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FINANCIAL AND MULTIDIMENSIONAL POVERTY IN EUROPEAN COUNTRIES: CAN THE FORMER BE USED AS A PROXY OF THE LATTER?

by

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Financial and multidimensional poverty in European countries: can the former be used as a proxy of the latter?

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Summary

In recent years, European policy has come to include the fight against poverty and social exclusion. In the context of the Open Method of Coordination, common indicators of poverty were developed. Often, these indicators are a function of household income. In the scientific literature, by contrast, the multidimensional measurement of poverty has taken on a new lease of life. This paper aims at bridging this gap between science and policy. Can the financial measure of poverty be taken as a proxy of a multidimensional measure of poverty? The answer to this question is found in several steps. First of all, an alternative multidimensional measure of poverty is presented and applied to the data of the ECHP of various European countries. Next, the results of this measure are compared with those of financial poverty. More specifically, the causes of multidimensional and financial poverty and those individuals at risk of multidimensional and financial poverty, are compared. The broad conclusions are, first of all, that financial poverty rates often are higher than multidimensional poverty rates. Secondly, the results of both measures of poverty very seldom contradict, so financial poverty can indeed be used as a proxy of multidimensional poverty. However, and that is the third conclusion: the position of some groups in terms of their risk of poverty is underestimated by the financial poverty measure: this is notably the case for those who are single with children, and those with a precarious health situation.

1. Introduction

Many have an intuitive idea of what poverty is, who is poor and who is not, but both the conceptualisation and measurement, and causes of poverty give rise to lengthy debates. On the conceptual level, the most well-known definition states that individuals or households "can be said to be in poverty when they lack the resources to obtain the types of diet, participate in the activities and have the living conditions and amenities which are customary or at least widely encouraged or approved, in the societies to which they belong" (Townsend, 1979: 31). That poverty is indeed a multidimensional concept, is now widely acknowledged. The question

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remains as to how it should be measured. Here, two distinct and diverging developments emerge; the one in the context of European social policy, and the other in scientific literature.

In recent years, European policy has come to include social policy, and notably the fight against poverty and social exclusion. In the context of the 'open method of coordination' (hereafter OMC), the need was acknowledged for developing common indicators for monitoring the performance of member states. The task of developing these indicators was given to the Indicators Sub-Group of the Social Protection Committee (SPC). At the Laeken Summit of December 2001, the European Council adopted a set of 10 primary and 8 secondary indicators, now known as the 18 Laeken Indicators. Three of the primary indicators and three of the secondary indicators are a function of household-income, more specifically with a poverty line set equal to 60 percent of the median equivalent household income. However, "the Indicators sub-group emphasized that this was to be seen as a measure to people who are "at risk of being poor", not a measure of poverty. This reflects a growing realisation that low income, on its own, may not always be a reliable indicator of poverty and social exclusion" (Atkinson *et al.,* forthcoming: 8).

In the scientific literature, the multidimensional measurement of poverty has taken on a new lease of life. Building upon the work pioneered by *inter alia* Townsend (1979) and Mack & Lansley (1985), a strand of research tries to measure poverty using multivariate information. Apart from studies that use cross-tabulation of indices (cf. Paugam, 1996; Böhnke & Delhey, 1999; Böhnke, 2000; idem, 2001), most involve the construction of an index incorporating the information from separate indicators, each of which reflecting an arrear in a specific field.

The advantages of the multidimensional measure are in some way the disadvantages of the income-based measure, and vice versa. Of course, considering only income means simplification. Indeed, "those observed with the same income level at a point in time may have quite different living standards, because both the other resources and the needs of households vary" (Atkinson *et al.,* forthcoming: 8). Moreover, income may vary a great deal over time, and if an individual or household is observed poor in a certain year, it might just be a temporary setback, and not necessarily a structural arrear. Finally, the decision who is poor and who is not, is taken by comparing the equivalent household income to a threshold, usually 60% of the median. Even though considerable thought as been given to this threshold (*op cit.*: 9), it ultimately remains arbitrary, as arbitrary as the equivalence scale needed to correct household income for differences in size and composition of the household.

