MULTIDIMENSIONAL ANALYSIS OF POVERTY DYNAMICS IN GREAT BRITAIN

Guido Maggio

ISER Working Papers
Number 2004-10

Institute for Social and Economic Research

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BHPS data are available from the Data Archive at the University of Essex
http://www.data-archive.ac.uk

Further information about the BHPS and other longitudinal surveys can be obtained by telephoning +44 (0) 1206 873543.

The support of both the Economic and Social Research Council (ESRC) and the University of Essex is gratefully acknowledged. The work reported in this paper is part of the scientific programme of the Institute for Social and Economic Research.

Acknowledgement:

Readers wishing to cite this document are asked to use the following form of words:

> **Maggio, Guido. (2004) 'Multidimensional Analysis Of Poverty Dynamics In Great Britain', *Working Papers of the Institute for Social and Economic Research*, paper 2004-10. Colchester: University of Essex.**

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Institute for Social and Economic Research
University of Essex
Wivenhoe Park
Colchester
Essex
CO4 3SQ UK
Telephone: +44 (0) 1206 872957
Fax: +44 (0) 1206 873151
E-mail: iser@essex.ac.uk
Website: http://www.iser.essex.ac.uk

MULTIDIMENSIONAL ANALYSIS OF POVERTY DYNAMICS IN UK

by

Guido Maggio

University of Siena, Dipartimento dei Metodi Quantitativi

Abstract

This paper investigates the multidimensional aspects of poverty in the population of Great Britain from 1991 to 2000 focusing mainly on the longitudinal analysis and on poverty dynamics, that is the persistence or the transience of the staying in the state of poverty and the movements into and out of such a state across the time. It examines monetary and supplementary variables, included an overview of the dimensions within the latter, by using the fuzzy approach recently proposed by Verma and Betti (2003).

1 Introduction

Poverty, is a phenomenon whose study is commonly oversimplified and its manifestation perceived as dichotomous, consequently its analysis is conventionally based merely over the splitting of the population into two groups: *poor* and *non-poor*, defined in relation to some chosen poverty line. As an alternative to the most famous conventional methodology in this paper the state of poverty is seen as a fuzzy set to which all members of the population belong but to varying degrees; this succeeds in avoiding the mentioned oversimplification and above all in capturing the various degrees of poverty which affect different persons determined by the different individual's position in the income distribution. Furthermore poverty is regarded as a multidimensional phenomenon of which income is only one aspect. Therefore the study of an income variable must be flanked with the introduction of a non-monetary (or supplementary) index, determined by an

appropriately weighted set indicators of deprivation which contribute to help our understanding over the different sources of those troubles daily experienced by families.

Hence, the conventional classification of the population into a simple “poor/non-poor” or “deprived/non-deprived” dichotomy is replaced by the theory originally proposed by Cerioli and Zani (1990) and later developed by Lemmi and Cheli (1995) and Betti and Verma (1998), which regards all the individuals as being subject to poverty but some individuals belong to the state of poverty more than others. That degree, say 1 for the poorest or the most deprived and 0 for the richest or the least deprived, is determined for the monetary variable by the individual’s rank in the income distribution (and/or access to non monetary resources and facilities determining the living conditions, for the non-monetary variable), and the individual’s share in the total resources in the society.

1.1 Poverty and Deprivation as a matter of degree.

The advantages of treating poverty and deprivation in the way previously outlined rather than as simply a "yes-no" dichotomic state, can be grouped as follows.

1. By taking into account the degree of poverty, further insights on the relative position of socio-economic subgroups within each national population can be gained.

2. Life-style (or non-monetary) deprivation depends on forced non-access to various facilities or possessions of goods. Hence life-style deprivation is inherently a matter of degree, and simply splitting the population into deprived/non-deprived categories is inappropriate or at best arbitrary.

3. The real potential of this approach is in the study of poverty in the longitudinal context. In the conventional approach the degree of mobility of persons close to (far from) the chosen poverty line tends to be over-estimated (grossly under-estimated), because it doesn’t reflect the actual magnitude of changes affecting individuals at all points of the distribution.

4. The combined analysis, considering income poverty and life-style deprivation simultaneously, especially in the longitudinal context, is greatly facilitated.

6. We can expect the resulting measures to be more precise and less sensitive to local irregularities in the income distribution curve, and to the particular choice of the poverty threshold.

1.2 Scope of the paper

The concern of this project is primarily with the application of the new methodology to the British Household Panel Survey in order to analyse poverty in Great Britain and with the emphasizing of its advantages over the conventional approach. I analyse *five types of measures of poverty and deprivation* in relation to each other: (1) *income poverty* as conventionally viewed; (2) *income poverty* viewed as a propensity or a matter of degree to which all individuals are subject; (3) *life-style deprivation* in its various underlying dimensions; (4) *latent deprivation* representing the presence of either (2) or (3), and (5) *manifest deprivation* representing the situation of individuals subject to both simultaneously. Then I explore each of these measures in five aspects in the time dimensions: cross-sectional measures (including their averaging over a time interval); the incidence of poverty/deprivation at *any-time* during the interval; the *persistence* of such a state over time; the *continuous* experience of such a state; the dynamic aspects of movements into and out of poverty/deprivation and the duration of the time spent in that state by individuals in the population.

1.3 Data source

First of all, I need to be clearer about my dataset, the British Household Panel Survey (BHPS), and about the way I have used it in this paper. The BHPS was designed in 1991 as a nationally representative sample of Great Britain living in private households[1]. Households interviewed were selected by an equal sampling mechanism and the achieved sample in wave 1 comprises about 5,000 households which correspond to a response rate of about 65% of effective sample size. Within the responding households, at wave 1, over 90% of the eligible adults (about 10,000 individuals) provided full interview. Original sample respondents have been followed across the time and them, and their co-residents, have been interviewed at approximately one year interval subsequently[2]. Children are interviewed once they reach the age of 16 when they become eligible adults. Thus the sample should remain broadly representative of the population of Britain as it changes through the 1990s.

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[1] For a further insight over the BHPS read Taylor. (ed), with Brice, Buck and Prentice-Lane (2001).

[2] See Laurie, Smith, Scott (1997).

Since the start of BHPS in 1991, a number of additional sub-samples have been added to the survey:

(i) From Wave 7 the BHPS began providing data for the United Kingdom European Community Household Panel (ECHP). As part of this, it incorporated a sub-sample of the original UKECHP, including all households still responding in Northern Ireland, and a 'low-income' sample of the Great Britain panel.

(ii) A major development at Wave 9 was the recruitment of two additional samples to the BHPS in Scotland and Wales done with the objective to increase the relatively small Scottish and Welsh sample sizes (around 400-500 households in each country in the initial BHPS sample) in order to permit independent analysis of the two countries and to facilitating comparative analysis among England, Wales and Scotland.

1.4 The analysis

Because of the irregular structure of the BHPS, its modifications and additions occurred across the time, I have decided to develop this survey using a particular approach to the data analysis. Two parallel surveys have been carried out with different samples and different focuses. The first one, appointed A, explores poverty over the population of Great Britain from wave 1 to 10, focusing mainly on the longitudinal analysis of different poverty indicators and their dynamic aspects. The second one, called B, investigates populations of England, Wales and Scotland simultaneously form wave 9 to 10 and, due to the shortness of the interval considered, its main scope is the joint analysis of cross-sectional indices of deprivation among the countries. A lesser importance will be given to the longitudinal syudy though some interesting conclusions will be made however.

1.5 Units of analysis

The units of analysis are respondents aged more than 16 and all the enumerated individuals belonging to completely respondent households, under the assumption that all the household members equally share the richness available within the household, which means that both the equivalised household income and similarly a wide range of household-level supplementary variables are assigned to each household member.

2 The Fuzzy approach to cross-sectional indices

I first introduce the methodology proposed by Betti and Verma which will be used throughout the paper.

2.1 The income variable

2.1.1 Conventional Income poverty measures

The population is dichotomised into the "poor" and the "non-poor" as follows. Each person *j* is assigned the equivalised income y_j of the person's household. Persons with (say) y_j<60% of the median are regarded as “poor” (assigned a poverty index $I_j^{(0)} = 1$), and the others as “non-poor” ($I_j^{(0)} = 0$). The conventional income poverty rate is the average over individuals of this poverty index.

2.1.2 The propensity to income poverty, Fuzzy Monetary index (FM)

The propensity to income poverty I_j for each individual *j* is related to the person’s rank and share in the equivalised income distribution. The model proposed is as follow: first we construct an index

$$V_j = \sum_{i=j+1}^{n} v_i , \qquad j = 1\ldots n\text{-}1; \tag{1}$$

Where $v_i = y_i \Big/ \sum_{2}^{n} y_i$ (2)

is the share of the total equivalised income (y_i) possessed by individual of rank *i* in the ascending income distribution. V_j varies from$V_1 = 1$ for the poorest and $V_n = 0$ for the richest individuals. Hence V_j is the share of the total equivalised income received by all

individuals less poor than the person concerned. Corresponding to the income index, the propensity to income poverty is defined as:

$$I_j = V_j * \exp\left(\alpha k / \bar{I}^{(0)}\right) \tag{3}$$

where $$\bar{I}^{(0)} = \frac{\sum_j w_j * I_j^{(0)}}{\sum_j w_j} \tag{4}$$

is the conventional income poverty rate.

We have determined parameter **α** such that for the *national population as a whole* the weighted mean of the index I_j, i.e. $\bar{I}$, is equal to the proportion of conventional poor $\bar{I}^{(0)}$ for each wave and country**,** while *k* is a purely arbitrary scalar factor which gives **α** ≈ 1 when averaged over the whole population. Empirically, large values of I_j tend to be concentrated at the lower end of the income distribution, making the propensity to income poverty sensitive to the share of the income received by poorer sections of the population.

2.2 Life-Style Deprivation, Fuzzy Supplementary (FS)

In addition to the level of income perceived, the standard of living of households and persons can be described by putting together a large set of non-monetary indicators of living conditions which involves a number of steps, models and assumptions.

Firstly, from the large set which may be available, we select indicators which are judged as the most meaningful and useful. A majority of so-called '*objective'* indicators of life-style deprivation, such as physical conditions of life or the possession of material goods and facilities are generally preferred at the expense of what may be called '*subjective*' indicators such as self-assessment of the general health condition and the expressed degree of satisfaction with work and life.

Secondly, it is useful to identify underlying dimensions and group the indicators accordingly, taking into account the manner in which different indicators cluster together (possibly differently in different national situations), because ignoring such dimensionality can in fact result in misleading conclusions.

Gathering categorical indicators of deprivation for individual items to construct composite indices requires decisions about assigning numerical values to the ordered categories and the weighting and scaling of the measures.

Most of the items which can be considered ('yes/no' dichotomies) are assigned a value of (say) 1 to the presence and 0 to the absence of a particular item of deprivation. In principle, some items may involve more than two ordered categories; in this case equally spaced values in the range 1-0 can be assigned to an ordered polytomy:

$$D_{j(m)} = \frac{M - m}{M - 1}, \tag{5}$$

where individual *j* is scored *m* on M ordered categories, with *m*=1 the most deprived and *m*=M the least deprived.

Next, individual indicators *within* each major dimension are combined to form an index describing the degree of deprivation specific to the dimension concerned. Denoting by $D_{di,j}$ the score of individual *j* on item *i* in dimension *d*, the individual's score averaged is written as the weighted mean:

$$D_{d,j} = \sum_i \left(w_{d,i} * D_{di,j} \right) \tag{6}$$

where the weights $w_{d,i}$ are taken to be common to all individuals *j* in the population, and have been computed, separately for each country and each wave, taking into account how the items are distributed in the population fallowing the methodology proposed by Betti and Verma (1998). Alternative models are possible.

a) Firstly, the weight is determined by the variable's power to 'discriminate' among individuals in the population, that is, by its dispersion. We take this as proportional to the coefficient of variation of the item:

$$w_{d,i}^{a} \alpha CV_{d,i} \tag{7}$$

Thus deprivations which affect only a small proportion of the population, and hence are likely to be considered more critical, get larger weights than those affecting large

proportions, but their contribution to the average level of deprivation in the population as a whole is correspondingly smaller.

b) Moreover it is necessary to limit the influence of those characteristics that are highly correlated with the others included in the analysis. Hence the weight of item *i* in dimension *d* is taken as the inverse of an average measure of its correlation with all the other variables in the dimension;

$$w^{b}_{d,i} \alpha \left(\frac{1}{1+\sum_{i'} \rho_{i,i'} \left| \rho_{i,i'} < \rho_H \right.} \right) * \left(\frac{1}{\sum_{i'} \rho_{i,i'} \left| \rho_{i,i'} \geq \rho_H \right.} \right) \quad (8)$$

The final weight, $w_{d,i}$ is taken as proportional to the product of the (6) and (7): $w_{d,i} \propto w^{a}_{d,i} * w^{b}_{d,i}$, and, to summarize, it is computed in order to be directly proportional to the variability of the item in the population and inversely proportional to its correlation with other items in the dimension. Besides the weights are scaled to sum to 1.0 over items in the dimension: $\sum_i w_{di} = 1$.

The next step is to seek an overall indicator of life-style deprivation for an individual *j*, i.e. a weighted average of the person's deprivation indices on the different dimensions *d*. It can be computed as:

$$D_j = \sum_d \left(w'_d * D_{d,j} \right) \quad (9)$$

where the dimension's weights w'_d are taken as proportional to a weighted (with item weights $w_{d,i}$) average of the coefficients of variation of the items in the dimension, which must satisfy again the assumption $\sum_d w'_d = 1$.

2.3 Income poverty and Life-Style Deprivation in combination

Up to now, two indices have been constructed using two similar procedures but independent ways, therefore in order to allow for a comparison it is necessary a rescaling

operation of the life-style deprivation index (and of the major dimensions indices). Verma and Betti (1998) suggest transforming the FS index in the fallowing way:

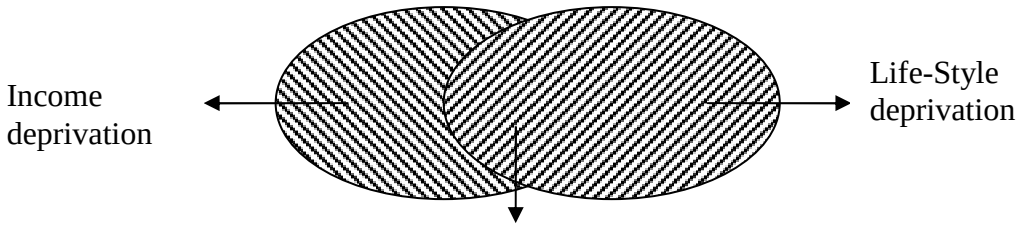
$$D'_j = \left(\frac{\bar{I}}{\bar{D}} \right) * D_j \quad , \tag{10}$$

so that the rescaled supplementary indicator D'_j gives the same average over the entire population as the FM indicator I_j. That is $\overline{D'} = (\bar{I})$.

I_j and D'_j can now be combined to construct composite measures which indicate the extent to which income poverty and life-style deprivation overlap for the individual concerned.

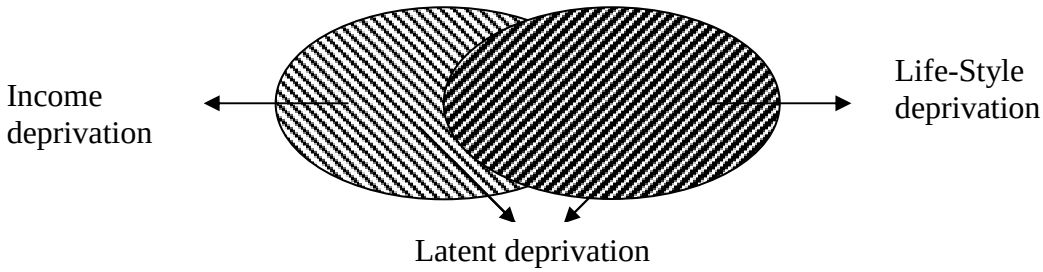
M_j Manifest deprivation, indicating the individual propensity to both income poverty and life-style deprivation simultaneously. Hence it represents, for the individual *j*, the intersection (the smaller) of the two measures; one may think of this as the '**m**anifest' or the '**m**ore intense' degree of deprivation.

$$M_j = \min(I_j, D'_j) \tag{11}$$



L_j Latent deprivation, representing the individual being subject to at least one of the two, income poverty and/or life-style deprivation; hence, for the individual *j*, it is the union (the larger) of the two measures; it may be thought also as the '**l**atent' or the '**l**ess intense' degree of deprivation.

$$L_j = \max(I_j, D'_j) \tag{12}$$



3 Cross-sectional analysis

3.1 The Samples

Households of interest are those completely respondent who provided a full interview to the questionnaire as well[3]. Therefore, the cross-sectional samples include all the enumerated individuals (also minor 16 of age) belonging to completely respondent households where both the FM and the FS indices could be computed.

