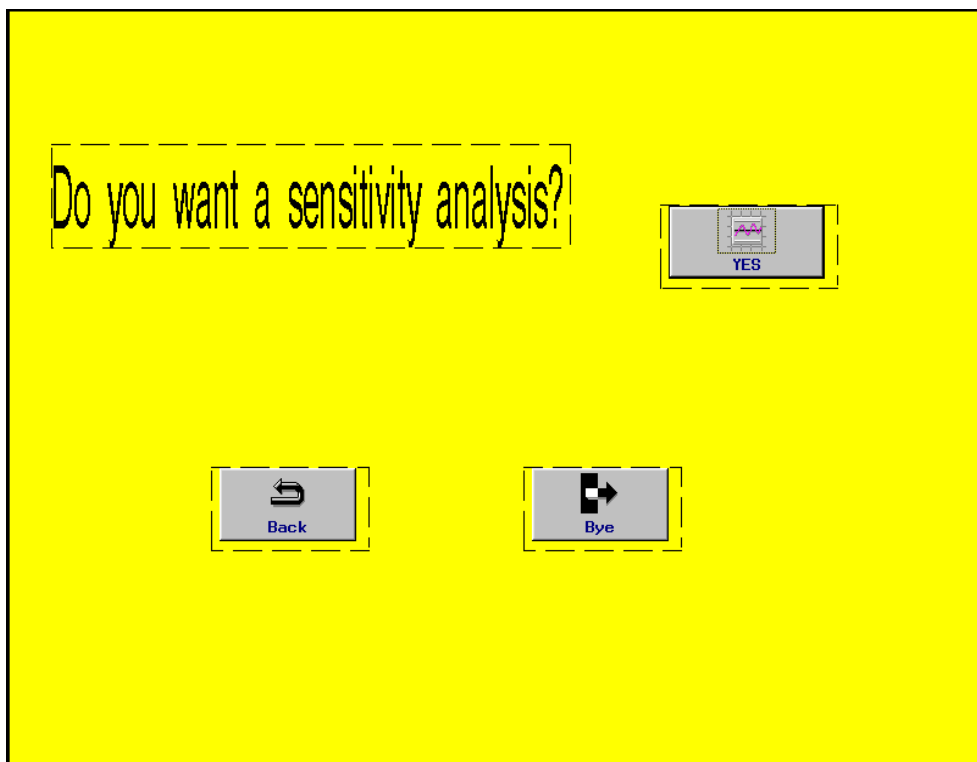
```
libname isiap 'c:\siap\  
dm 'af  
catalog=isiap.euro.start1.frame'
```



3.4 Sensitivity Analysis

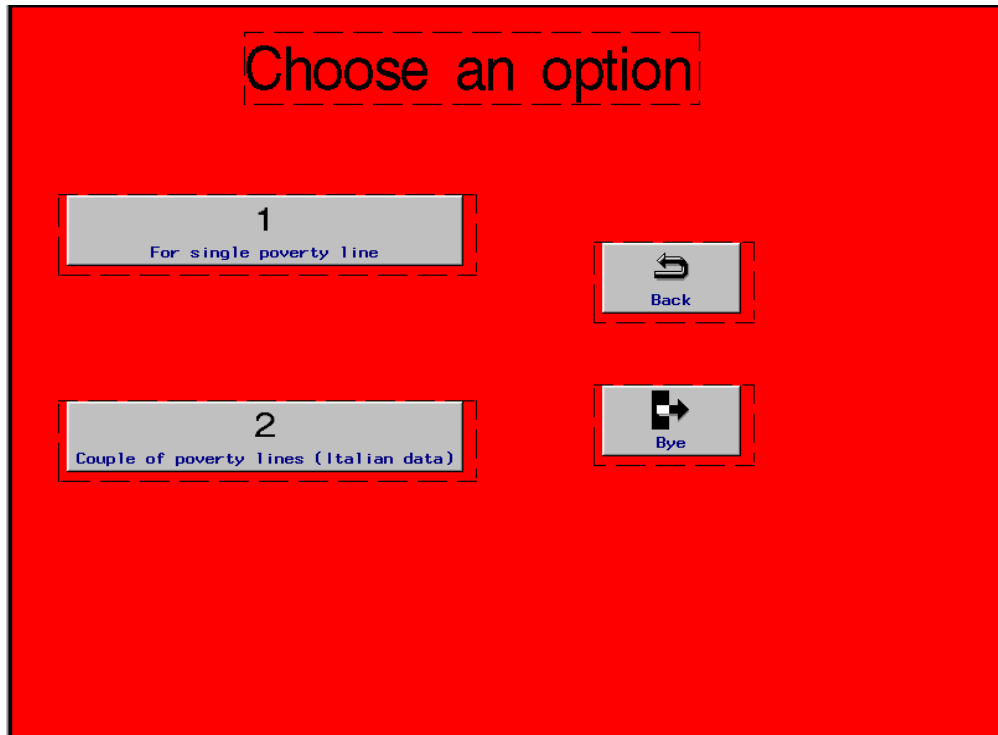
The last modification introduced into the SIAP concerns the insertion of a further analysis: the sensitivity analysis the use of which is described in section 4. Some more windows were added (frame type entries). The first window is the one reported in Figure 3.2.