But there are advantages as well of using low income to measure poverty. It is efficient in that only one variable is needed; it is well-defined; it is less complex, just because of the fact that only one variable is required; and it allows for comparison between countries. Moreover, the alternative, which is the construction of a measure of poverty that incorporates information from various indicators, has its downsides too. These will be discussed more elaborately later in this paper, so they are just summed up here. First of all, the choice of what indicators to include, as well as (save some recent research) the weight of these indicators in the index, and finally the way in which a distinction is made between poor and non-poor individuals or households; all this is based upon (often defendable, but nevertheless debatable) decisions or conventions. And these measures are methodologically complex and not yet out of the scientific development phase. In short: they do not meet the methodological selection-principles for indicators used by the Social Protection Committee (*op. cit*: 5), which means they are less useful in the political process of the OMC.

So, at the end of the day, there are good reasons why the OMC is largely based on income-indicators, which – as most are very well aware- measure poverty only to a certain

degree. But to which degree? Is there empirical ground for using low income as a proxy for the 'true' multidimensional poverty, more specifically in identifying those at risk, and the causes of poverty. This study aims at finding an answer to this question, by confronting the estimation results of a model explaining multidimensional poverty using various background variables with the results of the same model, but then explaining financial poverty. The hypothesis is that, if the estimation results of both models are more or less the same, a financial poverty indicator can be used as a 'proxy' of multidimensional poverty. This is the primary goal of this study.

The secondary goal is to consider which background variables explain poverty. Any event causing poverty should precede the event of falling into poverty, and any analysis into the causes of poverty should therefore use panel data techniques.

This paper starts by discussing how multidimensional poverty is measured in the literature. Next, an alternative model that builds upon some recent work by *inter alia* Nolan & Whelan (1996) and Layte *et al.* (2001), will be presented. The results of this alternative multidimensional measure will then be compared to an income-based measure, in both the identification of the causes of poverty, and those vulnerable. This will be done using the 1996 to 2000-waves of the European Community Household Panel (ECHP) of seven European Countries.

For a good understanding of what follows, a distinction must be made between 'poverty', a multidimensional notion, and deprivation, a specific non-financial arrear, be it physical, social or psychological. Poverty, then, is a general state within which one an experience several forms of deprivation (Smeeding, 2000). Or, in the words of Ringen (1987: 162, in Kangas & Ritakallio, 1998: 173), "poverty is the result of an accumulation of deprivation in both resources and the way of life". Finally, define financial poverty as a situation where a lack of disposable income is experienced. In this study, following the Laeken indicators, an individual is financially poor when the income of the household where he or she lives, taking into account the size and composition of the household using the modified OECD-scale, is lower than 60 percent of the median income in the sample.

2. Existing Multidimensional Approaches to Measuring Poverty

Poverty occurs when an individual or household experience a number of cumulative deprivations. These deprivations need to occur in different fields or dimensions of the life of the subject, and they need to be expressed in relation to an implicit or explicit norm set by society as a whole.

Measuring multidimensional poverty usually involves the construction of an index incorporating the information from the indicators. However, one still has to decide when a household or individual is said to be poor. Some have argued that each single indicator be assigned its own threshold value (cf. Tsui, 2002, Chakravarty *et al.*, 1998,). This results in a strain of dichotomous variables, each of which represents a specific form of deprivation. Next, a minimum number of deprivations are decided upon, at which point one is considered poor. For instance, Mack and Lansley (1985) use deprivation in three indicators as the cut-off point. The advantage of this approach is that the original indicators are 'standardized' at the threshold value, so that they do not need to be of the same scale or magnitude. The disadvantage, of course, is that the choice of a cut-off point remains arbitrary.

Others have used a compound threshold for the index itself (Townsend, 1993: 57; Nolan and Whelan, 1996: 230; Tsakloglou and Papadopoulos, 2002). These studies combine the individual indicators into one index variable and assign a threshold. If the index variable is below this threshold, the household or individual is considered poor. The advantage of this approach is that it is compensatory: a low score on a certain indicator may be neutralized by a high score on

another. One drawback, however, is that the variables are not standardized; they therefore need to be of the same scale. There moreover are two important decisions to be made, namely concerning the weights of the indicators in the index, and concerning the threshold value used to distinguish between poor and non-poor individuals or households. Consider these two aspects in more detail, as they are important in understanding of what follows.

A first problem is which variables to include in the index, or –if one does not want to make that choice- how to weigh the variables in the index. Nolan and Whelan (1996) use factor analysis to select indicators. They find a base dimension of poverty, and they use only the eight indicators in this dimension to construct an index. Halleröd (1995) on the other hand, does not exclude any indicators, but varies the weights. The weight of an individual indicator in the index is set equal to the inverse of the proportion of people who do not have an arrear on that indicator. Ingenious as it might be, the weighting decision imposes what is more and less important in measuring poverty. It therefore has a strong influence on the ultimate results. Ideally, this decision should not be taken by the researcher, but should itself be a result of empirical research. When measuring the quality of life across countries, Slottje (1991) has suggested that the indicators could be weighted "by the variances in the individual attributes. This is the method of principal components analysis. This technique has the feature that the normality assumptions in statistical theory are invoked and the overall variance of the data matrix is used" (*op. cit.*: 686). This approach will be discussed in more detail in the next paragraph.