In survey A, the sample withdrawn is an unbalanced panel of individuals including ECHP[4], Walsh and Scottish sub samples. Instead the second survey, B, considers a balanced panel of individuals present at each wave. Low attrition and low non-response rate in wave 10 did not prompt the choice of an unbalanced panel for a better cross-sectional analysis[5]. Table 1 provides with the figures of all the enumerated individuals in the BHPS and those sampled in the current surveys (Figure 1 regards survey A only).

3.2 The Income Variable

The income variable used to determine the equivalised household income has been recently proposed by Bardasi, Jenkins and Rigg (2003), as an unofficial supplement to the BHPS data. Its formula, for household *h* at time *t*, comes as follows:

[3] At least those questions related to the variables selected for building the life style deprivation index.
[4] Excluded individuals from Northern Ireland.
[5] In B I have also excluded 48 households whose geographical variable (XREGION) was missing, basically because of interviewer or data collection errors; moreover, to facilitate the longitudinal analysis I excluded also 33 individuals who moved within Great Britain from a country to an other one in wave 10. Such a small number of exclusions did not certainly caused distortions in the results.

$$y_t^h = \frac{\sum_i^{n^h} \sum_{k=1}^{K} x_{ikt}^h}{m(a^h, n^h)}; \quad h = 1,...,H; \quad t = 1,...,T; \quad i = 1,...,n^h; \tag{13}$$

where the numerator is a double summation over all persons in the household and over each money income source x_{ikt}^h, $k = 1,2,\ldots,K$[6]. The denominator is a household equivalence scale factor, derived from the McClements scale Before Housing Costs, which depends on household size n^h and on household composition and other characteristics summarized by vector a^h. The equivalised income is expressed in pounds per weeks deflated to January 2001 prices. The time period over which *current income* components are measured is the month prior to the interview or the most recent relevant period (except for employment earnings which are "usual earnings").

3.2.1 The poverty line

The conventional poverty line has been traced as 60% of the median of the equivalised income distribution in the population. The year considered is 1991 (wave 1) in A and 1999 (wave 9) in B, for each country. All persons with income below that threshold are defined "poor" ($I_j^{(0)} = 1$), and the remaining "non-poor" ($I_j^{(0)} = 0$). This line is kept fixed throughout the survey, which means that an *absolute* measure has been preferred to a *relative* one (computed differently each year).

Table 2 illustrates the values of the poverty lines computed each year, besides it displays a parallel overview of *absolute* and *relative* measures, which shows how the downward trend of the Head Count Ratio in A is somehow less evident if the *relative* poverty line is considered instead[7]. In B, the conventional poverty rates allow us to sort the countries by the descending traditional poverty measures: England, the richer, then Wales and Scotland, the poorer; nevertheless these rates indicate quite similar level of income poverty for all the countries.

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[6] y_t^h = Head of household (hoh) gross earnings from employment + spouse of hoh (where present) gross earnings from employment + hoh gross earnings from self employment + spouse of hoh (where present) gross earnings from self employment + other gross labour income (earnings of other household members + occasional earnings of head & spouse if they have no main job) - Total deductions (income tax + NI + pension contributions of all household members) + Total household investment income + Total household benefit income + Total household pension income + Total household transfer income - Local tax.

[7] See Figure 2 for a clearer view.

3.2.2 Fuzzy Monetary Index (FM)

The individual propensity to income poverty (I_j) can now be computed using for the calculation of α the values of the Head Count Ratio determined by the *absolute* poverty lines[8]. It must be specified that formula (2) which determines I_j must now be modified in order to allow for the individual weighting system in the following fashion:

$$v_i = y_i * w_i \Big/ \sum_{i=2}^{n} y_i * w_i \,. \tag{14}$$

Now, in order to grasp the advantages of treating poverty as a matter of degree, in Table 3 and Figure 3, the values of the propensity to income poverty I_j are divided into classes and the Table illustrates its distribution across them for survey A only. Similar conclusions could be made for B and it's my aim, throughout this paper, to be as less repetitive as possible.

It can be noticed, as it could have been predictable, that a high rate of individuals (always above 60%) gathers over the class 0-0.1, which means that a wide part of the population "belongs little to the fuzzy set of the poor". Furthermore it's clear how the same class becomes more and more crowded year by year; such effect is primarily due to both the downward trend in the income poverty rate and the increasing value of α which concentrates the distribution of I_j in the lower classes.

The income poverty rates (FM), computed using the fuzzy approach, don't give us any new information, since they have been adjusted at the level of each country (in B) so as to equal the conventional poverty rates at each wave. However, additional insight is provided by an examination of the *proportion of the population with above average propensity to poverty*, which is of course identical to the poverty rate in the conventional analysis, while this is not generally the case with the Fuzzy Approach. Column (3) of Table 4 shows the ratio of this proportion to the average poverty rate over the interval. This ratio is always above 1 and in B it's worth noting that it is higher for England and smaller for Scotland.

[8] In B, the index FM is equalised, by means of α, to the values of the Head Count Ratios of each country.

The implication is that in countries with already higher levels of poverty, that quantum of poverty tends to be more concentrated at the lower end of the income distribution. Despite the HCRs are rather similar, this conclusion seems to be confirmed in survey B. This effect is missing in the traditional approach to income poverty. Column (4) shows the values of parameter α, averaged over the interval, which turn out to be very similar for all the countries in survey B. Generally higher values of α mean higher inequality.

Now, to investigate better over connections between traditional and fuzzy measures and to study income poverty within the groups created by the traditional approach where we can find individuals with very dissimilar situations, I propose in Table 5 an investigation of the distribution of the population according to (equal sized ranges of) I_j value, separately for the conventional "poor" (p_j=1) and "non-poor" (p_j=0), about survey A. It can be easily seen that I_j is never below 0.4 for "the non-poor" and never above 0.5 for "the poor", which means that the two groups overlap in the class 0.4-0.5 where they have a quite similar situation despite a different traditional classification. For example in wave 1, 12.22% of the "poor" belongs to the same class as 1.77% of the "non poor". A vast majority of the conventionally "non-poor" have low I_j values in the range 0-0.1 and the population tend to grow the concentration in that class across time (plus 12% in 10 years), while the conventional "poor" are more fairly evenly distributed in the range 0.5-1 and tend to gather in the higher classes (>0.9) across time.

The FM rate is 0.729 for the poor in wave 1 and 0.747 in wave 10, while it is equal to 0.071 for the non-poor in wave 1 and 0.032 in wave 10.

3.3 Life-Style Deprivation

Because of the initial lack of questions in the questionnaire provided by the BHPS in waves 1-5, I have started the analysis of life-style deprivation from wave 6, when many variables were added in order to make BHPS more similar to the ECHP. For this reason, only from wave 6 onwards I had enough information to compute an FS index.

The items of deprivation and the underlying dimensions where they are grouped have been identified as follow, in agreement with the remarks made in paragraph 2.1.2 and similarly to EUROSTAT (2003).

1. Housing Facilities (HF) – these concern the absence of basic housing facilities (so basic that one can presume all households would wish to have them):

    a) A separate kitchen
    b) A separate bath/shower room
    c) An indoor flushing toilet
    d) A place to sit outside e.g. a terrace or garden
    e) any form of central heating, including any electric storage heaters in (part of) the accommodation

2. Environmental Problems (EP) – these concern problems with the neighbourhood and the environment:

    a) Shortage of space
    b) Noise from neighbours
    c) Other street noise
    d) Too dark/not enough light
    e) Pollution, grime or other environmental problems
    f) Vandalism or crime in the area

3. Housing Deterioration (HD) – these concern serious problems with accommodation:

    a) Leaky roof
    b) Damp walls, floors, foundation etc.
    c) Rot in window frames or floors

4. Secondary life-style Deprivation (SD) – these concern "enforced" lack of widely desired possessions ("enforced" means that the lack of possession is because of lack of resources):

    a) Car or van normally available for private use by any members of the household [9]
    b) A colour TV
    c) A video recorder
    d) A washing machine
    e) A microwave oven
    f) A telephone

5. Basic life-style Deprivation (BD) – these concern the lack of ability to afford most basic requirements:

    a) Keeping the home (household's principal accommodation) adequately warm
    b) Paying for a week's annual holiday away from home
    c) Replacing any worn-out furniture
    d) Buying new, rather than second hand clothes
    e) Eating meat chicken or fish every second day
    f) Having friends or family for a drink or meal at least once a month.

The weighting system has been constructed according to the methodology described in 2.2. Tables 6-11 illustrate the values[10] of the life-style deprivation indices and of the variables' weights relating to items and dimensions for the survey B.

[9] The BHPS questionnaire asks how many cars (or vans) are available in a household. This number being dependent of the household composition and size, the question has been simplified dichotomizing the respondents in two groups: those ones having no cars available and those with more than one car available by any household member.

Table 6 firstly indicates that possession of a "central heating" is the item with the highest deprivation related for the population of Great Britain within the dimension "Housing Facilities" and secondly that Scotland differentiates itself for having higher values in most of the variables (above all "kitchen" and "terrace/garden") in wave 9. England and Wales instead have got rather similar levels of deprivation in most of the items in the two waves considered. A concrete general improvement from wave 9 to 10 concerns Scotland while Wales only regarding the possession of a separate bath/shower. By contrast the situation worsens as to possession of a central heating in Wales.

As to the "Environmental Problems" (Table 7) England and Wales show similar deprivation rates for a majority of the items while Scotland is generally worse off, especially regarding lack of space and noise from neighbours. Problems due to darkness in the living area appear to be the least grave. To emphasize the methodology used it can be worthwhile noticing how the corresponding item gets the larger weight, being regarded as the most discriminatory. Across time a general improvement concerns most of the items in any subpopulation, mainly in Scotland again.

In Table 8 we can see how the population of Wales turns out to be the more deprived concerning difficulties with "Housing Deterioration". Its problems slightly improve in wave 10 but deprivation rates still maintain Wales the "poorer" country in this dimension, while England and Scotland appear to be rather wealthy instead.

Within the dimension "Secondary life-style Deprivation" (Table 9) the highest deprivation rate corresponds by far to the lack of availability of a car or van for private use, principally for Scotland, therefore this item gets the smaller weight for any country. Its deprivation index even increases in wave 10. By contrast the population of Great Britain does not seem to have many problems affording some goods such as colour TV and telephone. Making a comparison across countries England has got above average deprivation rates, Scotland across average rates despite very high deprivation related to the availability of a car or van; Wales below average measures of deprivation for items such as possession of a micro-oven and the colour TV.

The last dimension generated in the analysis is "Basic life-style Deprivation" (Table 10) within which we can find widely different situations. In fact the population of Great Britain seems to have no difficulties keeping the house warm and, to a lesser extent, affording new cloths and fish or meat any second day; by contrast the rest of the indicators show serious deprivation. As to Wales this wide gap of values makes the first variable

[10] Not rescaled yet.

absorb half of the weight of the entire dimension. Furthermore, the affordability of a week's annual holiday is the item with the highest deprivation rate associated in wave 9 for any countries, while having guests at dinner once a month becomes the toughest thing to achieve for Wales and England in wave 10.

Table 11 (and Figure 4) groups the items of deprivation and shows the levels of the dimension's deprivation rates computed using the weighting system proposed by Betti and Verma. "Environmental Problems" turns out to have the higher deprivation rate associated, particularly for Scotland in wave 9, while for all the countries and both waves the wealthier dimension is "Housing Facilities". Respectively they get the larger and the smaller weight for the calculation of the overall life-style deprivation index. In wave 9 deprivation is larger for Scotland within 3 out of 5 dimensions (much larger in "Housing Facilities"), but in the following wave a general improvement occurred never makes Scotland the most deprived country. England is better off concerning "Housing Deterioration" and slightly improves its deprivation rates related to "Environmental Problems" and "Secondary" and "Basic life-style deprivation". Wales seems to have fewer problems with "Secondary life-style Deprivation" and more as to "Housing Deterioration"; globally it shows few sensible improvements in the second year.

An overall life-style deprivation index can now be constructed using the weights of Table 11 (for survey B). The formula of the corresponding rate, which allows for individual weights w_j, is modified as follow:

$$\overline{D} = \frac{\sum_j w_j * D_j}{\sum_j w_j} \quad . \tag{15}$$

This rate has been calculated independently of the income poverty index and must be rescaled so that its simple average across waves over the whole population[11] exactly equals the same average of the income poverty rate $\overline{I}_m$ (0.129 A, 0.188 B). The rescaled individual values D'_j give $\overline{D'}_m$, simple average over waves of the rates $\overline{D'}$, which is equal to $\overline{I}_m$ [12].

[11] In B, as an overall population index, it's taken the simple average across all the countries in each wave (0.201 for wave 9 and 0.171 for wave 10).

[12] Any index referring to the internal dimensions has been rescaled in the same way. The rescaled values of the dimensions will be used later on for the longitudinal analysis. They are now illustrated in Figure 4.

Table 12 proposes a similar view to Table 4 of the variation and trends in the overall life-style deprivation. In the survey A (see Figure 5) it's somehow apparent how there are substantial differences from the $\bar{I}$ trend: $\overline{D'}$ drops about 7% from wave 6 to 7, despite the income poverty index does not vary significantly; again in wave 8 the life-style deprivation rate soars of about 3% despite $\bar{I}$ is steady. In B all countries have rather similar values of non monetary index again, but unlike the income poverty situation, Wales is, on average, more deprived than Scotland, which is the most deprived country in wave 9 and the least in wave 10 ($\overline{D'}$ loses 6% in one year). England has got the minimum deprivation rate in wave 9 but shows the smallest improvement the year after, about -1% only.

Likewise Table 4, an additional insight is provided by an examination of the *proportion of the population with above average propensity to life-style deprivation.* Column (3) of the Table shows the ratio of this proportion to the average $\overline{D'}_m$. All the measures exceed 1 again and seem to be substantially higher than the corresponding figures for the income measures, which may mean that in Great Britain deprivation tends to be less concentrated at the lower end than income poverty. Again, in B, this ratio is larger for England, which is the country with the lower deprivation, and differences with Wales and Scotland are larger than those in income measures. This confirms again that in countries with already higher levels of life-style deprivation, deprivation tend to be concentrated at the lower end. In the last column, in B, it's shown for each country ratio (4) of $\bar{I}_{m,p}$ to $\overline{D'}_{m,p}$, to emphasize which kind of poverty affects more its population. Such a ratio is approximately 1 for England, above 1 for Wales (income poverty is more intense) and below 1 for Scotland.

3.4 Income Poverty and life-style Deprivation in combination

I must first specify that, in order to allow for a comparative analysis between income poverty and life-style deprivation, the latter index has been rescaled in this paragraph again according to the formula (10) but in a different way: for the creation of the propensity to Manifest and Latent deprivation, D'_j have been rescaled to give the same average as I_j over the population at each wave. In B, the simple average taken across the countries is used as an index referring to the overall population.

As discussed in the introduction, one of the objectives of this paper is to farther our understanding on the relationships between income poverty and life style deprivation. First of all it must be taken into account that more than 55% of the individuals are more subject

to life-style deprivation than income poverty at each wave. The core of this paragraph illustrates the results, for both A and B, regarding the calculations of the indices introduced in 2.3 that give an overview of income poverty and life-style deprivation in combination: *propensity to manifest and latent deprivation*. The picture is displayed in Table 13 and 14.