Figure 3.2: First SIAP window



The user is asked if he wants to carry out this kind of analysis. A negative answer gives the user the possibility to leave SIAP or to return to the previous window. If he decides to go ahead, choosing “OK”, the window in Figure 3.3 is opened.

Figure 3.3: Second SIAP window



The choice is methodological, because it is possible to carry out a sensitivity analysis on a single poverty line or on two poverty lines. The second option makes sense only for Italian data sets when we compare two poverty lines calculated following the ISTAT method or the EUROSTAT method, which considers only one scale. So when comparing them, they match only when the elasticity of both equivalence scales is equal to one, while the line obtained using the ISTAT method will always result as being below the other one.

With regard to SIAP, the choice of a two poverty lines analysis leads to two different windows.

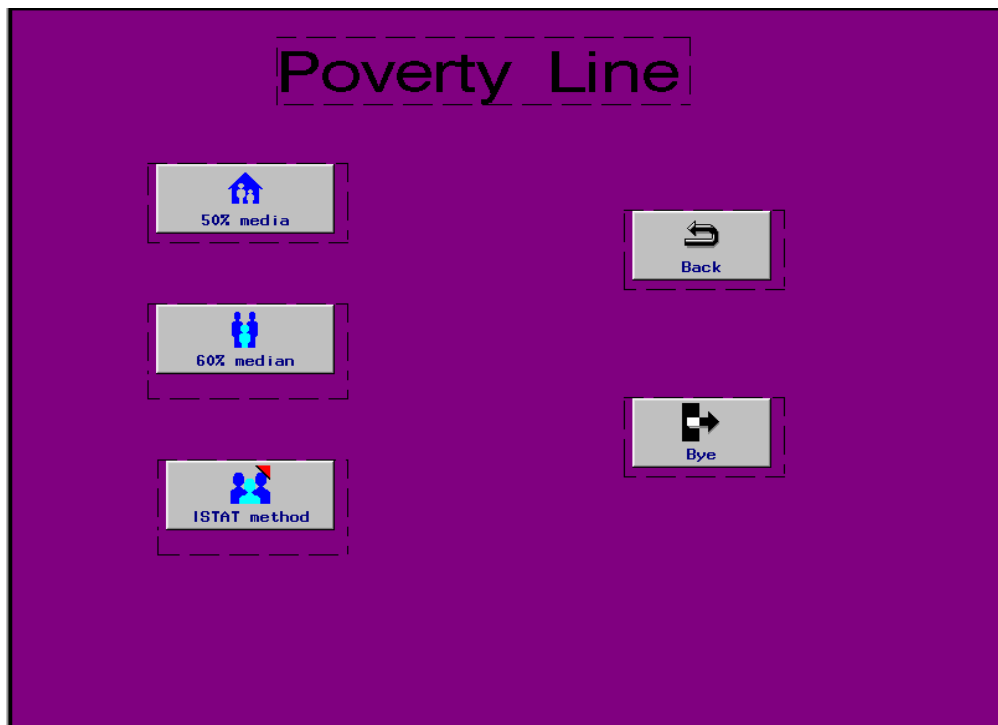
The window in Figure 3.4 will appear to a user choosing one poverty line.

Now the final choice comes. The methodology used to calculate the poverty line has to be selected, i.e the choice must be made between:

- A poverty line calculated on 50% of the average equivalent income;
- A poverty line calculated as 60% of the median income;
- A poverty line calculated in accordance with the ISTAT procedure.

Now SIAP asks the user the data set name to be used and permits the selection of the necessary variables: the identification code, the household size, the annual net income and the weights (not compulsory).

Figure 3.4: Choosing a poverty line.



So what happens is that an average net income and a chart describing the Head Count-Ratio behaviour pattern (varying with the elasticity) appear on the screen.

3.5 The SAS program: updates

Here a detailed description of the program used in this report is illustrated. SAS/IML (which stands for Interactive Matrix Language) software is a powerful programming language. The fundamental object of the language is a data matrix.

First of all, we simply create a temporary file containing the Household Identification code (HID) and three autoexplicative variables.

```
libname data '\\\echp';
libname output 'd:\output';
data temp (keep= HID income fsize weight); set data.ithous1;
```

Introducing the IML procedure, our three main SAS variables are converted into three vectors with n rows. $nmax$ is defined as the maximum family size and the $nmax * 1$ vector *scale* which will contain the equivalence scale to be used at each iteration is created.