The choice of what threshold value to adopt is even more arbitrary than the choice of the weights. Tsakloglou and Papadopoulos (2002) set the cut-off point equal to 70 or 80 percent of the median of the index. Layte *et al.* (2001) set it so that the proportion of poor equals the proportion of financially poor. This, however, only replaces the problem of the choice of the income-threshold. An ingenious solution to this problem is suggested by Muffels (1993), who combines the index with a question of the perceived welfare level of the household. The cut-off point is then determined as "the average consumption welfare level of those households who rate their current living conditions with the school mark 5.5" (Muffels & Dirven, 1998: 253). Another interesting solution is brought forward by Townsend (1993: 57) who uses discriminant analysis to find the threshold that maximizes the difference between two subgroups in the sample.

Yet all of the above approaches to measuring poverty implicitly assume that the population can be divided into poor and non-poor households or individuals. As straightforward as this may be when one measures financial poverty or some sort of deprivation, the fact that deprivation scores are combined into a poverty measure implicates that the assumption of two separate groups may no longer be valid, since deprivation scores may or may not compensate each other. For instance, it could be that different groups show arrears on different dimensions of poverty, but that there is no group that is deprived on all dimensions. The assumption that such a group exists, should therefore be made explicit, if not tested in some way. In the next section, an alternative measure will be presented. This measure will then be applied to data of the ECHP. Then, using the same model, the variables explaining both multidimensional and financial poverty will be analyzed and compared.

3. An Alternative Multidimensional Measurement of Poverty

If poverty is defined as a situation where deprivations in various fields accumulate, these fields may be latent dimensions that are only approximated with the available manifest indicators. To the extent the manifest indicators are correlated with one another, the more likely it is that they represent the same dimension of poverty. Factor Analysis (FA) and Principal Component

Analysis (PCA) can be used to uncover latent patterns in a set of multivariate data. Even though the underlying assumptions behind FA and PCA are quite different, the results often are quite similar (Widaman, 1993). Every latent variable is written as a weighted function of the manifest indicators, where the weights are optimal in the sense that they are based on the correlations between the variables, and that the latent dimensions contain the maximum information of the manifest variables.

Here, as multiple datasets and various countries are being analyzed, confirmatory FA seems to be the appropriate technique to use. Moreover, as poverty implies that various deprivations should occur simultaneously, i.e. be cumulative, one may want to relax the assumption that the factors be uncorrelated and apply oblique rotation of the extracted factors.

Other studies have used FA or PCA to measure poverty. Nolan and Whelan (1996) use FA to find a "basic dimension" of indicators. The eight variables in this basic dimension are then used in one index. Whelan *et al.*, 2001 and Whelan *et al.*, 2002, follow a comparable approach.

Separating poor and non-poor households, however, remains a problem, which often is avoided by either comparing the compound scores of the financially poor with the population in general, or by setting the compound threshold such that the proportion of poor equals the proportion of financially poor, or by imposing a threshold, for instance a certain percentage of the median.

So, if the observed variables are linear combinations of the latent dimensions of poverty, the first question is: which dimensions? Here FA is applied to a multivariate dataset to bring the latent dimensions of poverty to the surface, yielding continuous factor scores representing the arrear of an individual or household on these dimensions of poverty. Each "estimated factor score is a linear composite of the optimally weighted variables under analysis" (Hatcher, 1994, 97). In contrast with *inter alia* Nolan and Whelan (1996) not one dimension –and therefore one index- will be selected. This approach follows the line set by Halleröd (cf. *supra*), with this difference that the weights are optimal for the result of FA. This of course complicates things in that we do not end up with one but several optimally weighted indices.

It is however necessary to categorize individuals or households on the basis on whether or not they are poor, and this means that the information on the specific deprivations – the factors- needs to be combined. The solutions described in the previous paragraph cannot be applied in this specific case. The first possible solution would be that a threshold would be set at a certain percentage of the median. This first of all would mean that the different factor scores of the various dimensions would have to be combined, for instance by taking the mean. This way of combining indicators was what we wanted to avoid in the first place. Moreover, the decision what threshold to use would be an arbitrary decision like the one used in the measure financial poverty. The second possible solution would be setting the threshold such that the percentage of poor equals the percentage of financially poor. This is not appropriate either, as the central hypothesis concerns the comparison of the two measures in terms of how they are explained by the same variables.