A) As it was expectable both latent and manifest deprivation indices have a downward trend. More interesting is to note that about 62% of those in latent deprivation are income poor and of course the same proportion are subject to life-style deprivation. The overlap between these two groups (the manifest deprivation) is 38% of either group, i.e 23% of those subject to latent deprivation.

B) Manifest and Latent deprivation indices are substantially lower in wave 10 for Scotland while steady for England; Wales instead has a higher manifest deprivation rate in wave 10. Ratios (6) and (7) of Table 13 and (5) and (6) of Table 14 highlight once more how Wales is more subject to life-style deprivation and Scotland to income poverty. Averaged over countries the Tables shows that 64% of the individuals who are subject to latent deprivation are income poor (and in deprivation), the overlap between the two groups (manifest deprivation) is about 45% of either groups, that is 29% of those in latent deprivation. More important is to analyze Ratio (7) of Table 14, which is the ratio of Manifest to Latent deprivation; it indicates the level of overlap between the two dimensions. This is higher for Wales and Scotland and suggests that in countries with higher poverty and deprivation, different dimensions of deprivation tend to be more overlapping over the same individuals. While it is lower in England where there is a smaller level of disparities among the population. Despite the three states composing Great Britain show rather similar values of income poverty and life style deprivation, this insight confirms some conclusion which have been taken in other surveys which applied the alternative approach to more countries in the European Union[13].

[13] Verma and Betti, 2003.

4 The Fuzzy approach to longitudinal aspects

Any of the measures introduced in Chapter 2 (i.e. $I_j^{(0)}, I_j, D'_j$ and all the internal dimensions, L_j and M_j) can be studied in the time dimension: both in the cross-sectional and the longitudinal contexts. In the latter, indicators can be designed to capture the experience of poverty and deprivation at any-time, persistently or continuously during a period. We can also construct individual propensities and average rates of exit and re-entry into the state of poverty and deprivation, and the distribution of the time spent in such a state. The following concepts apply to any of the above measures (and their conventional counterparts) and the symbol P is used to represent any of these. Thus:

$P_{t,j}$ = the propensity to poverty(and/or deprivation) at time *t* of individual *j*, over some interval *t* = 1,…,T.

$P_{(t),j}$ = the ordered set corresponding to the above.

Cross-sectional rates

$$\overline{P}_t = \frac{\sum_j w_j * P_{t,j}}{\sum_j w_j} \quad ; \quad t = 1,...,T \tag{16}$$

where w_j is the sample weight of individual *j*

4.1 Longitudinal rates over period *t* = 1 to T

Consider a panel of individuals *j* over a period from *t* = 1 to T years.

i) The individual's propensity to **'any-time poverty'** (i.e., poverty during at least one year over the interval) is given by the largest cross-sectional index: $P_{(1),j}$. And the corresponding **rate** for the population being

$$\overline{P}^{(A)} = \frac{\sum_j w_j * P_{(1),j}}{\sum_j w_j} \tag{17}$$

ii) The individual propensity to **'persistent poverty'** refers to poverty during at least a majority of the T years, i.e. for at least T' years, where T' = int(T/2) + 1 (i.e. the smallest

integer strictly larger than T/2). At the individual level, this is the T'th largest value of the annual propensities to poverty, i.e. $P_{(T'),j}$. The corresponding persistent poverty **rate** is

$$\overline{P}^{(P)} = \frac{\sum_j w_j * P_{(T'),j}}{\sum_j w_j} \tag{18}$$

iii) The individual's propensity to '**continuous poverty'** (i.e., for all the whole interval) is the smallest of the cross-sectional indices: $P_{(T),j}$. And the corresponding rate for the population being

$$\overline{P}^{(C)} = \frac{\sum_j w_j * P_{(T),j}}{\sum_j w_j} \tag{19}$$

4.2 Dynamic aspects: movements across poverty and deprivation

This section tells how the various dynamic measures of individuals' movements into and out of poverty, of spells and durations in the state of poverty, etc., can be constructed, when poverty is treated as a propensity rather than simply a "yes-no" state. Conventional measures are seen only as a special case of the more general formulation below.

4.2.1 Exits from and re-entries to the state of poverty

Given the state of poverty at time t=1, the objective is to estimate the rates of exit from and re-entry that state in the following years t = 2,3,4,… with

$P_{t,j}$ = the propensity to poverty(and/or deprivation) at time t of individual j.

$\boldsymbol{p_{t,j}}$ = min($P_{t,j}$,$P_{1,j}$): being the propensity to poverty at both times 1 and t.

Given poverty at time 1, the individual's propensity at time t to *exit* from poverty at time (t-1) is

$$E_{t,j} = \max\{0,(\boldsymbol{p_{t-1,j}} - \boldsymbol{p_{t,j}})\} \tag{20}$$

The corresponding "*population at risk*" is $\boldsymbol{p}_{t-1,j}$, giving the *exits rate* at time *t* as:

$$e_t = \frac{\sum_j w_j * E_{t,j}}{\sum_j w_j * \boldsymbol{p}_{t-1,j}}, \tag{21}$$

where w_j is again the sample weight of individual *j*.

Similarly, given poverty at time 1 but having exited from it by time (*t*-1), the individual's propensity to *re-enter* poverty at time *t* is

$$R_{t,j} = \max\{0,(\boldsymbol{p}_{t,j} - \boldsymbol{p}_{t-1,j})\}. \tag{22}$$

The corresponding "*population at risk*" is that which has escaped by time (*t*-1) from poverty at time 1, i.e., $\boldsymbol{p}_{1,j} - \boldsymbol{p}_{t-1,j}$, giving the *re-entry rate* at time t as:

$$r_t = \frac{\sum_j w_j * R_{t,j}}{\sum_j w_j * (\boldsymbol{p}_{1,j} - \boldsymbol{p}_{t-1,j})}. \tag{23}$$

From propensity to poverty at time 1, the *gross exit rate* over the time *t*=2 to T is

$$e_T^{(G)} = \frac{\sum_j w_j * \left(\sum_t E_{t,j}\right)}{\sum_j w_j * \boldsymbol{p}_{1,j}}. \tag{24}$$

This measures the gross volume of exits experienced, even if some are followed by subsequent *re-entry* into poverty. Similarly, the *gross re-entry rate* over the time *t* =3 to T is

$$r_T^{(G)} = \frac{\sum_j w_j * \left(\sum_t R_{t,j}\right)}{\sum_j w_j * \boldsymbol{p}_{1,j}}. \tag{25}$$

The difference between the above two is the *net exit rate* over the interval: $e_T^{(N)}$.

4.2.2 Time spent in the state of poverty

With the conventional "poor/non-poor" dichotomy, any individual spends specific number of year between 0 and T in the state of poverty during an interval T. However, with poverty treated as a matter of degree, a single individual is seen as contributing to the *whole distribution* (from 0 to T) of the number of years spent in poverty. The *individual's contribution* to exactly *t* out of T years spent in poverty is

$$\Pi_{t,j} = P_{(t),j} - P_{(t+1),j} \quad \text{for } t = 1,...,T, \tag{26}$$

with $P_{(T+1),j} = 0$ defined for convenience.

The individual's contribution to zero years (never) in poverty is the remainder:

$\Pi_{0,j} = 1 - \sum_t \Pi_{t,j} = 1 - P_{(1),j}$ the sum being over *t*=1 to T.

Obviously, the *total time* spent by the individual in poverty during the T years is

$$T_j = \sum_t t * \Pi_{t,j} = \sum_t P_{t,j} . \tag{27}$$

From the above, various measures averaged over the population can be computed, such as the following.

Distribution of the *population* according to the number of years in poverty

$$\overline{\Pi}_t = \frac{\sum_t w_j * \Pi_{t,j}}{\sum_j w_j}, \qquad \overline{\Pi}_0 = 1 - \sum_t \overline{\Pi}_t = 1 - \overline{P}^{(A)}, \qquad t = 1,\ldots,T \tag{28}$$

Mean proportion of the *time* during T spent in poverty by the population:

$$\overline{T} \quad \frac{\sum_t w_j * T_j}{\sum_j w_j} . \tag{29}$$

Distribution of that *time* according to the number of years in poverty:

$$\overline{T_t} = \frac{\sum_t w_j * \left(t * \Pi_{t,j}\right)}{\sum_j w_j * T_j} = t * \left(\frac{\sum_j w_j * \Pi_{t,j}}{\sum_j w_j * T_j} \right). \quad (30)$$

It is instructive to note how the conventional "poor/non-poor" dichotomous approach is a special case of the above. In that approach, a person is “poor” during a specific number of years, say T_j in the range 0 to T. Only one of the $\Pi_{t,j}$ values equals 1, the rest being 0. ($\Pi_{t,j}=1 \left| T_j = t \right.$; $\Pi_{t,j}=0 \left| T_j \neq t \right.$; per t=0,...,T).

The weighted proportion of the population who spend exactly *t* years in poverty is

$$\overline{\Pi}_t = \frac{\sum_t w_j \left| T_j = t \right.}{\sum_j w_j}. \quad (31)$$

The mean proportion of the time spent in poverty is as well as before the (29).

The distribution of that time according to the number of years in poverty being:

$$\overline{T_t} = \frac{\sum_t w_j * T_j \left| T_j = t \right.}{\sum_j w_j * T_j}. \quad (32)$$

5 Longitudinal analysis

5.1 The samples

A balanced panel of individuals, from which sufficient information can be achievable, must be drawn for a longitudinal analysis. Hence survey B can keep the same sample of 21320 elements as the cross sectional analysis (Table 1), while A must turn to a balanced panel of 5049 individuals present at all waves whose household net income (and FM) and life-style deprivation index (FS) can be estimated at each wave[14].

5.2 Persistence of poverty and deprivation

Table 15 groups the results belonging to the analysis of the persistence of poverty and deprivation for survey A. Figures of 2nd and 3rd row give confirmation on the fact that by fixing a poverty threshold we tend to overestimate the mobility across the set of "poor" and "non-poor". This effect is determined by those individuals who live near the poverty line whose movements across it cause a change of state, despite their actual financial condition has not meaningfully changed. On the other hand using the fuzzy approach (FM) the propensity to *continuous* and *any-time* poverty indices are respectively lower and higher (Figure 6); in addition their ratio (8) is half that one computed by means of the conventional approach (wave 1-10). In this sense it is constructive to remark how mobility in the fuzzy approach means movements along the fuzzy set of poverty.

The life-style deprivation[15] shows less mobility (Figure 7), due to the nature itself of the variables included in the study, so long as possessing or not-possessing either a car or a central heating is clearly something more persistent than income perceived which is

[14] Given that those individuals were required to be enumerated in the sample since wave 1, all the additional sub samples had to be excluded.

[15] In order to introduce a joint longitudinal analysis of FM and FS for A, the former has been calculated separately for waves 6-10.

affected by wide volatility more than ever for household members belonging to certain categories of the labour market.

Within life-style deprivation each dimension which composes the overall index has been studied in the longitudinal context (Figure 8). Column (1) confirms that averaged over waves “environmental problems” first and “basic life-style deprivation” second are the deepest source of deprivation for the population of Great Britain who seems by contrast to be rather “prosperous” in relation to “housing facilities”.

From ratios (5), (6), (7) and (8) it can be deduced that the major mobility belongs to “Housing Facilities” and “Housing Deterioration”, while the steadiest dimensions are “Basic” and “Secondary life-style Deprivation” and “Environmental Problems”.

Table 16 deals with survey B and despite considering only a pair of waves it can lead to same conclusions as A about a certain overestimation of income poverty mobility using the conventional approach and a major steadiness of FS.

More interesting is to see how the countries behave in these aspects of the study: England turns out to be the steadier and Scotland the more mobile regarding both FM and FS. Concerning dimensions we can make conclusions similar to A again. However it’s worthwhile to emphasize firstly how mobile Wales is as to “Housing Deterioration” even though these movements don’t lead to any change of the deprivation index in wave 10 (see Table 11) and secondly that Scotland registers, as expected, the biggest volume of movements in most of the dimensions.

5.3 Analysis of poverty dynamics

5.3.1 Exits from and re-entries to the state of poverty

In the conventional analysis the exit from and re-entry rates to the state of poverty are computed as a simple percentage, over the whole population, of those individuals whose income increase or decrease crossing the poverty line. Again it does of course overestimate movements of people living near the threshold and underestimate those of persons living far away from it failing to valuate the real volume of the movements of the population across the income distribution.

For both of the surveys, A and B, these considerations imply for the conventional analysis higher exit and re-entry rates (the latter can be computed for A only) in most of the waves in A, and for all the countries in B, higher gross exit and re-entry rates and net exit rate (A). See Figure 9, 10 and 11 and Tables 17 and 18for a better view.

As to survey A specifically, a joint assessment of FM and FS illustrates that the latter, despite a higher stability which is confirmed by minor gross exit rate, has got a consistently higher exit rate in wave 7. This is mainly due to a 7% decrease of the FS index caused by an exit rate of "Housing Facilities", which is the dimension with the highest weight associated, equal to 0.722. Higher re-entry rates are linked to FS form wave 8 onwards which in fact correspond to a slight increasing of the overall FS index (read Table 12). Globally, the population seems to escape more from income poverty than from life-style deprivation (Figure 11), being the respective net exit rates 0.542 and 0.416. Concerning underlying dimensions (Figure 12), "Housing Facilities" and "Housing Deterioration" have the higher net exit rate while "Secondary life-style Deprivation" the lowest. In the end it's worth remarking that propensity to latent deprivation has a lower net exit rate than propensity to manifest deprivation; this fact may mean that the population of Great Britain tends to escape more from just one dimension of deprivation.

In Survey B only exit rates from wave 9 to 10 can be computed. Therefore the analysis focuses on a comparison across countries and gives evidence on the fact that Wales has got a higher rate for FM, Scotland for FS and England basically equal for either (Figure 13). Scotland is also the country which can better escape from deprivation in most of dimensions but Housing Deterioration where Wales makes the bigger improvement. England instead confirms a certain stability having the lowest exit rates associated to most of the variables. As an additional insight in this survey a further operation has been made in order to investigate more deeply over who is getting out of poverty and deprivation. The two groups ("poor"/"non-poor") of the dichotomized population in the conventional way have been taken and their exit rates have been calculated for each group (Figure 14). As to the monetary variable the exit rate turned out to be higher for those individuals who were situated below the poverty threshold, primly for Scotland and even more for Wales. Instead as to the supplementary variable, the individuals living above the poverty line are contributing more to getting out of the fuzzy state of poverty, in particular those belonging to England. This may mean that income poor improve their monetary situation more than their life-style deprivation.

5.3.2 Time spent in the state of poverty

I first commence analysing time spent in poverty concerning survey A through measures studied in 4.2.2 (27), (28), (29). Index $\overline{\Pi}_t$ displayed in Table 19 and Figure 15 is

the distribution of the population according to the number of years in poverty. About 59% of the sampled individuals does not even contribute to spend 1 year in income poverty, while 3%[16] is subject to poverty for the whole interval (10 years). It must be noted how the figures of the column FM 1-10 have a downward trend up to wave 8 and soar up in waves 9 and 10 confirming a certain persistence of the phenomenon. The row below treats time spent in poverty with the conventional method and the mobility overestimation is proved by higher values in the middle of the interval and lower in the extremes ($\bar{\ }_1$= 0.56 means that more than half of the population spent 10 years above the poverty line). As it can be deducted from Figure 16, Life-style deprivation is steadier again having $\bar{\ }_1$ 3% above the same measure for FM 6-10. As to the underlying dimensions we see that about 60% of the population of Great Britain have been contribute to at least one year deprivation concerning "Environmental problems" and about 50% suffered "Basic life-style Deprivation". On the other hand, as it has been repetitively emphasized, "Housing Facilities" is the dimension with the least deprivation associated; in fact 87% of the individuals have never been subject to it. In the last rows we note that 90% of the people has never contribute to be both income poor and deprived (manifest), while 62% never did to either if them (latent). In the last column is reported the mean proportion of the time spent in poverty by the population in the interval (formula (29)) which is about 1 year and a half out of 10 years and 7-8 months out of the last 5 years of the interval. The population spends 1 year in latent deprivation and 3 months in manifest deprivation.