In order to perform the sensitivity analysis we start from the elasticity $e=0$ and we set number of iteration $ne=101$ (from 0 to 1 with step equal to 0.01). Finally the matrix eh will contain the 101 couples elasticity-Head Count Ratio.

```
proc iml; use temp; read all var { income } into income; n=nrow(income);
read all var { weight } into weight; read all var { fsize } into fsize;
nmax=max(fsize); scale=j(nmax,1,1); e=0; j=1; ne=101; eh=j(ne,2,0);
```

Next, in accordance with each value of elasticity e , the equivalence scale is calculated and the corresponding vector $eqinc$, representing the equivalent income is defined. From this the poverty line - defined as 50% of the equivalent income average – is represented by the variable pl .

```
do until (e > 1.01); i=2;
do until (i > nmax); scale[i,1]=scale[i-1,1]*(1+e/(i-1)); i=i+1; end; end;
eqinc=j(n,1,0); i=1;
do until (i>n); x=fsize[i,1]; eqinc[i,1]=income[i,1]/sc[x,1]; i=i+1; end;
pl=((btran(eqinc,1,1)*weight)/sum(weight))/2;
```

In order to evaluate the Head Count Ratio corresponding to the actual value of elasticity e , we define the vector vpl containing the poverty line to be compared to the vector containing the equivalent income. The vector $poor$ contains ones in correspondence to poor families; its weighted mean, h , is placed in the previously defined vector eh , as well as the actual value e . At the end of the overall iteration the vectors of e and h are exported as a SAS data set.

```
vpl=j(n,1,pl); poor=eqinc < vpl; h=(btran(poor,1,1)*weight)/sum(weight);
eh[j,2]=h; eh[j,1]=e; j=j+1; e=e+0.01; e=eh[1:ne,1]; h=eh[1:ne,2];
create results.itout1 var { e h }; append; close results.itout1; run.
```

4. Empirical Analysis

4.1 General contents.

In this section we present the sensitivity analysis carried on the data of the socio-economic European Community level survey named ECHP.

The *European Community Household Panel* is an annual longitudinal survey, which covers a wide range of topics such as financial condition, income, job market situation, welfare, education, living condition etc. conducted by EUROSTAT, the statistical office of the European Community. ECHP wants to be able to present the EC population both at individual level and household level. It aims at carrying out research on the changes happening in the population through the continuous evolution of the sample. The great importance of this

survey is given by the comparability of each result between the countries which is ensured by some typical and common characteristics: the structure of the survey; minimal requests for the sampling; concepts and classifications; common questionnaire developed by EUROSTAT; procedures for data editing, weights and imputation; creation of standardised micro data. This empirical analysis concerns the panel data of three yearly waves sampled in fourteen countries of the European Union between 1994 and 1996. In 1999 ECHP was extended for three more years (2000-2002).

4.2 Sensitivity Analysis

Recently work like that of Betti (2000) proved that poverty measures are very sensible to the choice of the equivalence scale used. The number (and the type) of households in all of the poor can depend on the scale and this fact may disturb the results of studies concerning poverty. Therefore sensitivity analysis looks decisive. In fact, it can lead to a very interesting conclusion: it is possible to see for which elasticity, and therefore for which scale, the minimum value of poor families in one country may be obtained. This is quite important for social policy makers. Our tool of investigation is the Head Count Ratio, i.e. the ratio between the number of poor households (i.e. families below the poverty line) and the total population considered. Therefore, thanks to the statistical program SAS System, (the use of which was commented on in the previous section) this poverty index H was calculated and varied in function of the elasticity for every country, during the three waves. For every wave the elasticity was moved from zero up to one; these two edges respectively represent the economic situations of perfect economies of scale and absence of economies of scale. This measure completely ignores the grade of poverty of every unit and simply reflects the percentage of poor but however it answers the essential question of how many poor there are. In this report poverty statistics will be given in terms of households. In their place, individuals are another measurement unit frequently used. This ratio has the advantage of being easily interpreted for every use of poverty statistics.

Important literature exists on different poverty measures regarding the fact that the H index suffers from important limitations. The main objection to the Head Count Ratio is that it is insensitive to the variation of the income distribution within the population of the poor, and varies only when the number of poor changes. Each household contributes equally to the head count, without considering how poor the unit is. Comparing poverty in different nations, H does not consider the fact that an equal poverty percentage may hide differences concerning the resources of the poor and the distribution of resources within the population of the poor.