The problem therefore resembles the one we came to solve in the first step: we do not look for a latent structure in the variables describing the households or individuals; rather we look for a latent structure in the households or individuals, given the factor scores on the various dimensions. Cluster analysis is the general name for a number of techniques that group households or individuals, using available information. In this case, the basic cluster analysis groups households using the average distance between the factor-scores in a n-dimensional Euclidian space.

An obvious critique to this two-step procedure would be that it contains one step too many. Why not follow Townsend (1993, appendix 3.2, 67) and apply cluster analysis directly to the observed variables? There are two reasons not to do so pertaining to the number of indicators representing a latent dimension, and the measurement of those indicators. First, not all latent dimensions of poverty are represented by the same number of indicators. Suppose that 6 and 2 indicators respectively represent dimensions A and B. Omitting FA and applying cluster analysis directly would result in the weight of dimension A being three times greater than that of dimension B. Second, factoring also resolves the problem of 'standardizing' the variables. Suppose that a dimension is described by two variables, one being dichotomous ('does or does not posses an item') and the other having a scale from 1 to 10. If applied directly in the cluster analysis, the second variable would erroneously have a larger weight than the first variable. Using continuous and standardized factor scores equalizes the a priori weight of all deprivations in the cluster analysis.

To end this paragraph, two problems concerning the application of the suggested two-step model in this specific project. The first problem is about the underlying manifest variables. The second problem concerns the fact that the model is to be applied to the data sets of various countries.

The first problem is about the observed variables, which are the point of departure of the FA. It will be shown in the next section that most observed variables are ordinal and even dichotomous. This poses a problem since standard FA derives the underlying latent structure on the basis of the Pearson correlation-matrix of the observed variables. The resulting categorisation errors may be substantial if the response options are low (Coenders & Saris 1995; 126; Mislevy, 2001: 9; Muthén & Christoffersson, 1981: 407). In an earlier application, indicators were combined in an *ad-hoc* way to higher-order variables (Dekkers, 2003). Here, we adopt a more elegant solution in calculating tetrachoric and polychoric correlation coefficients (Drasgow, 1988) on the original indicators, and using the resulting matrix as the point of departure for the FA[1]. Basically, tetrachoric and polychoric correlations are the Pearson correlations between latent continuous and normally distributed variables assumed to underlie the observed dichotomous or ordinal variables. When following this "underlying variable approach" (Jöreskog & Moustaki, 2001), the estimators –and therefore the factor scores- will be consistent, although the standard errors as well as the chi-square tests of the models as a whole will be inconsistent (Muthén & Christoffersson, 1981). However, the tetrachoric and polychoric correlations assume that normally distributed variables underlie the observed ordinal variables. When this demand is not met, inconsistencies will be the result. Yet, as Quiroga (1992, cf. Coenders & Saris, 1995: 133) conclude: "even if normality does not hold, the bias is usually higher for covariances and Pearson correlations than for polychoric correlations", especially since most variables are dichotomous. Knol & Berger (1991) describe four problems connected with the use of tetrachoric correlations. On the basis of a simulation study, they suggest using unweighted least squares (ULS) FA.

A second problem stems from the fact that the model is to be applied to more than one country. This implies a trade-off between fit and comparability. One wants the fit of every separate model to be as good as possible, but one also wants to maximize the comparability between the results. The two-step procedure is applied to different countries and at five points in time. The fit of every model would be maximized if exploratory analysis were used for every country and every year. In this case, however, comparability would be minimal. Likewise, if the

[1] The SAS-macro POLYCHOR (version 1.3), was used and adjusted to account for cross-sectional weighting of the indicators.

same model is imposed on all countries and in all years, the comparability would be maximized, but the fit of each model would be very low. The chosen compromise is to develop a 'base model' or common denominator using exploratory factor analysis for every country and every year, while using all available indicators. This base model can then be used in a confirmatory factor analysis of every country and every year. Finally, fit is improved for every country by removing some indicators for all years.