Table 20 groups the results concerning the distribution of the time spent in poverty according to the number of years in poverty (formula (30)). This seems to be homogeneously distributed in the conventional analysis unlike the fuzzy approach where it appears to be more concentrated on waves 9-10 following a similar trend to $\overline{\Pi}_t$ which is the numerator of its second factor in formula 30.

In Table 21 all the measures studied in 4.2.2 are displayed for survey B. Having 2 waves only on disposal those figures are not as meaningful as those in survey A and they mostly lead to same conclusions which were made in the previous paragraphs about a major stability of England concerning both FM and FS for example.

[16] This value is the same as the propensity to continuous poverty in Table 16

Conclusions

This paper has provided new evidence on income poverty and life-style deprivation shedding light both on cross sectional and dynamic aspects for individuals living in Great Britain from 1991 to 2000 using a nationally representative data set. Previous longitudinal surveys in Great Britain, using BHPS data, had mainly focused on income poverty regarding income as the prime and unique variable in the analysis of poverty. The importance of a multivariate analysis has been sustained by many critics who remark the scarce reliability of the effective income declared by the household members and the high volatility which affects income perceived by certain categories of workers for example. In addition, it appears obvious that poverty conditions can't only stem from income troubles. For these reasons the multivariate analysis seems to be the most proper choice if we aim at investigating poverty and deprivation on a given population.

The wide interval considered in this paper made possible to provide a better view of longitudinal aspects of poverty and deprivation such as persistence of the phenomena, the estimation of exit and re-entry rates and the time spent in poverty by the population.

Two differentiated surveys has been led inside this paper: A) considering the whole population of Great Britain from wave 1 to 10 focusing mainly on the longitudinal aspects; B) regarding only waves 9-10, in order to include the additional subsamples of Wales and Scotland with the objective to allow for a comparative analysis of poverty and deprivation among the countries composing Great Britain.

Throughout the paper I have used a new methodology proposed by Betti and Verma (1998) based on the fuzzy sets theory which takes into account the multidimensional aspect of the phenomenon. The attempt is to emphasize the advantages that the Fuzzy Monetary approach brings to a survey which is merely based on the conventional splitting of the population into "poor" and "non-poor", helping the traditional study give a better and realer view of the income poverty distribution among the population both in the cross-section and above all on the longitudinal analysis. Furthermore the new method greatly facilitates the multidimensional study with the inspection of the other sources of deprivation, represented by objective indicator of the families' life-style, which can be analyzed separately or grouped in dimensions. It becomes clear that in this case it is impossible to accomplish the simple splitting of the population in "deprived" and "non-

deprived". All the measures of poverty and deprivation ($I_j^{(0)}, I_j, D'_j$ and all the internal dimensions, L_j and M_j) have been analyzed both in the cross-sectional and in the longitudinal study. We have seen how the conventional approach tends to overestimate the mobility of the population along the income distribution, and gives higher exit and re-entry rates. A certain volatility of the income variable is proved by a larger mobility shown by the FM index compared to FS.

The second survey (B) has mainly focused on the different aspect of poverty and deprivation to which England, Wales and Scotland are subject, illustrating how they overlap in each state. The level of overlap, which is usually higher for poorer countries, indicates how useful may be a joint study of income poverty and life-style deprivation in combination. The smaller the overlap the more useful the choice of a multivariate analysis, that is, information obtained from the two indices turn out to be non negligible and complementary.

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Table 1: Enumerated individuals and sampled individuals in the cross-sectional analysis

survey	country	w1		w2		w3		w4		w5	
		enum	samp	enum	samp	enum	samp	enum	samp	enum	samp
A	G. Britain	13840	11634	13151	11078	13104	10521	12851	10523	12549	10167
survey	country	w6		w7		w8		w9		w10	
		enum	samp	enum	samp	enum	samp	enum	samp	enum	samp
A	G. Britain	12720	10339	15042	12469	14835	12152	21568	17276	21604	17354
B	England							12238	8881	12177	8881
	Wales							4368	2720	4313	2720
	Scotland							4714	3123	4862	3123
	Total							21320	14724	21352	14724

Figure 1: enumerated and sampled individuals in the cross-sectional analysis. Survey A.

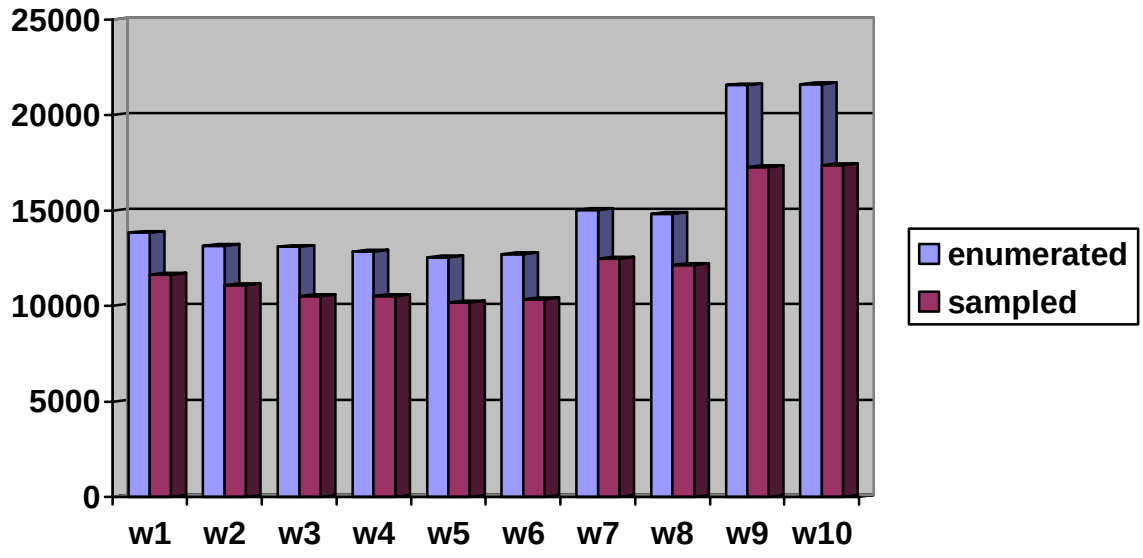

Table 2: cross sectional analysis: poverty lines. Absolute and relative measures.

survey	A			B								
country	Great Britain			England			Wales			Scotland		
poverty	ABS	REL	povline	ABS	REL	povline	ABS	REL	povline	ABS	REL	povline
w1	0.207	0.207	150.88									
w2	0.181	0.194	154.33									
w3	0.177	0.201	158.69									
w4	0.168	0.191	157.43									
w5	0.147	0.179	162.50									
w6	0.139	0.190	170.38									
w7	0.138	0.190	169.78									
w8	0.128	0.190	173.38									
w9	0.128	0.186	174.91	0.183	0.183	177.63	0.186	0.186	159.84	0.199	0.199	168.92
w10	0.112	0.182	181.66	0.183	0.183	185.87	0.185	0.185	173.19	0.191	0.191	172.51

Figure 2: Absolute and relative poverty rates. Head Count Ratios. Survey A.

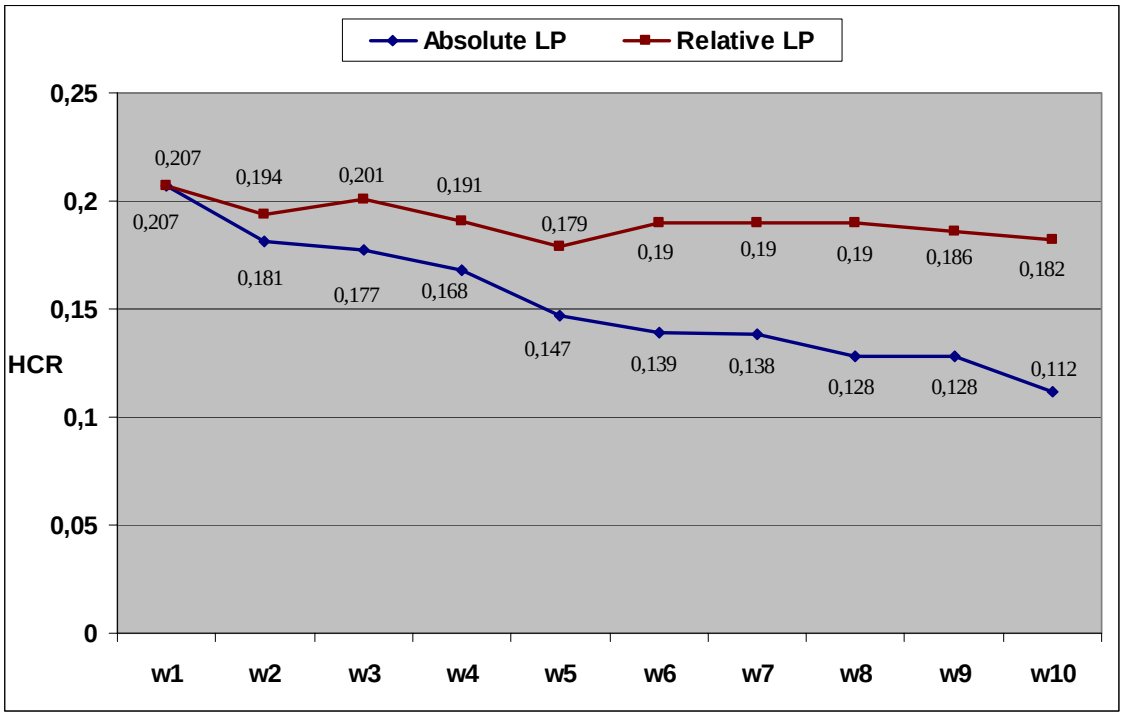

Table 3: Distribution of the fuzzy monetary index I_j , survey A.

A Great Britain										
Classes *Ij*	**w1**	**w2**	**w3**	**w4**	**w5**	**w6**	**w7**	**w8**	**w9**	**w10**
>1	0.40	0.61	0.42	0.49	0.54	0.45	0.60	0.51	1.19	1.03
1-0.9	4.38	3.94	3.49	3.26	2.99	2.68	3.14	3.26	3.21	2.64
0.9-0.8	3.23	2.69	2.47	2.53	2.08	1.96	2.19	1.82	2.12	1.53
0.8-0.7	3.26	2.68	2.65	2.52	2.03	2.12	2.09	1.78	1.94	1.64
0.7-0.6	3.30	2.66	2.74	2.36	2.14	2.13	2.25	2.19	2.14	1.74
0.6-0.5	3.46	2.86	3.02	2.60	2.43	2.29	2.49	2.10	1.99	2.09
0.5-0.4	3.92	3.24	3.22	3.00	2.82	2.21	2.59	2.41	2.32	1.95
0.4-0.3	4.38	3.93	3.45	3.54	3.14	2.94	3.00	2.84	2.92	2.56
0.3-0.2	5.55	4.87	4.83	4.61	4.05	3.67	3.99	3.84	3.87	3.09
0.2-0.1	8.11	7.51	7.30	6.87	6.03	5.90	5.77	5.71	5.62	4.85
0.1-0	60.01	65.00	66.41	68.22	71.75	73.65	71.88	73.44	72.69	76.88
Total	100	100	100	100	100	100	100	100	100	100
mean	0.207	0.181	0.177	0.168	0.147	0.139	0.138	0.128	0.128	0.112

Figure 3: Distribution of the Fuzzy Monetary index I_j , survey A.

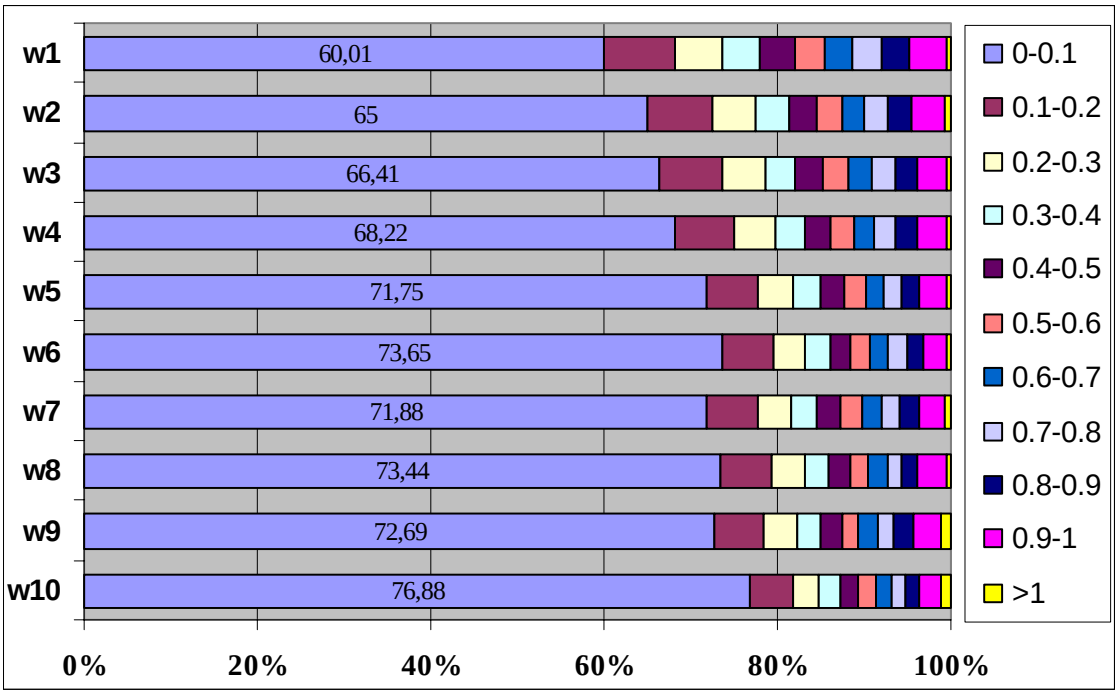

Table 4: Income poverty index ($\bar{I}$) , cross-section analysis

survey	country	w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	Averages over the interval				
												(1) Poverty rate $\bar{I}$	(2) Proportion above average $\bar{I}$	(3) Ratio (2) / (1)	(4) Parameter α	(5) Ratio $(1) / \bar{I}_m$ [***]
A	**GB**	0.207	0.181	0.177	0.168	0.147	0.139	0.138	0.128	0.128	0.112	0.153 (0.129)[****]	0.261 (0.243)	1.711 (1.883)	17.120[**]	1
B	**ENG**									0.183	0.183	0.183	0.300	1.636	1.032	0.974
	WAL									0.186	0.186	0.186	0.295	1.588	1.042	0.990
	SCO									0.199	0.189	0.194	0.304	1.558	0.946	1.036
	mean									0.189	0.186	0.188	0.299	0.299	1.007[*]	1

[*] From formula (3) parameter *k* is taken equal to ln(9.3) so that the mean of alfa over the nations be abut 1. [**] It has not been necessary to equal alfa to 1, since there is no territorial differentiation in A. [***] $\bar{I}_m$ indicates the longitudinal averages computed over the whole population (0.188 in the survey B). [****] The figures in between the brackets are referring to the last 5 waves (6-10), those will be used in the comparative analysis with the FS index of survey A.

Table 5: Distribution of I_j, according to p_j. Survey A.