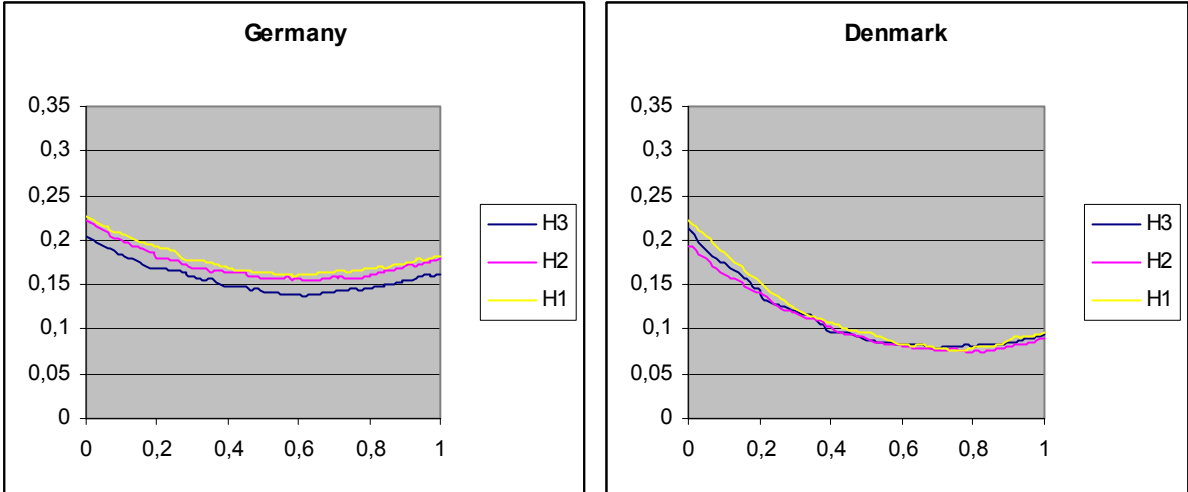
The graphs added, show the percentage of poor families in each country for every year of the survey. Results underline the behaviour of the H index for every annual take over and summary graphs reveal changes taking place over the years.

4.2.1 Germany

The first country seems to be a little worse than the others examined, as the H ratio remains steady on high figures for all the field of elasticity variation. However it should be stressed that the second and the third wave show that year by year the percentage of poor families in Germany is decreasing. The chart seems to show a regular behaviour pattern. Particularly the first two waves, which are close to each other, with the second one below 0.1 on the Head Count Ratio for all the elasticity values. The third line on the summary graph has the minimum numbers, and from the third wave chart it can be noticed that for an elasticity of 0.6 the H index touches its lowest point in 0.14.

The values of H in the presence of perfect economies of scale are fairly high compared to the others kept by the country studied. In fact in 1994 when the first wave of the survey was sampled this value was 0.23, and for the ones that followed, they don't change much.

Figure 4.1: Germany and Denmark



4.2.2 Denmark

The lowest level of poverty seems to belong to Denmark. In fact the maximum value of H found is 0.22 for null figure of elasticity and the lowest are near 0.8 of elasticity. As we can see from the chart, the behaviour pattern of all drawings is equal, the three lines match in many points and sometimes they are superimposed. Maximum and minimum are very close one to each other. The state of things appears quite steady.

4.2.3 The Netherlands

With regard to the first country belonging to the Benelux, poverty looks like it is growing a little over the three years. Curves appear quite regular in their behaviour, spreading from a minimum of $H1=0.2$ to a maximum of $H3=0.22$ for a null elasticity. The trend of each diagram is very similar and the amount of the Head Count Ratio increases but not in a dangerous way. Every wave has an average rise of 0.01 in the poverty index. The lowest points stand between 0.4 and 0.5 of elasticity for similar values of $H1=0.11$, $H2=0.12$, $H3=0.13$. In short, poverty seems to increase in a controlled and not alarming way.

4.2.4 Belgium

In 1994 setting $e=0$ we find the highest value of poverty for this country is found as $H1$ (the index on the first wave) has 0.255. But the important reference point is that on the three waves $H1$ also has the lowest value for $e=0$ where it is a little less than 0.15. In the summary graph we can observe how the line goes down faster than the others. For an elasticity value of 0.5 this is already the lowest line. Next, the second wave has similar values of poverty with the minimum on the whole survey at 0.13 for an elasticity of 0.8. It should be noticed that such an elevated value of elasticity leads to a really steep equivalence scale.

The third line registered a similar decreasing move, where the distance between the value of each wave is 2%, until the elasticity reaches 0.4; then the $H3$ index is a little higher finding the top at 0.16 for $e=1$. In this case the least numerous families are the ones, which suffer more disadvantages among the population, given that the index H is quite elevated for low values of elasticity. The economies of scale will tend to be more marked.