4. The Data

The two-step procedure described in the previous section will be applied to various European countries using the 1996 to 2000 waves of the Users Database of the European Community Household Panel (ECHP, release of June 2003). The ECHP is a panel dataset consisting of seven waves to date, from 1994 to 2000, covering the 15 European member states. It is based on data on identical questionnaires gathered by the member states, which are then standardized, recoded and weighted by Eurostat to harmonize the data. Questions describe households as well as individuals, and cover demographics, income, earnings, benefits, description of housing and living conditions, possession of durables, employment, health, education and physical health, and so forth. However, not all variables are present in every wave and for every country. Table A1 in the appendix shows which indicators are available in each country. In order to have a balanced dataset, i.e. to avoid missing variables, the analysis has been limited to the waves between 1996 and 2000, while excluding Germany, Sweden and Luxembourg. For other reasons that will be discussed later, the Netherlands, Greece, Ireland and Spain are left out as well. So, five waves remain for seven countries: Denmark, Belgium, France, the United Kingdom, Italy, Portugal, and Finland. That harmonized information is available for a number of European countries, and for several years in a row, opens many possibilities for empirical analysis. This paper aims at exploiting these possibilities, apply the above-described multidimensional poverty measure on various countries and finally make a comparison with financial poverty in its causes and those vulnerable. While only adults are included in the data set the assumption is that the poverty-situation of adults in a household determines the situation of children, but not vice versa.

Table 1 describes the variables that are the starting point of the analysis. The first column contains the variable name, the second column describes the variable and the third column shows the place of the variable in the base model, which will be explained later. There are 37 variables in total, of which 34 and 3 variables, respectively, describe the household and the individual. In fact, possible differences between individuals in the same household are caused by variables describing contentment with work, finances and housing. Note, furthermore, that a higher value of any variable describes a more *negative* situation. This way, unambiguous interpretation of the clusters using the factor scores becomes possible. Finally, contrary to Costa (2003), all variables that may be a cause of multidimensional poverty (such as labour market status, level of education, as well as financial poverty) were not included in Table 1, as including these variables would confuse cause with outcome (Tsakloglou & Papadopoulos, 2002: 213), and would also mean that they could no longer be used as covariates in models to be presented later in this paper. Moreover, many of these variables (such as gender and nationality) are inherently categorical, so we cannot assume an underlying continuous variable, as tetrachoric and polychoric correlations require.

[Table 1 here]

To deal with the conflicting demands of fit and comparability, the fit of the base model was improved for every country separately by removing some indicators for all years. Table A1 in the appendix shows which indicators were used for measuring poverty in which country. The result is a model that differs somewhat between countries, due to different indicators used, but is the same for each year. Finally, the choice what number of clusters to retain, was taken for every country and every year.

5. The Results: Multidimensional Poverty in European Countries

5.1. Factor Analysis

The measure of poverty described is developed by first applying FA to identify latent dimensions of poverty. Next, cluster analysis is applied to divide the sample in a certain number of groups using information from the FA.

A first step in confirmatory FA involves the decision how many latent dimensions or factors the model should retain. As we do not have a theoretical reason for choosing a certain number of factors, an exploratory factor analysis is applied to the datasets describing the different countries at different points in time to find the base model. Based on the eigenvalues of the exploratory analyses, a two-factor model is selected, with the loadings of the indicators for the various countries and years yielding the base model. This is shown in the last column of Table 1. The first factor describes the material position of the individual. Does the household where he or she lives have debts to repay? Can it make ends meet, buy new furniture and clothing, pay the bills? The first factor also includes indicators describing its satisfaction with work, finances and leisure time. The second factor describes the housing circumstances of the individual's household. Does the dwelling have minimal comfort elements, such as a kitchen, toilet, warm water, heating, and so forth? Is there enough space and light? What about noise and pollution in the living area? To make what follows easier to read and understand, we name these two factors as "material conditions" and "living and housing conditions". One should keep in mind, however, that these names are nothing more than subjective labels based on the indicators that underlie the two factors.

The base model was then applied to the data of the various countries and years using confirmatory FA. In the Netherlands, Ireland and Austria, the fit of this model was unacceptably low, and, in the case of Greece and Spain, the results where otherwise not credible[2]. These countries are therefore omitted from subsequent analysis. Table A2 in the appendix shows the fit of the remaining seven countries. Overall, the fit seems reasonable, but not marvellous, as could be expected. Only in four cases (once in Denmark and the United Kingdom, and twice in Finland) is the AGFI below its threshold value of .9.

As poverty is a cumulative concept, in that arrears in the two dimensions should occur simultaneously, the assumption that the factors are uncorrelated is therefore relaxed in the FA. Table 2 shows the covariances between the two factors underlying poverty for the different countries. With the exception of Portugal in 1999, the two factors have positive correlations.