Great Britain																				
Classes I_j	**w1**		**w2**		**w3**		**w4**		**w5**		**w6**		**w7**		**w8**		**w9**		**w10**	
	p_j=1	**p_j=0**	**p_j=1**	**p_j=0**	**p_j=1**	**p_j=0**	**p_j=1**	**p_j=0**	**p_j=1**	**p_j=0**	**p_j=1**	**p_j=0**	**p_j=1**	**p_j=0**	**p_j=1**	**p_j=0**	**p_j=1**	**p_j=0**	**p_j=1**	**p_j=0**
>1	1.97	0.0	3.44	0.0	2.44	0.0	3.09	0.0	3.77	0.0	3.40	0.0	4.07	0.0	3.77	0.0	8.24	0.0	8.29	0.0
1 - 0.9	21.30	0.0	22.09	0.0	20.35	0.0	20.37	0.0	20.82	0.0	20.03	0.0	21.22	0.0	24.09	0.0	22.17	0.0	21.34	0.0
0.9 - 0.8	15.73	0.0	15.07	0.0	14.42	0.0	15.80	0.0	14.45	0.0	14.68	0.0	14.81	0.0	13.44	0.0	14.65	0.0	12.40	0.0
0.8 - 0.7	15.86	0.0	15.02	0.0	15.47	0.0	15.74	0.0	14.11	0.0	15.84	0.0	14.16	0.0	13.14	0.0	13.45	0.0	13.28	0.0
0.7 - 0.6	16.07	0.0	14.91	0.0	15.97	0.0	14.73	0.0	14.93	0.0	15.91	0.0	15.25	0.0	16.18	0.0	14.77	0.0	14.07	0.0
0.6 - 0.5	16.86	0.0	16.03	0.0	17.64	0.0	16.27	0.0	16.92	0.0	17.14	0.0	16.87	0.0	15.51	0.0	13.73	0.0	16.92	0.0
0.5 - 0.4	12.22	1.77	13.45	1.02	13.70	1.06	14.01	0.91	15.00	0.78	13.02	0.54	13.62	0.68	13.87	0.62	13.01	0.51	13.70	0.29
0.4 - 0.3	0.0	5.51	0.0	4.78	0.0	4.16	0.0	4.21	0.0	3.66	0.0	3.39	0.0	3.52	0.0	3.28	0.0	3.41	0.0	2.93
0.3 - 0.2	0.0	6.99	0.0	5.92	0.0	5.83	0.0	5.49	0.0	4.73	0.0	4.23	0.0	4.69	0.0	4.56	0.0	4.52	0.0	3.52
0.2 - 0.1	0.0	10.20	0.0	9.14	0.0	8.81	0.0	8.18	0.0	7.04	0.0	6.81	0.0	6.77	0.0	6.60	0.0	6.57	0.0	5.53
0. 1- 0	0.0	75.53	0.0	79.13	0.0	80.14	0.0	81.22	0.0	83.78	0.0	85.03	0.0	84.35	0.0	84.98	0.0	84.98	0.0	87.73
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
mean	0.729	0.071	0.728	0.060	0.722	0.060	0.724	0.056	0.719	0.048	0.724	0.045	0.730	0.043	0.729	0.040	0.739	0.038	0.747	0.032

Table6: Weights and indices of the items within the dimension <Housing Facilities>, survey B.

		w9				w10			
item	**country**	D_{di}	Wa	W_b	W_i	D_{di}	Wa	W_b	W_i
kitchen	**ENG**	0.008	11.385	0.791	0.271	0.009	10.985	0.705	0.251
	WAL	0.008	10.827	0.602	0.246	0.010	10.381	0.900	0.286
	SCO	0.023	6.702	0.522	0.181	0.007	13.515	0.743	0.276
bath/shower room	**ENG**	0.009	11.062	0.735	0.244	0.010	10.173	0.719	0.237
	WAL	0.014	8.633	0.540	0.176	0.006	12.998	0.670	0.267
	SCO	0.022	6.753	0.510	0.179	0.006	12.152	0.752	0.251
WC	**ENG**	0.007	12.334	0.766	0.284	0.007	11.832	0.799	0.306
	WAL	0.008	11.617	0.715	0.314	0.006	11.072	0.657	0.223
	SCO	0.007	11.362	0.649	0.382	0.006	13.933	0.774	0.297
terrace/ garden	**ENG**	0.046	4.439	0.814	0.109	0.046	4.489	0.758	0.110
	WAL	0.038	5.256	0.809	0.161	0.033	5.819	0.792	0.141
	SCO	0.087	3.198	0.725	0.120	0.086	3.297	0.862	0.078
central heating	**ENG**	0.082	3.298	0.934	0.093	0.073	3.518	0.847	0.097
	WAL	0.072	3.669	0.749	0.104	0.082	3.387	0.794	0.082
	SCO	0.085	3.489	0.765	0.138	0.060	4.104	0.867	0.098

Table 7: Weights and indices of the items within the dimension <Environmental Problems> survey B.

		w9				w10			
item	**country**	D_{di}	Wa	W_b	W_i	D_{di}	Wa	W_b	W_i
lack of space	**ENG**	0.243	1.686	0.608	0.126	0.233	1.722	0.615	0.124
	WAL	0.235	1.775	0.641	0.124	0.213	1.827	0.656	0.119
	SCO	0.276	1.587	0.519	0.110	0.260	1.613	0.541	0.105
noise from neighbours	**ENG**	0.113	2.664	0.523	0.171	0.110	2.734	0.539	0.173
	WAL	0.104	2.798	0.597	0.181	0.082	3.214	0.678	0.216
	SCO	0.152	2.343	0.528	0.165	0.121	2.519	0.475	0.145
street noise	**ENG**	0.181	2.097	0.470	0.121	0.169	2.161	0.465	0.118
	WAL	0.159	2.798	0.539	0.134	0.163	2.228	0.527	0.116
	SCO	0.186	2.141	0.433	0.123	0.140	2.415	0.430	0.125
darkness	**ENG**	0.065	3.622	0.574	0.255	0.063	3.749	0.613	0.270
	WAL	0.068	3.711	0.634	0.255	0.071	3.588	0.655	0.233
	SCO	0.090	3.218	0.546	0.234	0.060	3.896	0.550	0.259
pollution/ grime	**ENG**	0.099	3.04	0.523	0.195	0.085	3.280	0.501	0.193
	WAL	0.105	2.975	0.565	0.183	0.093	3.122	0.634	0.197
	SCO	0.079	3.489	0.538	0.250	0.060	4.055	0.519	0.254
vandalism/ crime	**ENG**	0.189	2.031	0.537	0.134	0.181	2.088	0.503	0.123
	WAL	0.208	1.948	0.579	0.123	0.171	2.084	0.575	0.119
	SCO	0.221	1.846	0.484	0.119	0.184	2.003	0.465	0.112

Table 8: Weights and indices of the items within the dimension <Housing Deterioration> survey B.

		w9				w10			
item	**country**	D_{di}	Wa	W_b	W_i	D_{di}	Wa	W_b	W_i
leaky roof	**ENG**	0.035	5.173	0.782	0.469	0.041	4.587	0.684	0.410
	WAL	0.068	3.801	0.625	0.414	0.059	3.973	0.712	0.427
	SCO	0.041	4.668	0.716	0.418	0.036	5.046	0.717	0.412
dampness	**ENG**	0.086	3.131	0.732	0.266	0.073	3.400	0.646	0.287
	WAL	0.152	2.429	0.605	0.256	0.125	2.572	0.664	0.258
	SCO	0.098	3.096	0.679	0.263	0.090	3.056	0.699	0.243
rot in windows	**ENG**	0.092	3.042	0.749	0.265	0.078	3.310	0.701	0.303
	WAL	0.099	2.916	0.651	0.331	0.090	3.062	0.683	0.316
	SCO	0.074	3.554	0.720	0.320	0.060	4.129	0.733	0.345

Table 9: Weights and indices of the items within the dimension <Secondary life-style Deprivation> survey B.

		w9				w10			
item	**country**	D_{di}	Wa	W_b	W_i	D_{di}	Wa	W_b	W_i
car or van	**ENG**	0.193	2.168	0.489	0.098	0.196	2.149	0.501	0.079
	WAL	0.188	2.109	0.516	0.081	0.202	2.042	0.509	0.063
	SCO	0.272	1.656	0.511	0.076	0.273	1.643	0.567	0.057
colour TV	**ENG**	0.020	7.246	0.407	0.273	0.014	8.809	0.465	0.300
	WAL	0.010	9.803	0.486	0.355	0.009	10.381	0.564	0.355
	SCO	0.017	7.838	0.407	0.286	0.013	9.131	0.506	0.281
video-recorder	**ENG**	0.093	3.421	0.374	0.118	0.089	3.530	0.407	0.105
	WAL	0.077	3.598	0.414	0.111	0.063	4.067	0.444	0.109
	SCO	0.077	3.521	0.387	0.122	0.064	3.792	0.454	0.105
washing machine	**ENG**	0.061	4.212	0.395	0.154	0.055	4.534	0.442	0.147
	WAL	0.049	4.737	0.442	0.156	0.043	5.172	0.494	0.155
	SCO	0.033	5.441	0.403	0.197	0.024	6.289	0.539	0.206
microwave oven	**ENG**	0.158	2.414	0.468	0.104	0.142	2.575	0.502	0.095
	WAL	0.119	2.840	0.489	0.103	0.097	3.229	0.581	0.114
	SCO	0.131	2.639	0.463	0.110	0.116	2.880	0.565	0.099
telephone	**ENG**	0.022	6.334	0.432	0.253	0.018	7.054	0.533	0.275
	WAL	0.032	5.343	0.485	0.193	0.034	5.533	0.609	0.204
	SCO	0.032	5.334	0.439	0.210	0.023	6.968	0.599	0.254

Table 10: Weights and indices of the items within the dimension <Basic life-style Deprivation> survey B.

		w9				w10			
item	**country**	D_{di}	Wa	W_b	W_i	D_{di}	Wa	W_b	W_i
keeping home adequately warm	**ENG**	0.022	6.606	0.568	0.383	0.017	7.845	0.669	0.457
	WAL	0.013	8.887	0.649	0.509	0.016	7.889	0.704	0.481
	SCO	0.020	6.912	0.407	0.341	0.023	6.968	0.696	0.398
paying for a week's annual holiday	**ENG**	0.253	1.650	0.472	0.079	0.245	1.716	0.456	0.068
	WAL	0.358	1.313	0.486	0.056	0.328	1.423	0.472	0.058
	SCO	0.301	1.461	0.387	0.069	0.277	1.576	0.491	0.064
replacing worn-out furniture	**ENG**	0.195	1.995	0.452	0.092	0.180	2.122	0.446	0.082
	WAL	0.195	2.061	0.478	0.087	0.168	2.228	0.495	0.096
	SCO	0.176	2.196	0.403	0.107	0.155	2.415	0.506	0.100
buying new cloths	**ENG**	0.076	3.390	0.477	0.165	0.080	3.264	0.525	0.149
	WAL	0.077	3.329	0.496	0.146	0.083	3.236	0.546	0.153
	SCO	0.064	3.762	0.463	0.211	0.048	4.193	0.543	0.187
eating meat or fish every second day	**ENG**	0.091	3.127	0.590	0.188	0.080	3.337	0.568	0.165
	WAL	0.111	2.813	0.561	0.139	0.103	2.928	0.597	0.151
	SCO	0.088	3.198	0.439	0.170	0.070	3.521	0.576	0.166
inviting friends for a dinner/drink	**ENG**	0.253	1.716	0.530	0.093	0.251	1.732	0.523	0.079
	WAL	0.336	1.373	0.520	0.063	0.350	1.349	0.514	0.060
	SCO	0.254	1.636	0.511	0.101	0.244	1.694	0.608	0.084

Table 11: Weights and the underlying dimensions, survey B.

		w9		w10	
dimension	**country**	D_d	W'_d	D_d	W'_d
Housing Facilities	**ENG**	0.019	0.386	0.019	0.351
	WAL	0.020	0.337	0.018	0.359
	SCO	0.033	0.322	0.018	0.387
Environmental Problems	**ENG**	0.133	0.104	0.123	0.104
	WAL	0.131	0.103	0.118	0.103
	SCO	0.145	0.113	0.114	0.103
Housing Deterioration	**ENG**	0.064	0.156	0.062	0.141
	WAL	0.086	0.118	0.086	0.119
	SCO	0.066	0.165	0.058	0.142
Secondary life-style Deprivation	**ENG**	0.067	0.195	0.056	0.220
	WAL	0.054	0.228	0.047	0.235
	SCO	0.062	0.223	0.048	0.214
Basic life-style Deprivation	**ENG**	0.100	0.159	0.084	0.184
	WAL	0.092	0.214	0.092	0.183
	SCO	0.101	0.177	0.084	0.155

Figure 4: underlying dimensions (Rescaled values), survey B

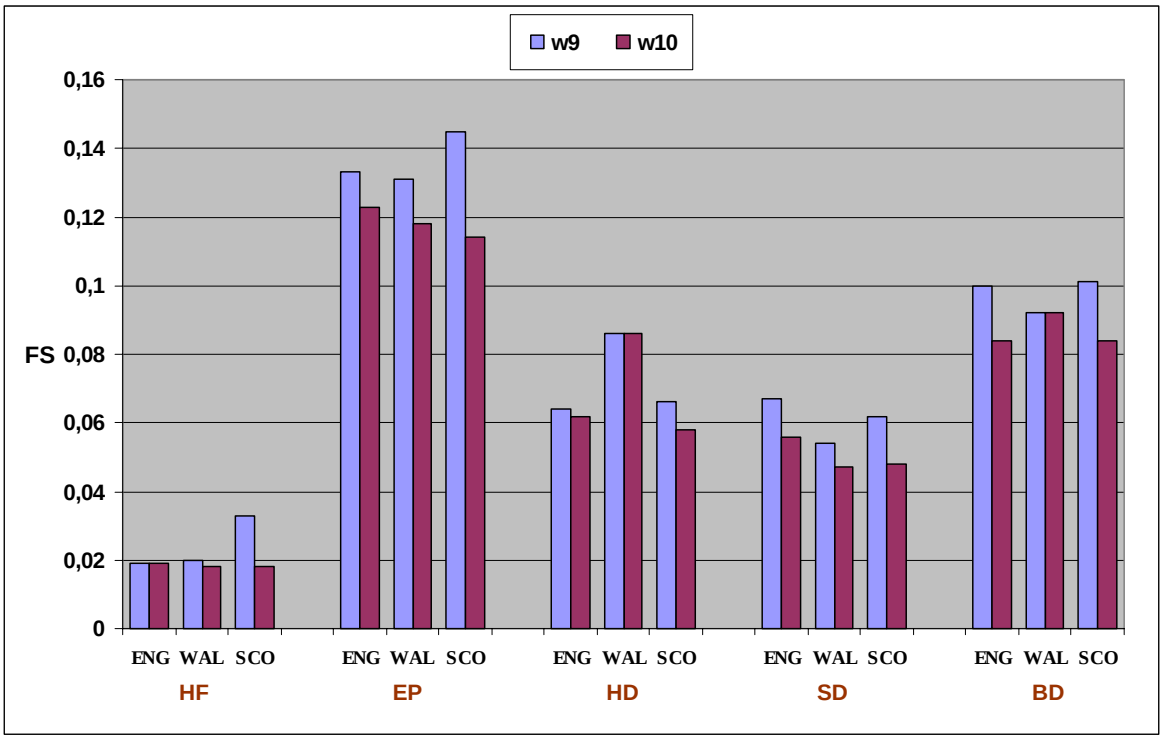

Table 12: Overall life-style deprivation index ($\overline{D'}$) , cross-sectional analysis.

survey	country	w6	w7	w8	w9	w10	Average over the interval				
							(1) Deprivation rate $\overline{D'}$	(2) Proportion above average $\overline{D'}$	(3) Ratio (2) / (1)	(4) Ratio $(1) / \overline{D'}_m$ *	(5) Ratio $(1) / \overline{I}_{m,p}$ **
A	**GB**	0.177	0.107	0.099	0.139	0.123	0.129	0.383	2.964	1	
B	**ENG**				0.189	0.176	0.183	0.372	2.036	0.975	1.001
	WAL				0.202	0.179	0.191	0.369	1.934	1.017	1.027
	SCO				0.220	0.158	0.189	0.364	1.927	1.008	0.973
	mean				0.204	0.171	0.188	0.368	1.965	1	1

* $\overline{D'}_m$ indicates the simple average over waves of the life-style deprivation index $\overline{D'}$ ($\overline{D'}_m$ =0.188 in B, $\overline{D'}_m = \overline{I}_m$). ** $\overline{I}_{m,p}$ represents the simple average over waves of the income poverty rate in country *p*.