Figure 4.2: Belgium and The Netherlands

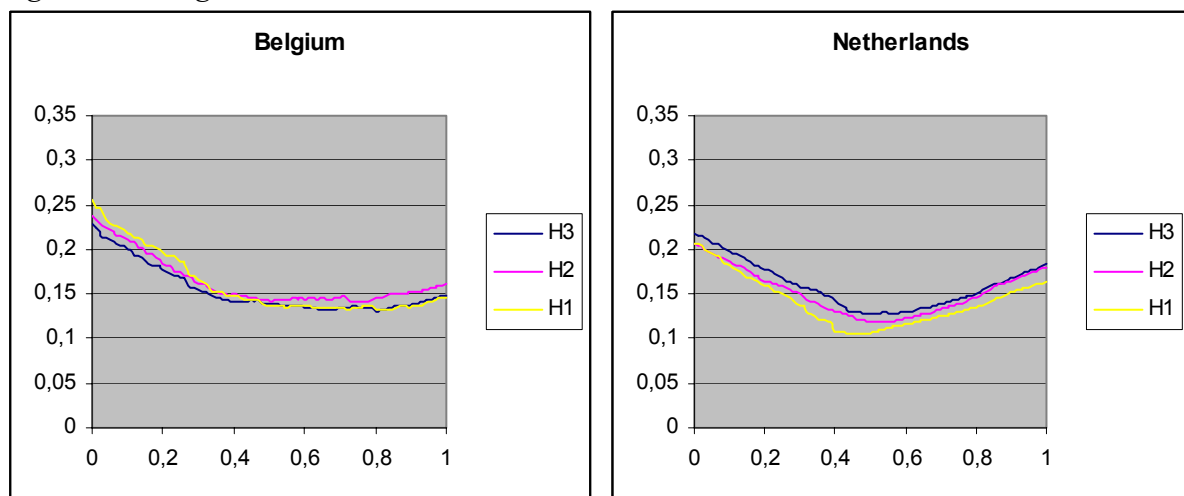
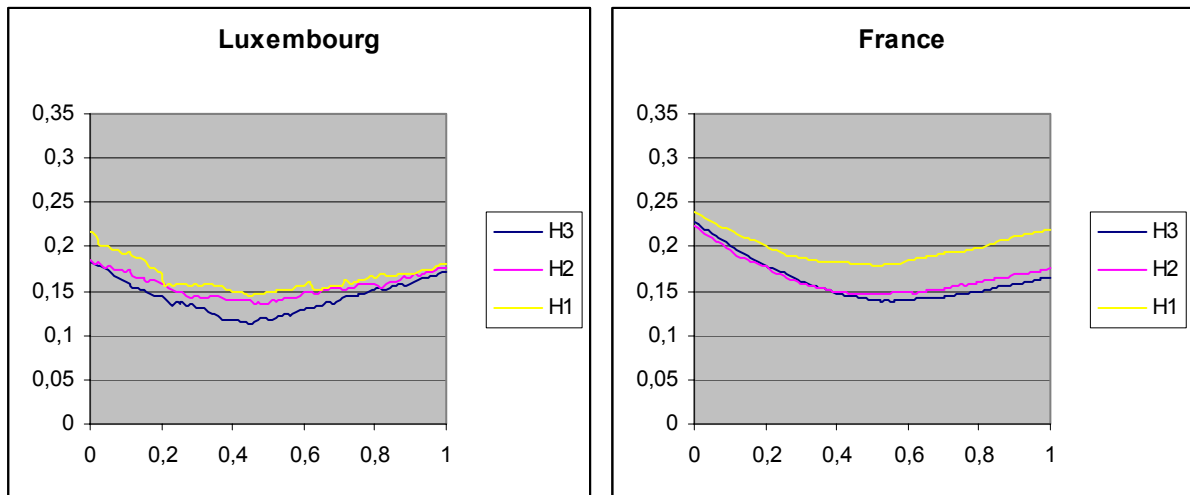


Figure 4.3: Luxembourg and France



4.2.5 Luxembourg

Closing the digression concerning the Benelux countries, the situation now appears upside down. The waves show a short improvement of the general state.

All the lines do have an irregular trend, in fact, they look indented. The small number of families sampled may explain this. As the models estimated for calculating the equivalence scales are not strong (i.e. the estimate is not very efficient), they depend closely on data at our disposal. The first curve is rather flat; H varies on a measure of 0.05 and values on the edges are both close to 0.2. The second wave is a little more regular and flat.

The ends keep the highest values (both close to 0.18); this shows that in extreme condition of economies of scale that large or small families are damaged in a really similar way. Whereas about 0.14 is the minimum for $e=0.45$. Looking at the summary chart it can be noticed how the H ratio decreases and that H1 and H2 only match for $e=0.2$.

As far as the rest is concerned they never meet in other points. The lowest points of the third line are close to $H3=0.11$ for $e=0.45$. Then we can speak of a minimum drop of the number of poor families, even if the H ratio doesn't give any further information about the observed population.