[2] In Greece, the correlation between the two factors turned out to be negative for all years, which was not only considered counterintuitive, but which also jeopardized the results of the cluster analysis. In Spain, the number of variables that had to be omitted in order to get an acceptable fit, as that high that too few variables remained for the results to be trustworthy.

[Table 2 here]

5.2. Cluster Analysis

Next, cluster analysis is applied to the factor scores generated in the first step. The distance between two clusters is the average distance between the scores in both clusters in a two-dimensional Euclidian space. The number of clusters chosen is the therefore such that the information loss is limited (or, the number of clusters is set as one minus that number where the pseudo-R^2 and pseudo-t, respectively, are maximal), as well as that the difference between the clusters (the pseudo-F: the between-cluster variance divided by the within-cluster variance) is maximized. If these three indicator variables do not lead to the same number of clusters to retain, which is often the case, then the lowest number of clusters is chosen[3]. All clusters containing less than one percent of the sample are treated as outliers. The resulting clusters are interpreted on the basis of the mean factor scores. This is because a higher value on any variable describes a more negative situation. A higher factor score therefore unambiguously reflects a larger arrear in that dimension of poverty. So, any cluster that is not an outlier and that has positive mean factor scores on both dimensions of poverty (and where the hypothesis that these mean factor scores are zero should be rejected), is considered a 'poor cluster'.

To clarify this further, Tables 3a to 3c present two typical cases, Portugal (Table 3a) in 1997, the United Kingdom (Table 3b) in 1998 and one atypical case, being Denmark in 1998 (Table 3c). Each of these tables is divided into two separate parts. The first part contains the values of three information variables: the pseudo-R^2 pseudo-F and pseudo-t^2, on which basis one may decide how many clusters to retain. Given this decision, the second part of the table describes each of the clusters. So, if we decide to retain five clusters, the second part of the table will consist of five lines, each describing one cluster.

[Table 3a here]

In Portugal, based on the pseudo R^2, pseudo-F and pseudo-t^2, a solution of either two or four clusters should be chosen. With the additional criterion that the number of clusters be minimal, two clusters are retained. Given the choice to retain two clusters, the bottom rows in Table 3a show the t-values of the mean scores to be different from zero. The largest cluster of almost 89 percent of the sample clearly has a negative mean factor score, reflecting a positive situation on both dimensions of poverty, thereby indicating the non-poor. The smaller cluster of about 11 percent of the sample, however, shows an arrear in both dimensions of poverty. *Ergo*, this last cluster contains the poor individuals in the sample[4].

[Table 3b here]

[3] Experience learns that the clusters often differ in size, and that retaining more clusters usually results in a further subdivision of the largest cluster –the non-poor- into smaller non-poor clusters.

[4] If, by the way, four instead of two clusters would have been retained, then the largest cluster (the non-poor) would have been subdivided into a clusters (cf. footnote 4), one of which showing a small arrear on one of the two dimensions of poverty, and a cluster of 36 individuals (0.32) would have been taken out of the poor cluster. In this case, the poor cluster would include 10.75 percent of the individuals in the sample. So, the results would have been more or less the same.

As a second example, Table 3b describes the results for the United Kingdom in 1998. The pseudo-R^2 pseudo-F and pseudo-t^2 in the first seven rows of the above table suggest retaining four clusters In the second part of Table 3b, the t-value of the average factor scores are presented for the various clusters, where the number of clusters is decided upon the basis of the figures in the first part of the Table. The first cluster, of almost 90 percent of the sample, contains non-poor individuals as evidenced by their negative t-values on both dimensions. The other three clusters have an average arrear in both dimensions of poverty. So, they meet the requirements outlined above and they therefore are considered poor. However, the last cluster contains less than one percent of the sample, so it is considered an outlier. So, the poor individuals are found in the second and third cluster, and the percentage of poor individuals equals 9.84 percent.

In most of the 35 cases (seven countries and five years), the decision process resembles the one described in Table 3b. Unfortunately, odd results were found in two cases, namely Denmark in 1998 and Portugal in 1999. Consider Denmark in 1998.