Figure 5: FM and FS indices. Survey A.

Table 13: Latent Deprivation index ($\overline{L}$), *cross-sectional* analysis

analysis	country	w6	w7	w8	w9	w10	Average over the interval						
							(1) Deprivation rate $\overline{L}$	(2) Proportion above average $\overline{L}$	(3) Ratio (2) / (1)	(4) Ratio (1) / $\overline{L}_{m,p}$	(5) Ratio (1) / $\overline{I}_{m,p}$	(6) Ratio $\overline{I}_{m,p}$ /(1)	(7) Ratio $\overline{D'}_{m,p}$ /(1)
A	**GB**	0.220	0.220	0.207	0.210	0.188	0.209	0.341	1.632	1	1.620	0.617	0.617
B	**ENG**				0.281	0.291	0.286	0.378	1.321	0.981	1.567	0.638	0.641
	WAL				0.294	0.291	0.292	0.364	1.244	1.003	1.575	0.635	0.653
	SCO				0.311	0.282	0.296	0.374	1.262	1.016	1.526	0.655	0.634
	mean				0.295	0.288	0.292	0.372	1.275	1	1.555	*0.643*	*0.643*

Table 14: Manifest Deprivation index ($\overline{\overline{M}}$), *cross-sectional* analysis

analysis	country	w6	w7	w8	w9	w10	Average over the interval						
							(1) Deprivation rate $\overline{\overline{M}}$	(2) Proportion above average $\overline{\overline{M}}$	(3) Ratio (2) / (1)	(4) Ratio (1) / $\overline{\overline{M}}_{m,p}$	(5) Ratio (1) / $\overline{I}_{m,p}$	(6) Ratio (1) / $\overline{D'}_{m,p}$	(7) Ratio (1) / $\overline{L}_{m,p}$
A	**GB**	0.057	0.056	0.049	0.046	0.037	0.049	0.257	5.237	1	0.380	0.380	0.235
B	**ENG**				0.077	0.083	0.080	0.295	3.689	0.960	0.438	0.436	0.280
	WAL				0.080	0.089	0.084	0.288	3.417	1.012	0.454	0.441	0.288
	SCO				0.093	0.079	0.086	0.281	3.275	1.028	0.441	0.456	0.289
	mean				0.083	0.083	0.083	0.288	3.455	1	*0.445*	*0.445*	0.286

Table 15: Survey A: longitudinal indices

index**	(1) average	(2) any-time	(3) persistent	(4) continuous	ratio (5)=(2)/(1)	ratio (6)=(3)/(1)	ratio (7)=(4)/(1)	ratio (8)=(4)/(2)	ratio with measures FM*=			
									(2)/(1)	(3)/(1)	(4)/(1)	(4)/(2)
FM 1-10	0.154	0.413	0.133	0.026	2.687	0.865	0.168	0.063				
HCR 1-10	0.154	0.442	0.131	0.013	2.879	0.853	0.085	0.029	1.071	0.986	0.504	0.471
FM 6-10	0.133	0.274	0.111	0.044	2.059	0.838	0.334	0.162				
HCR 6-10	0.133	0.291	0.107	0.033	2.190	0.805	0.247	0.113	1.064	0.961	0.739	0.695
FS	0.133	0.241	0.117	0.061	1.815	0.882	0.458	0.253	0.882	1.052	1.374	1.558
HF	0.046	0.128	0.028	0.010	2.797	0.622	0.216	0.077	1.541	0.705	0.470	0.305
EP	0.299	0.595	0.257	0.090	1.990	0.858	0.300	0.151	1.096	0.974	0.653	0.596
HD	0.146	0.374	0.101	0.023	2.566	0.694	0.157	0.061	1.413	0.787	0.342	0.242
SD	0.166	0.287	0.144	0.095	1.731	0.869	0.574	0.332	0.953	0.985	1.251	1.313
BD	0.240	0.485	0.202	0.079	2.018	0.840	0.327	0.162	1.112	0.953	0.714	0.642
LAT	0.215	0.381	0.193	0.102	1.772	0.897	0.474	0.268	0.861	1.071	1.421	1.651
MAN	0.051	0.103	0.042	0.016	2.026	0.835	0.326	0.161	0.984	0.997	0.977	0.993

*Indices related to the dimensions have the denominator referring to the FS index. **HF = Housing Facilities; EP = Environmental Problems; HD = Housing Deterioration; SD = Secondary Deprivation; BD = Basic Deprivation.

Figure 6: longitudinal rates. Income measures. Wave 1-10. Survey A.

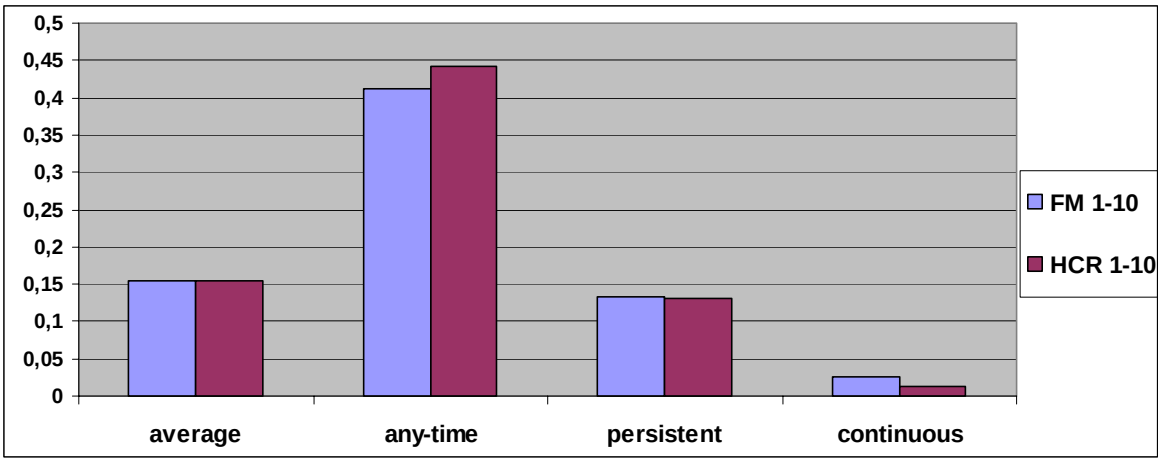

Figure 7: longitudinal rates. FM and FS. Wave 6-10. Survey A.

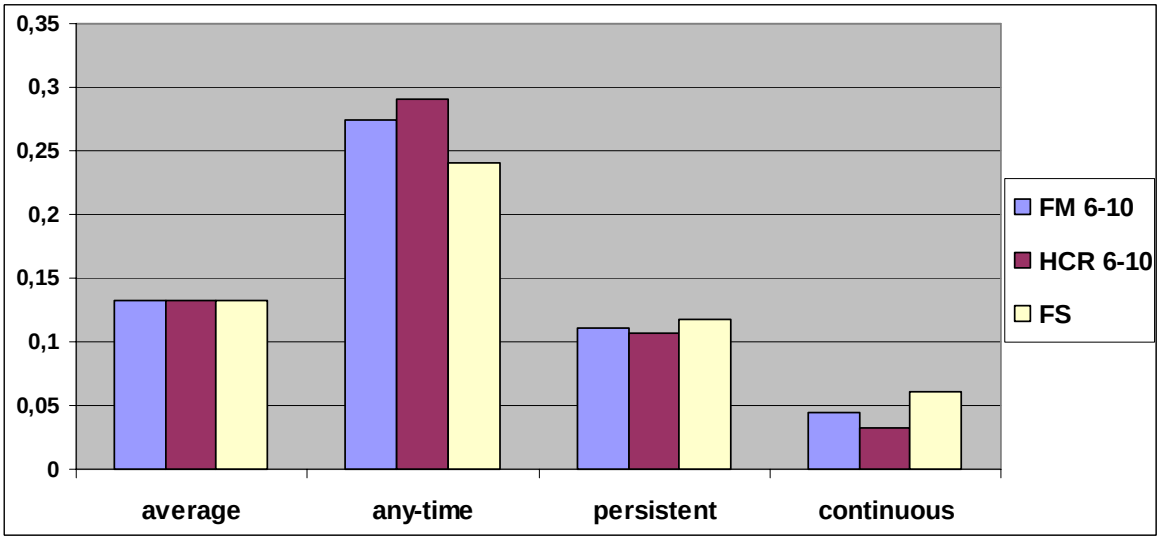

Figure 8: longitudinal rates. Dimensions. Wave 6-10. Survey A.

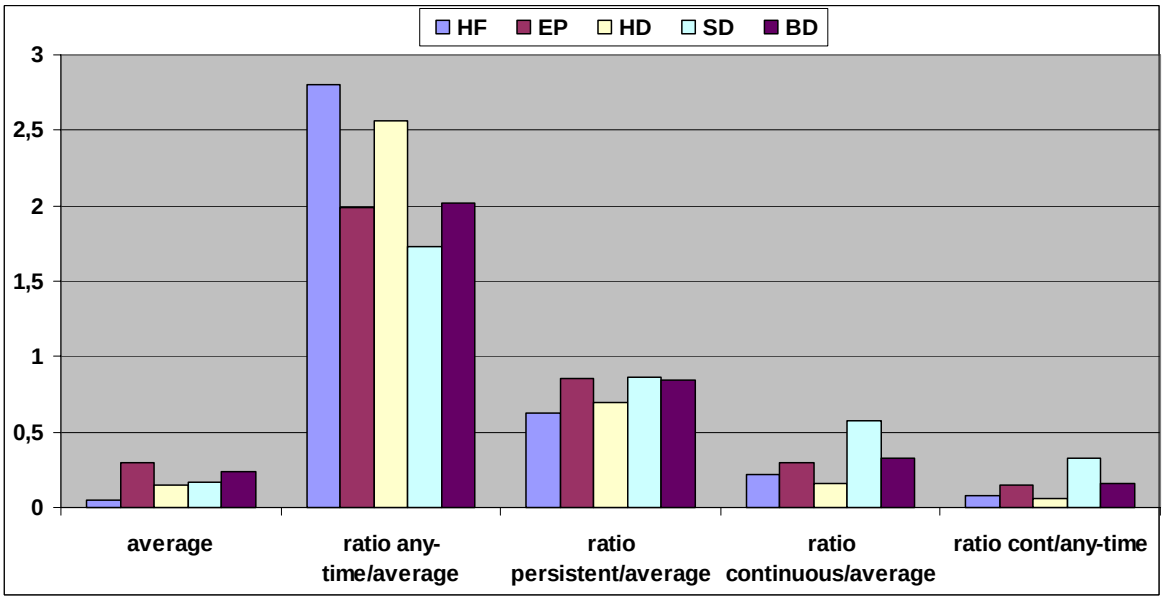

Table 16: Survey B: longitudinal indices

FM						
country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**
ENG	0.183	0.237	0.128	1.299	0.701	0.540
WAL	0.186	0.256	0.116	1.376	0.624	0.453
SCO	0.194	0.266	0.122	1.370	0.630	0.460
mean	0.188	0.253	0.122	1.348	0.652	0.484

HCR									
country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FM=**		
							(2)/(1)	**(3)/(1)**	**(3)/(2)**
ENG	0.183	0.244	0.121	1.336	0.664	0.497	1.028	0.947	0.921
WAL	0.186	0.258	0.114	1.388	0.612	0.441	1.008	0.982	0.974
SCO	0.194	0.275	0.114	1.414	0.586	0.414	1.033	0.929	0.900
mean	0.188	0.259	0.116	1.379	0.621	0.451	1.023	0.953	0.931

FS									
country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FM=**		
							(2)/(1)	**(3)/(1)**	**(3)/(2)**
ENG	0.183	0.234	0.132	1.279	0.721	0.564	0.985	1.029	1.046
WAL	0.191	0.249	0.132	1.306	0.694	0.531	0.949	1.113	1.172
SCO	0.189	0.251	0.127	1.329	0.671	0.505	0.97	1.065	1.098
mean	0.188	0.245	0.130	1.304	0.696	0.534	0.968	1.069	1.106

HF									
country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FS=**		
							(2)/(1)	**(3)/(1)**	**(3)/(2)**
ENG	0.060	0.089	0.030	1.497	0.503	0.336	1.171	0.697	0.595
WAL	0.060	0.094	0.027	1.556	0.444	0.285	1.191	0.640	0.537
SCO	0.080	0.126	0.034	1.580	0.420	0.266	1.189	0.626	0.526
mean	0.067	0.103	0.030	1.544	0.456	0.296	1.184	0.654	0.553

EP									
country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FS=**		
							(2)/(1)	**(3)/(1)**	**(3)/(2)**
ENG	0.404	0.550	0.259	1.360	0.640	0.471	1.063	0.888	0.835
WAL	0.393	0.569	0.218	1.446	0.554	0.383	1.107	0.798	0.721
SCO	0.409	0.586	0.233	1.430	0.570	0.399	1.076	0.849	0.789
mean	0.402	0.568	0.237	1.412	0.588	0.418	1.082	0.845	0.781

HD							
country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FS=**

							(2)/(1)	(3)/(1)	(3)/(2)
ENG	0.198	0.299	0.097	1.509	0.491	0.325	1.181	0.680	0.576
WAL	0.293	0.456	0.130	1.556	0.444	0.286	1.191	0.640	0.538
SCO	0.196	0.298	0.093	1.524	0.476	0.313	1.146	0.709	0.618
mean	0.229	0.351	0.107	1.530	0.470	0.308	1.172	0.676	0.577

SD

country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FS=**		
							(2)/(1)	**(3)/(1)**	**(3)/(2)**
ENG	0.194	0.248	0.140	1.278	0.722	0.565	0.999	1.001	1.001
WAL	0.160	0.208	0.111	1.304	0.696	0.533	0.999	1.002	1.036
SCO	0.174	0.229	0.120	1.313	0.687	0.523	0.988	1.024	1.036
mean	0.176	0.228	0.124	1.298	0.702	0.541	0.995	1.009	1.014

BD

country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FS=**		
							(2)/(1)	**(3)/(1)**	**(3)/(2)**
ENG	0.290	0.402	0.178	1.388	0.612	0.441	1.085	0.849	0.782
WAL	0.290	0.410	0.170	1.414	0.586	0.414	1.083	0.844	0.779
SCO	0.291	0.417	0.164	1.436	0.564	0.393	1.081	0.840	0.777
mean	0.290	0.410	0.171	1.413	0.587	0.416	1.083	0.844	0.780

Latent

country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FM=**		
							(2)/(1)	**(3)/(1)**	**(3)/(2)**
ENG	0.286	0.358	0.215	1.250	0.750	0.600	0.962	1.070	1.112
WAL	0.292	0.374	0.208	1.280	0.710	0.555	0.930	1.139	1.224
SCO	0.296	0.380	0.212	1.283	0.717	0.559	0.936	1.138	1.215
mean	0.292	0.371	0.212	1.270	0.726	0.571	0.93	1.116	1.184

Manifest

country	**(1) average**	**(2) any-time**	**(3) persistent**	**ratio (4)=(2)/(1)**	**ratio (5)=(3)/(1)**	**ratio (6)=(3)/(2)**	**ratio with measures FM=**		
							(2)/(1)	**(3)/(1)**	**(3)/(2)**
ENG	0.08	0.107	0.053	1.338	0.662	0.495	1.03	0.945	0.918
WAL	0.084	0.117	0.051	1.390	0.610	0.439	1.010	0.978	0.968
SCO	0.086	0.120	0.051	1.406	0.594	0.423	1.026	0.943	0.919
mean	0.083	0.115	0.052	1.378	0.622	0.452	1.021	0.955	0.935

Table 17: Survey A: exit and re-entry rates

index	of poor in w1										of poor in w7								
	exit in w2	re-enter in w3	exit in w3	re-enter in w4	exit in w4	re-enter in w5	exit in w5	re-enter in w6	exit in w6	re-enter in w7	exit in w7	re-enter in w8	exit in w8	re-enter in w9	exit in w9	re-enter in w10	exit in w10	gross exit rate	gross re-entry rate	net exit rate
FM 1-10	0.377	0.259	0.282	0.255	0.218	0.189	0.242	0.156	0.256	0.176	0.269	0.138	0.273	0.158	0.273	0.105	0.296	1.379	0.714	0.666
HCR 1-10	0.427	0.283	0.369	0.268	0.325	0.213	0.303	0.162	0.299	0.211	0.352	0.117	0.303	0.177	0.350	0.099	0.314	1.549	0.846	0.703
FM 6-10											0.335	0.187	0.251	0.220	0.246	0.182	0.287	0.789	0.247	0.542
HCR 6-10											0.407	0.169	0.291	0.200	0.287	0.178	0.334	0.871	0.269	0.602
FS											0.487	0.206	0.198	0.341	0.118	0.210	0.186	0.764	0.348	0.416
HF											0.722	0.114	0.239	0.098	0.312	0.098	0.185	0.930	0.223	0.707
EP											0.391	0.311	0.297	0.281	0.242	0.233	0.297	0.866	0.354	0.512
HD											0.480	0.170	0.423	0.221	0.345	0.132	0.405	0.988	0.299	0.689
SD											0.196	0.070	0.191	0.278	0.104	0.087	0.131	0.508	0.134	0.375
BD											0.391	0.229	0.325	0.235	0.247	0.193	0.285	0.853	0.304	0.549
LAT											0.257	0.224	0.186	0.279	0.172	0.211	0.210	0.644	0.227	0.417
MAN											0.331	0.199	0.308	0.224	0.255	0.144	0.303	0.823	0.243	0.580

Figure 9: exit rates. Income measures. Wave 2-10. Survey A.