4.2.6 France

This time the first wave shows a starting condition with a high percentage of H for all the chart varying from 0.24 on the left for the null elasticity until it reaches the minimum for $e=0.5$ with 0.18 for the poverty index. Therefore it can be said that numerous and small households are both equally damaged for extreme values of e . The changes remain on the rest

of the graph because the second curve already shows reducing values for the Head Count Ratio. The third wave reaches the lowest point of H with $H_3=0.14$ for an elasticity of 0.55. These two offer a different picture of the situation because the Head Count Ratio starts growing fast from the minimum to the left part of the diagram.

4.2.7 United Kingdom

On the contrary the United Kingdom shows a variable situation. First of all the 1994 wave shows a value of H which is always above 0.21 reaching a maximum of 0.295, which are pretty high. During the second year there is a significant improvement as the line maintains a similar behaviour pattern at 0.025 below the first drawing in the summary plot. This could be a very important result if the following waves were to confirm this. What happens next is that the Head Count Ratio undergoes another change, increasing in the third year. On the other hand the curves describe trends already explained before.

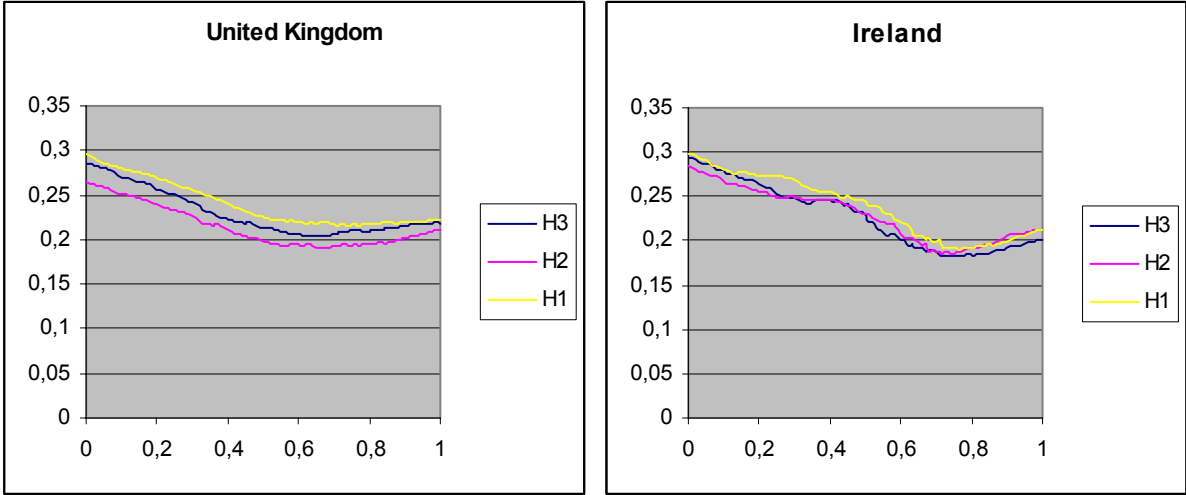
4.2.8 Ireland

We find three really similar lines that explain a conjecture, which has not changed during every wave. Values of H are pretty high, going from 0.18 as a minimum on the third wave for $e=0.8$, to 0.3 as a maximum for $e=0$ in 1994. All lines drop to a minimum 0.5 elasticity, and then start rising again a little more.

The value 0.3 of the H is one of the highest found during this survey.

The recap proves a very short decreasing of the percentage of poor, which is not considerably significant.