[Table 3c here]

The three information variables again suggest retaining four clusters. The first and largest cluster clearly contains non-poor individuals. The individuals in the second cluster have, on average, an arrear in their 'material conditions' (the first dimension), but show no arrear in their 'living and housing conditions' (the second dimension). When conceptualizing multidimensional poverty, it was outlined that arrears in the various dimensions should accumulate. This is not the case, so the individuals in the second cluster cannot be considered poor. Likewise, the individuals in the third cluster have an important arrear as far as their 'living and housing conditions' (factor 2) are concerned, but the t-value of the first factor indicates that the average score is close to zero. So, for the same reason as before, the individuals in this cluster cannot be considered poor. Finally, the t-values describing the last cluster show an arrear in both dimensions of poverty. The result therefore is that only the individuals in this last cluster of 1.50 percent of the Danish sample, are multidimensional poor. As said, this situation occurs twice. In the case of Portugal (1999) it is clearly caused by the negative correlation between the factors, as represented in table 2. In the case of Denmark, however, no such obvious technical reason was found.

5.3. Poverty rates and why one should be careful when comparing them

What are the results when the decisions, which have been discussed in more detail in three cases, are taken for all countries and all years? Figure 1 shows the development of the percentage of multidimensional poor in all countries from 1996 to 2000.

[Figure 1 here]

After a brief discussion of Figure 1, more thought will be given to why comparing the multidimensional poverty rates of two or more countries may lead to different results as when financial poverty rates are compared. The Belgian poverty percentage starts somewhere in the middle, but decreases between 1996 and 1997 and remains low afterwards. Save 1999, when the percentage in Belgium is lower, poverty is the lowest in Denmark, and remains well below 10 percent. In most countries, poverty does not increase between 1996 and 1997. In France, poverty remains rather high, even though it decreases throughout the years taken into consideration. In

1996, only the percentage in France exceeds that of Italy. But where the French poverty rate decreases, the Italian increases from 1997 onwards, causing it to be the highest in 2000. The poverty percentage is remarkably low in Portugal, especially when compared to Italy. Until 1998, the poverty rates of Portugal and Finland are comparable, but the Finnish poverty rate remains more or less the same after 1998, whereas it drops in Portugal. This surprising finding of course stands in opposition to conclusions drawn in other research, using income-based poverty indices. Finally, the UK-poverty rate starts off somewhere in the middle, but remains more or less the same, so that it ends up as the second highest, after Italy.

There are however several reasons why such a comparison between poverty rates of different countries might lead to different results as when financial poverty rates are compared. First of all, the same model is used *within* each country to measure poverty in all years. It is however unclear to what extent this also holds for the comparison *between* countries at a certain moment in time. For the common model differs between countries, because variables were omitted in order to improve fit. This is the first argument.

The second argument is that poverty may not 'mean' the same thing in all countries. In FA, the observed variables are assumed to be linear combinations of the latent dimensions of poverty, and an "estimated factor score is a linear composite of the optimally weighted variables under analysis" (Hatcher, 1994, 97). As the goal is to 'explain' the covariance in the dataset, the weight of a variable depends on its covariance with the other variables. Even when a common factor model is imposed by confirmatory factor analysis, the weights will reflect country-specific characteristics of poverty. Suppose, for example, that having heating in the house is of more importance in Finland than it is in Portugal. Then one might expect that the correlation between the heating variable and the other variables to be less strong in Portugal as compared in Finland. Consequently, the weight will be lower in Portugal than Finland. From the conceptual point of view, this is very convenient as country-specific characteristics of poverty are fully taken into account. It however also implies that poverty 'means' something else in Portugal than Finland, which makes interpretation of the differences rather difficult.

The third and maybe most important argument, involves the fact that cluster analysis has been used to select the poor. These clusters are not based upon some common threshold, but among other things on which grouping makes the groups homogeneous, while maximizing their difference. There is no reason why this criterion would 'mean' the same thing in Portugal as in Finland. It is very well possible that the clustering splits the dataset in half in Finland, where the difference between the clusters would be small, whereas the split could be more unequal (say, 90 and 10 percent) in Portugal, and where the difference between the poor and non-poor is much larger. The percentage of 'poor' would be higher in Finland than Portugal, but 'poverty' would again have a totally different meaning.

What is the consequence of all this? It means that we have to be very modest when comparing multidimensional poverty rates between countries, for the possibilities to do so in an unambiguous way, are limited. But what use then remains for the proposed measure? Its contribution lies in that the way poverty is measured, lies closely to the intuitive idea of what poverty conceptually is. Moreover, this paper sets out to analyse who are at risk of being poor and what causes poverty in the countries under consideration. This requires a country-specific analysis, and does not involve an analysis between countries. A more elaborate longitudinal analysis into the causes of both multidimensional and financial poverty, and a cross-sectional analysis of who are vulnerable to multidimensional and financial poverty is the subject of the sixth and seventh paragraph. The order of discussing these models reflects the idea that

differences in transition rates (the risk of falling into poverty) result in differences in the risk of being observed in poverty, and not vice versa.