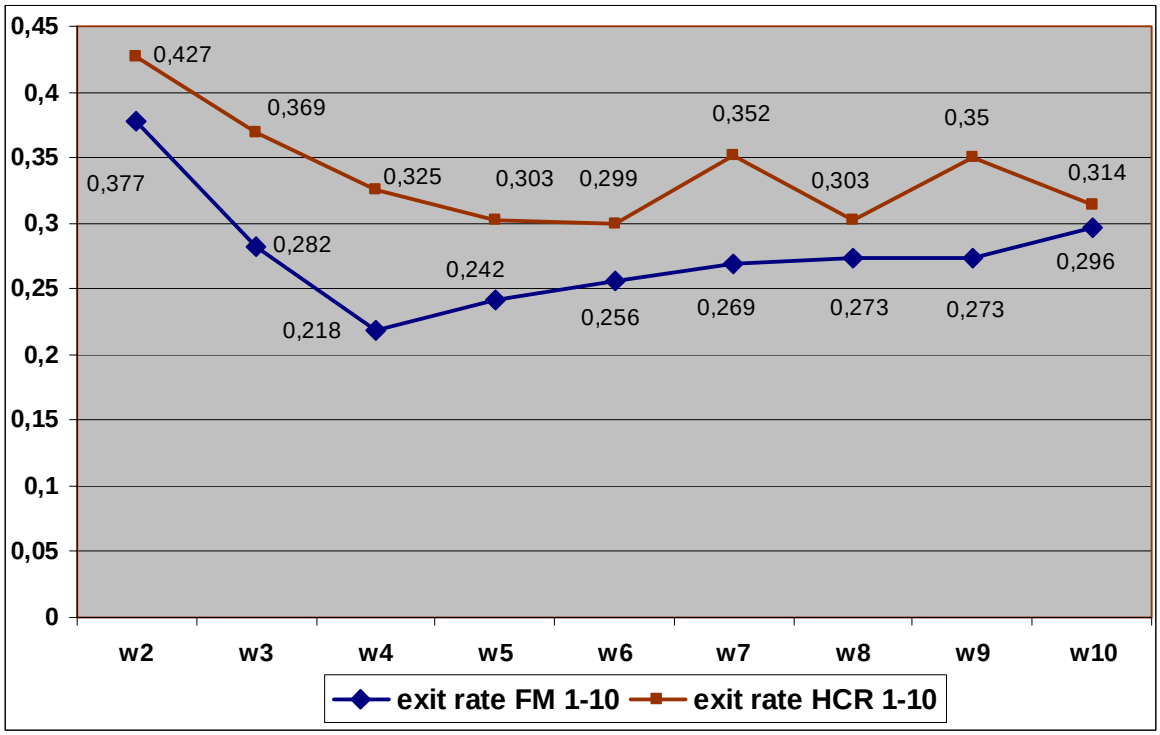

Figure 10: re-entry rates. Income measures. Wave 3-10. Survey A.

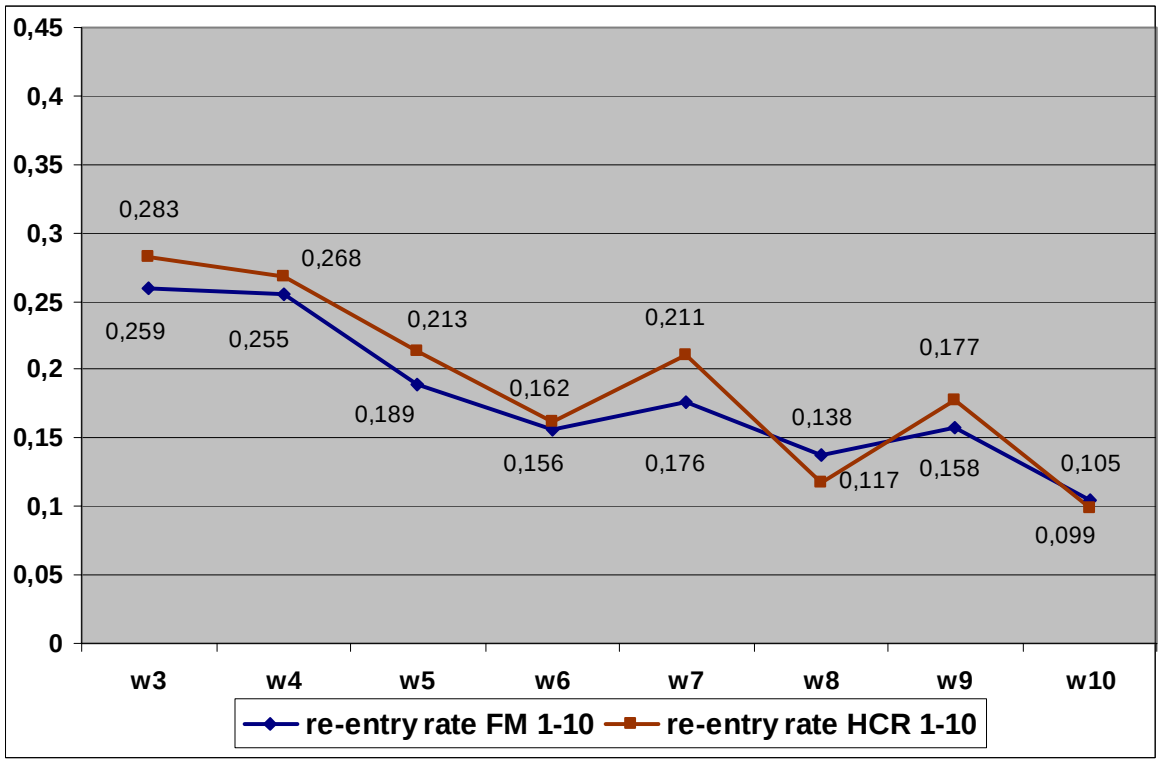

Figure 11: gross and net rates. FM and FS. Wave 6-10. Survey A.

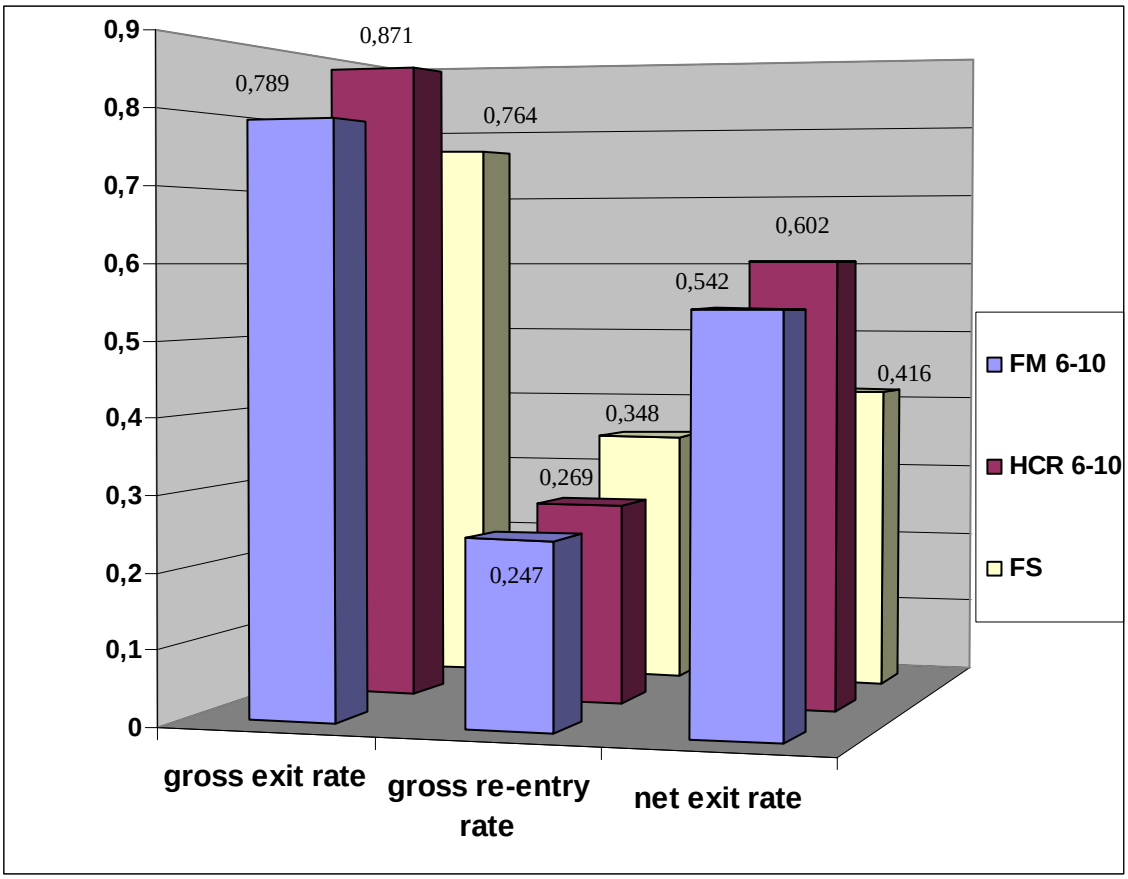

Figure 12: net exit rates. Dimensions, Latent and Manifest deprivation. Wave 6-10. Survey A.

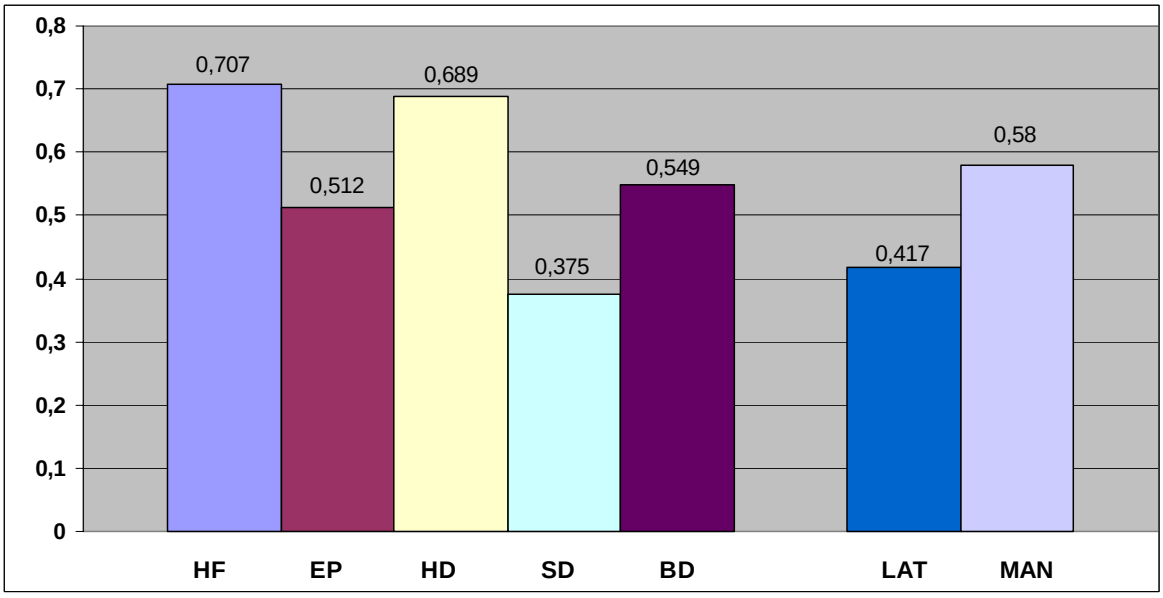

Table 18: Survey B: exit and re-entry rates

FM				TR		FS				HF	
country	of poor in w9	poor=1	poor =0	country	of poor in w9	country	of poor in w9	poor =1	poor =0	country	of poor in w9
	exit in w10	exit in w10	exit in w10		exit in w10		exit in w10	exit in w10	exit in w10		exit in w10
ENG	0.300	0.300	0.299	ENG	0.337	ENG	0.303	0.252	0.323	ENG	0.499
WAL	0.376	0.389	0.335	WAL	0.388	WAL	0.346	0.328	0.354	WAL	0.587
SCO	0.386	0.394	0.362	SCO	0.430	SCO	0.423	0.411	0.429	SCO	0.675
mean	0.354	0.361	0.332	mean	0.385	mean	0.357	0.330	0.369	mean	0.587

EP		HD		SD		BD		LAT		MAN	
country	of poor in w9	country	of poor in w9	country	of poor in w9	country	of poor in w9	country	of poor in w9	country	of poor in w9
	exit in w10		exit in w10		exit in w10		exit in w10		exit in w10		exit in w10
ENG	0.382	ENG	0.518	ENG	0.339	ENG	0.435	ENG	0.236	ENG	0.316
WAL	0.475	WAL	0.587	WAL	0.345	WAL	0.413	WAL	0.284	WAL	0.358
SCO	0.492	SCO	0.554	SCO	0.393	SCO	0.484	SCO	0.316	SCO	0.452
mean	0.450	mean	0.553	mean	0.359	mean	0.444	mean	0.279	mean	0.375

Figure 13: exit rates. FM and FS. Survey B.

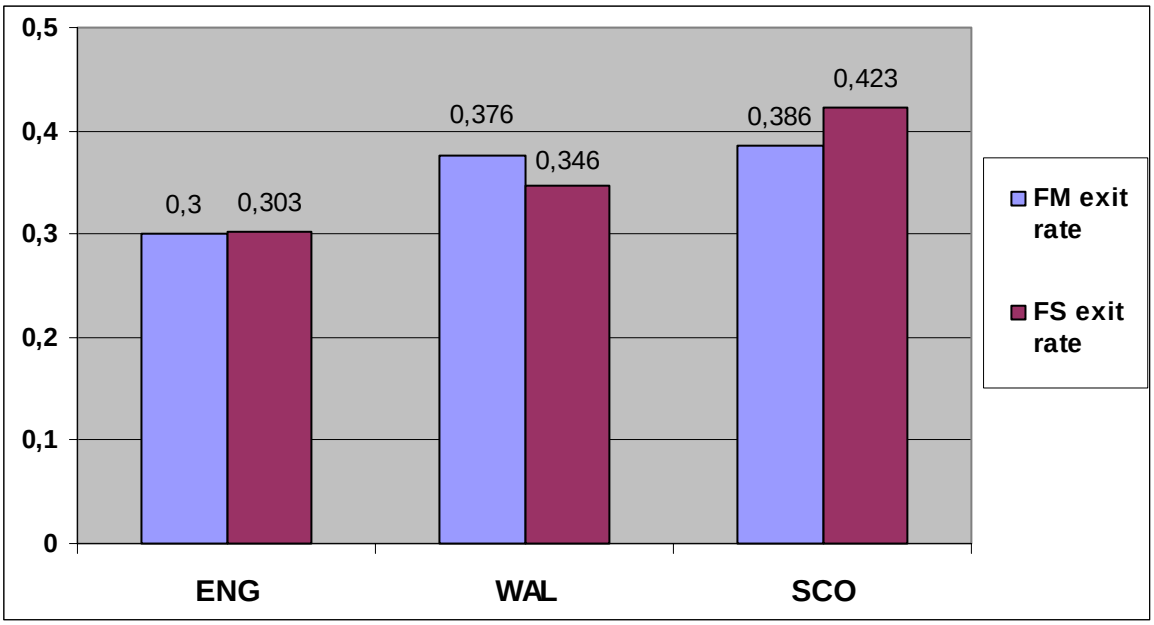

Figure 14: exit rates of "poor" and "non-poor". FM and FS. Survey B.