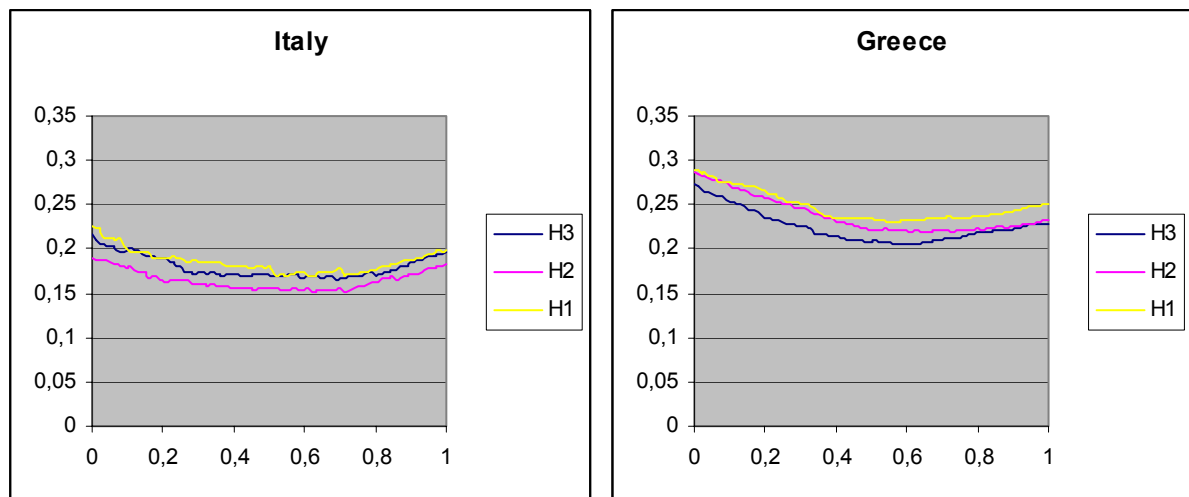
Figure 4.4: United Kingdom and Ireland



4.2.9 Italy

The case of Italy represents a stable situation, which seems to improve during the second year of the survey. In fact, in 1995 the percentage of households below the poverty line decreased as the second wave stands on lower levels: it finds its lowest figure in $e=0.7$ as the Head Count Ratio H2 has 0.15 which is almost two points less than the other minimum values. Anyway, all the lines in this chart follow a very similar pattern. H1 and H3 are close to crossing each other in various points, as their movement is not extremely regular. They show the highest values of H for this country, which reaches 22% for a null elasticity and 20% on the other edge of the chart.

Figure 4.5: Italy and Greece



4.2.10 Greece

Taking a look at the first wave in the diagram, the reader can notice how high the level of poverty is. This is the only country up until now where the values of the Head Count Ratio are so high, particularly at the end of the field of variation of elasticity. In 1994 for $e=0$, H1 reaches the level of 0.29, which means that small households result as being penalised for consequent important values of H1. Its minimum in every year comes close to 0.6 of elasticity. It is however greater than the others considered, in fact 0.21 to Finland is a top for a null elasticity (where in general the maximum is met).

The line concerning the final wave shows a slight decreasing trend for the H index; however the percentage of poor families in this population remains high.

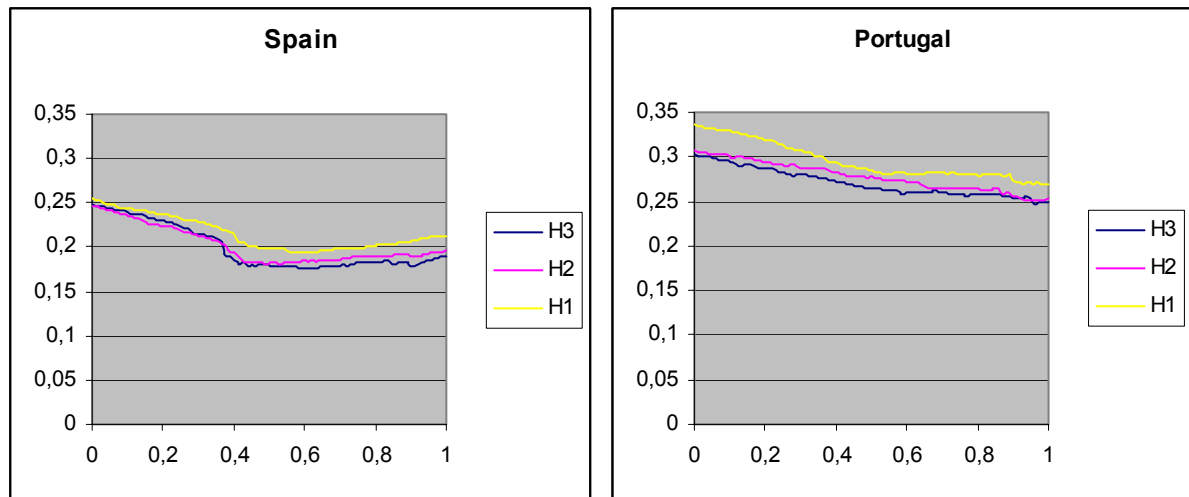
4.2.11 Spain

This case looks more particular than the others that we have just presented. From left to right looking at all three lines, it can be noticed that they all start from quite a high point of the Head Count Ratio (with a top on the first wave $H1=0.255$). Immediately after, the three lines fall until when the elasticity reaches the value of 0.4. Here the economies of scale are more and more perfect and it tallies with a much flatter equivalence scale. In this case small households tend to be more damaged than the rest, that's the reason why the H ratio rises.

Then the lines settle down to figures between $H3=0.18$ and $H1=0.21$ as a top for $e=1$.

This state suggests a short improvement of the general condition, as the third wave lies below.

Figure 4.6: Spain and Portugal



4.2.12 Portugal

Here is a very different case. For the first time we now find particular kinds of lines, i.e. as we can see from the chart, the value of H always decreases as e rises without finding a minimum value and increasing, like we have noticed before. However a decreasing ratio underlines a smaller amount of poor households as its formula is given by the number of poor divided by the total population. This may have occurred because of a particular composition of the families around this country, i.e. Portugal shows a different distribution of its household size.