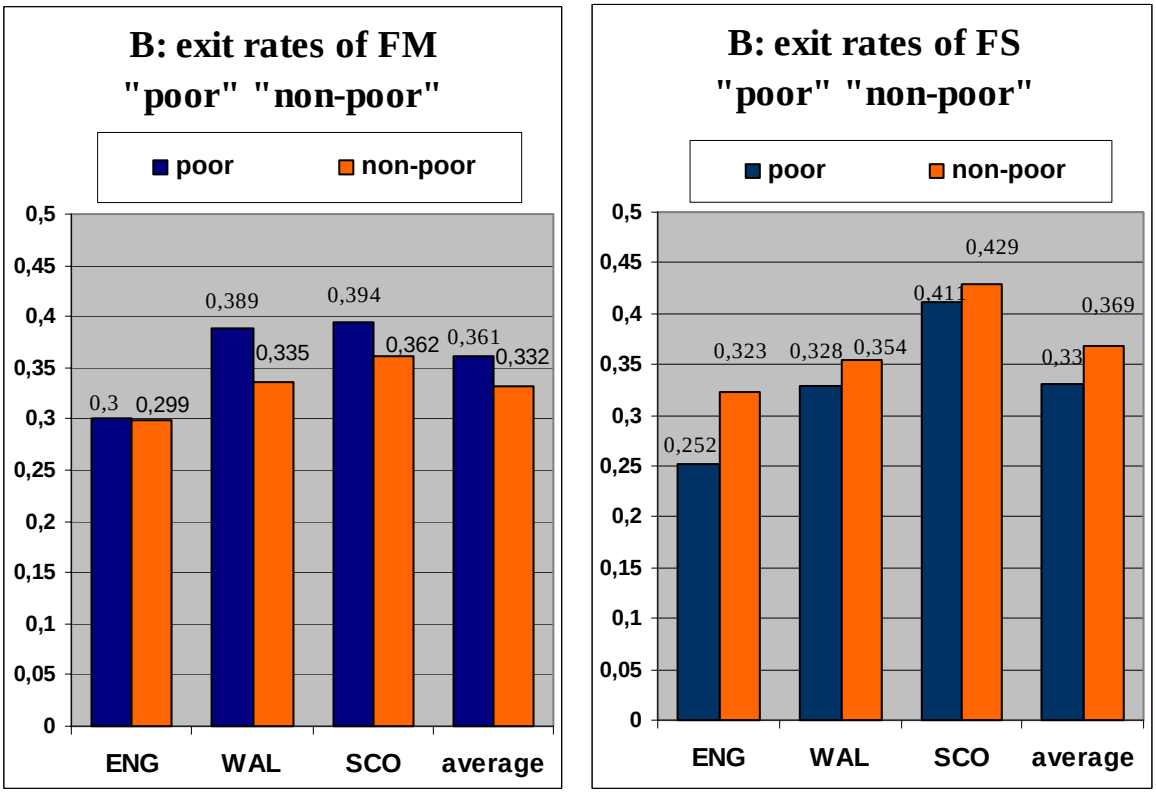

Table19: Survey A:

Distribution of the population according to the number of years in poverty ($\overline{\Pi}_t$)

Mean proportion of the T years spent in poverty ($\overline{T}$)

	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{\Pi}_3$	$\overline{\Pi}_4$	$\overline{\Pi}_5$	$\overline{\Pi}_6$	$\overline{\Pi}_7$	$\overline{\Pi}_8$	$\overline{\Pi}_9$	$\overline{\Pi}_{10}$	$\overline{T}$
FM 1-10	0.587	0.129	0.072	0.045	0.034	0.026	0.022	0.020	0.018	0.021	0.026	1.54
HCR 1-10	0.558	0.135	0.080	0.056	0.041	0.035	0.027	0.022	0.014	0.019	0.013	1.54
FM 6-10	0.726	0.113	0.049	0.037	0.030	0.044						0.665
HCR 6-10	0.709	0.124	0.060	0.041	0.033	0.033						0.665
FS	0.759	0.083	0.041	0.030	0.026	0.061						0.665
HF	0.872	0.083	0.017	0.011	0.007	0.010						0.229
EP	0.405	0.210	0.128	0.088	0.079	0.090						1.494
HD	0.626	0.197	0.076	0.048	0.031	0.023						0.729
SD	0.714	0.102	0.041	0.026	0.023	0.095						0.828
BD	0.515	0.183	0.100	0.068	0.056	0.079						1.201
LAT	0.619	0.127	0.061	0.048	0.043	0.102						1.075
MAN	0.897	0.039	0.021	0.014	0.012	0.017						0.254

Table 20:

Survey A: Distribution of the time spent in poverty according to the number of years

	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}
FM 1-10	0.084	0.093	0.088	0.089	0.086	0.087	0.090	0.094	0.121	0.168
HCR 1-10	0.088	0.104	0.109	0.106	0.114	0.106	0.102	0.072	0.113	0.085
FM 6-10	0.170	0.148	0.165	0.183	0.334					
HCR 6-10	0.186	0.182	0.184	0.202	0.247					
FS	0.126	0.122	0.135	0.159	0.459					
HF	0.361	0.149	0.150	0.125	0.216					
EP	0.141	0.172	0.176	0.213	0.300					
HD	0.270	0.209	0.196	0.168	0.157					
SD	0.123	0.098	0.094	0.111	0.574					
BD	0.153	0.166	0.169	0.186	0.327					
LAT	0.118	0.114	0.133	0.160	0.474					
MAN	0.154	0.169	0.167	0.184	0.326					

Figure 15: Time spent in poverty. $\overline{\Pi}_t$. Income measures. Survey A.

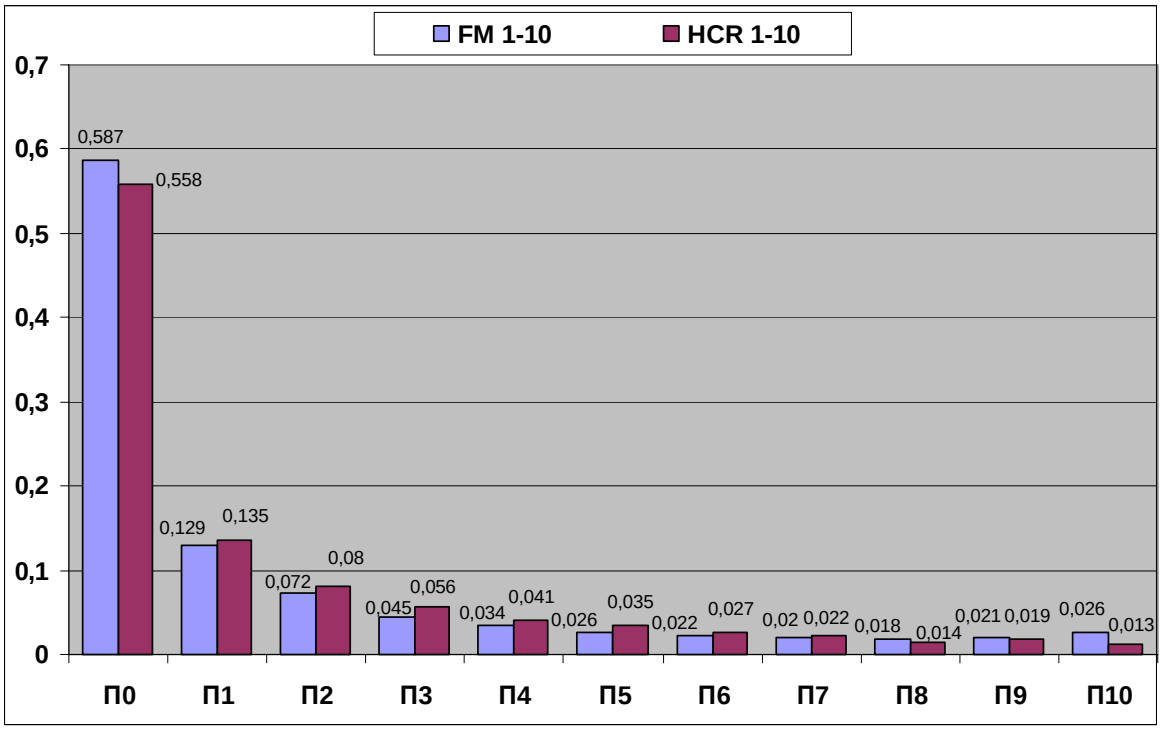

Figure 16: Time spent in poverty. $\overline{\Pi}_t$. FM and FS. Survey A.

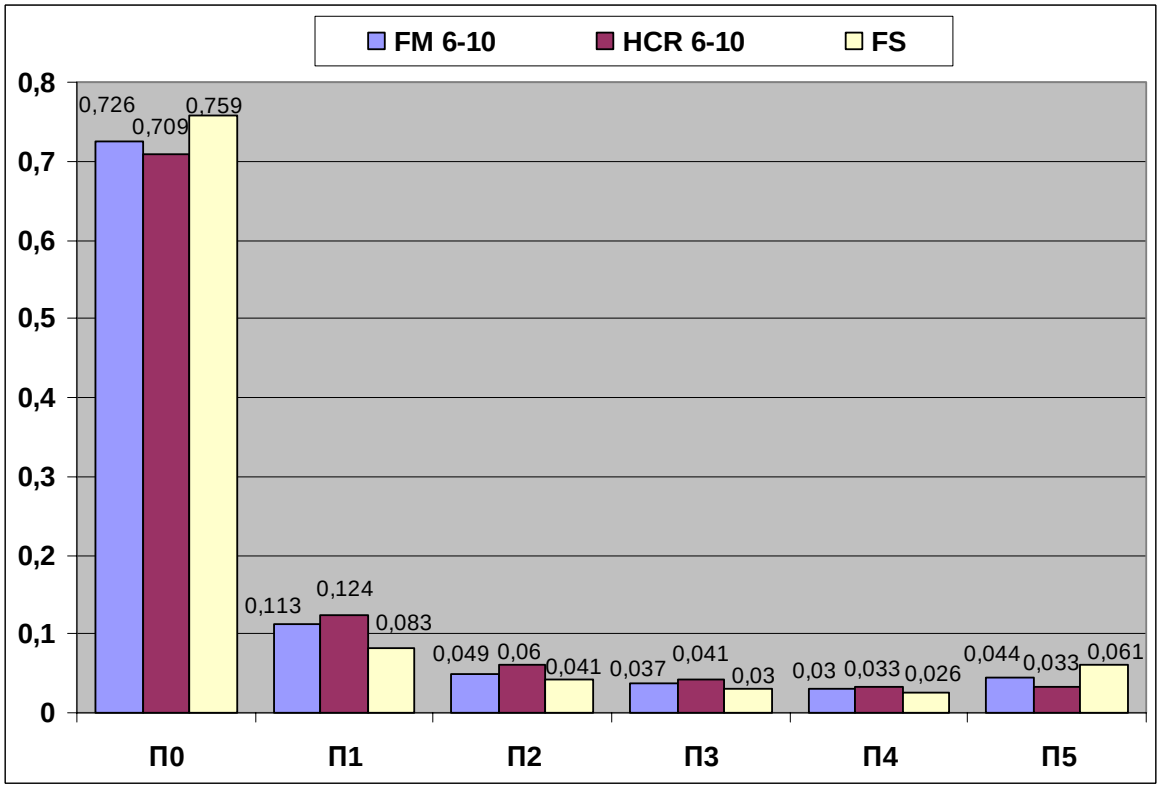

Table 21: Survey B: Time spent in the state of poverty.

FM							HCR						
	Distribution of the population according to the number of years in poverty			Mean proportion of the time spent in poverty	Distribution of the time according to the number of years in poverty			Distribution of the population according to the number of years in poverty			Mean proportion of the time spent in poverty	Distribution of the time according to the number of years in poverty	
country	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$	**country**	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$
ENG	0.763	0.109	0.128	0.365	0.299	0.701	**ENG**	0.756	0.123	0.121	0.365	0.336	0.664
WAL	0.744	0.140	0.116	0.371	0.376	0.624	**WAL**	0.742	0.144	0.114	0.371	0.388	0.612
SCO	0.734	0.144	0.122	0.388	0.370	0.630	**SCO**	0.725	0.161	0.114	0.388	0.414	0.586
mean	0.747	0.131	0.122	0.375	0.348	0.652	**mean**	0.741	0.143	0.116	0.375	0.379	0.621
FS							**HF**						
country	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$	**country**	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$
ENG	0.766	0.102	0.132	0.366	0.279	0.721	**ENG**	0.911	0.059	0.030	0.119	0.497	0.503
WAL	0.751	0.117	0.132	0.381	0.306	0.694	**WAL**	0.906	0.067	0.067	0.120	0.556	0.444
SCO	0.749	0.124	0.127	0.378	0.329	0.671	**SCO**	0.874	0.093	0.034	0.160	0.580	0.420
mean	0.755	0.114	0.130	0.375	0.304	0.696	**mean**	0.897	0.073	0.043	0.133	0.544	0.456
EP							**HD**						
country	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$	**country**	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$
ENG	0.450	0.291	0.259	0.809	0.360	0.640	**ENG**	0.701	0.202	0.097	0.396	0.509	0.491
WAL	0.431	0.351	0.218	0.787	0.446	0.554	**WAL**	0.544	0.326	0.130	0.586	0.556	0.444
SCO	0.414	0.352	0.233	0.819	0.430	0.570	**SCO**	0.702	0.205	0.093	0.392	0.524	0.476
mean	0.432	0.331	0.237	0.805	0.412	0.588	**mean**	0.649	0.244	0.107	0.458	0.530	0.470
SD							**BD**						
country	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$	**country**	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$
ENG	0.752	0.108	0.140	0.388	0.278	0.722	**ENG**	0.598	0.225	0.178	0.580	0.388	0.612
WAL	0.792	0.097	0.111	0.320	0.304	0.696	**WAL**	0.590	0.240	0.170	0.580	0.414	0.586
SCO	0.771	0.109	0.120	0.349	0.313	0.687	**SCO**	0.582	0.254	0.164	0.582	0.436	0.564
mean	0.772	0.105	0.124	0.352	0.298	0.702	**mean**	0.590	0.240	0.171	0.581	0.413	0.587
LAT							**MAN**						
country	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$	**country**	$\overline{\Pi}_0$	$\overline{\Pi}_1$	$\overline{\Pi}_2$	$\overline{T}$	$\mathbf{T_1}$	$\mathbf{T_2}$
ENG	0.642	0.143	0.215	0.572	0.250	0.750	**ENG**	0.893	0.054	0.053	0.160	0.338	0.662
WAL	0.626	0.167	0.208	0.582	0.286	0.714	**WAL**	0.883	0.066	0.051	0.169	0.390	0.610
SCO	0.620	0.168	0.212	0.593	0.283	0.717	**SCO**	0.880	0.070	0.051	0.171	0.406	0.594
mean	0.629	0.159	0.212	0.582	0.273	0.727	**mean**	0.885	0.063	0.052	0.167	0.378	0.622