On the right end of the chart the reader is reminded that economies of scale are absent so that the most numerous families are gradually penalised. The general average of household size is 2.81 in the analysed countries which made the first wave. Among all countries the highest averages belong to Portugal (3.01), Spain (3.19), Italy (3.08) and Ireland (3.6). The household

size of the first three countries were compared and it was found that Portugal has the least amount of large families; when the number of household members grows to more than five, Spain and Italy clearly overtake Portugal. In short, compared to the other countries, we can attribute the falling of the Head Count Ratio, as elasticity rises to one, to the presence of a minor number of large families.

Using this ratio we are not able to say if this smaller number of poor families lying below the poverty line depends on the distribution of rent in the population or to the type of families sampled.

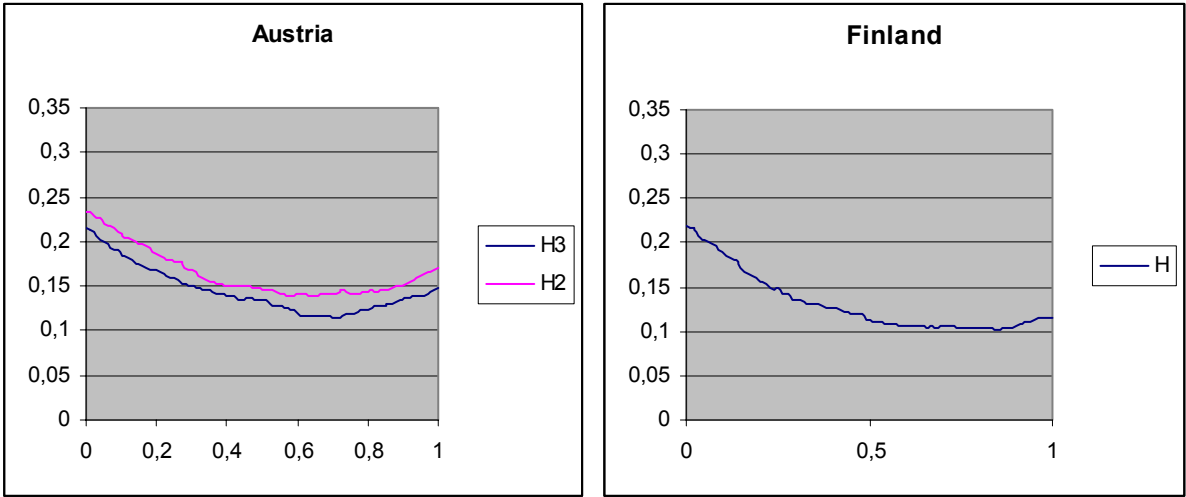
4.2.13 Austria

As Austria joined the project in 1995, only the data of the two final waves exist. Varying elasticity can be noticed for the behaviour of H. Analysing the first wave, it shows quite a flat curve. For low values of e small families suffer greater damage, with the highest poverty index of 0.22, which means that the percentage of poor families in Austria is 22% of the population. Then it drops to a minimum for an elasticity of 0.7. This trend changes and H increases up to 0.17 for the maximum value of e .

As the comparison shows on the graph, the behaviour pattern is very similar for the second wave, but slightly more smooth compared to the others, decreasing to the minimum for $H=0.11$ together with an elasticity of 0.7.

The important difference is in the values; they show a lower percentage of poor families in Austria in 1996, for $e=0.7$ is the point where the curves are much farther apart. The 1996 curve measures about 0.02 points less than the others.

Figure 4.7: Austria and Finland



4.2.14 Finland

Finland entered the program in its final year; and therefore only the state for 1996 can be shown. For a null value of elasticity 22% of the population would lie below the poverty line. This figure is due to the fact that perfect economies scale would favour larger families, and many small households would be damaged by this situation.

The Head Count Ratio falls to 0.1 when e gets higher. However, varying elasticity from $e=0.5$ the poverty index stops falling and settles down to a value equal to about 0.11.

5. Conclusions

The paper introduces an extensive and updated presentation of the several approaches proposed in literature for the estimation of equivalence scales.

The introduction of these methods into the Integrated System for Poverty Analysis (SIAP) has started gradually with the normative scales and with scales based on the Engel method.

The paper has aimed at pointing out that the choice of a particular scale is essential in the definition of the overall approach of poverty measurement; therefore it has been one of the main goals has been to present a sensitivity analysis and to introduce it into the SIAP module.

This sensitivity analysis has been applied on the basis of the Engel method; in particular, in accordance this method, the crucial variable is the elasticity of total consumption to the family size: when the elasticity is equal to zero the corresponding scale is equal to the unity for any household; alternatively, when the elasticity is equal to one, the corresponding equivalence scale is just the family size.

The analysis performed on the data set of the European Community Household Panel Survey has shown that for all the Member States the percentage of poor families (Head Count Ratio) assumes a “U” shape when the elasticity varies from zero to one.

This fact can lead to a very interesting conclusion: it is possible to see for which elasticity, and therefore for which scale, the minimum value of poor families in one country is obtained.

This is quite important for social policy makers.

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