Before turning to these paragraphs, however, it is of interest to briefly compare the rates of financial and multidimensional poverty in the various countries. Figure 2 shows cobwebs plotting multidimensional and financial poverty rates for the various European countries considered.

[Figure 2 here]

The financial poverty rate is the percentage of individuals whose equivalent household-income (using the modified OECD-scale) lies below 60 percent of the median. The multidimensional poverty rates of course are the same as plotted in figure 1. The most important conclusion to be drawn from this Figure is that the multidimensional poverty rate is in almost all cases below the financial poverty rate. This emphasizes the structural or long-term character of multidimensional poverty. Finland and France in 1996 and 1997 are the exceptions, however for opposite reasons. The financial poverty rate is low in Finland, whereas the multidimensional poverty rate is high in France. It is striking that Portugal combines a very high financial poverty rate with a moderate multidimensional poverty rate.

6. What causes poverty? A longitudinal analysis

The goal of this paper is to draw conclusions on whether or not the financial poverty measure can be used as a proxy for the multidimensional poverty measure. To do this, two separate questions should be answered. First, do both measures lead to non-contradictory and comparable results in identifying the causes of poverty? Second, do both measures lead to non-contradictory and comparable results in identifying the individuals in poverty? Results are said to be contradictory when the estimators in the models explaining multidimensional and financial poverty are of the opposite sign, and they are said to be comparable when they are not contradictory and more or less of the same magnitude.

The first question, identifying the causes of poverty, requires a longitudinal analysis, for causes should by definition occur before consequences. In this and the next paragraph, two longitudinal models describing the probability that an individual will become either multidimensional or financial poor will be presented and discussed. Are both models comparable in their identification of what causes poverty?

Taking a non-poor individual at time t, what is the probability that he or she will 'survive' until $t+1$, …, $t+z$, and become poor only then? Survival analysis is a class of methods that study the occurrence and timing of events, in this case falling into multidimensional or financial poverty. Most of these models assume that time, and therefore the duration of a spell, is a continuous variable. These standard hazard models cannot be used here, because "event times are measured coarsely even though events can actually occur at any point in time" (Allison, 2000, 216). Let p_{it} be the probability that an individual i falls into poverty at time t, given that he or she did not do so before. Assuming that events are generated by Cox's proportional hazard model, it can be shown (cf. *supra*) that the events are the generated by a *complementary log-log function*:

$$\log\left[-\log(1-p_{it})\right] = \alpha_t + \beta_1 x_{it1} + \ldots + \beta_k x_{itk} + \beta_{k+1} y_{i(k+1)} + \ldots + \beta_{k+n} y_{i(k+n)}$$

where the x represent time-variant covariates, including the duration of the spell, and y represent the time-invariant covariates. Contrary to the logit function, this function is asymmetrical, which makes it important that the model is set up to predict the probability of an event, in this case falling into poverty. An attractive characteristic of this complementary log-log model is that the coefficients have a relative risk interpretation, just as if it were a proportional hazards model. This allows for the interpretation of the coefficients in terms of the percentage change of the probability of falling into poverty[5]. Finally, the above model was at first estimated without restrictions on time. This showed that time is linear to the log-odds of falling into poverty, which is equivalent to assuming a Gompertz distribution (cf. *supra*: 219). To make interpretation, the estimation models whose results are shown in Tables 4 and 5 assume a linear effect of time.

7.1. Multidimensional poverty

The below Table 4 shows the results of the complementary log-log function describing the probability that an individual will fall into multidimensional poverty.

[Table 4 here]

The first column for every country contains the estimator, as well as its significance level. The second column expresses this estimator as a percentage-change of the probability of falling into poverty. Note that the above table does not include estimators for the intercept, nor do the ones below. This does not mean an intercept was not included in the model. However, there are two ordinal variables with three levels: labour market situation and family type. By using dummy coding, one regression model allows for one reference group. In order to get the incremental effect upon the log-odd for poverty, a separate regression was run, where only the reference group was changed. Of course, this changing of the baseline does affect the intercept, but not the other estimators, their significance levels or the significance level of the model as a whole. As there are two ordinal variables, the table includes information from three separate regressions for each country. An intercept term is therefore included in the estimated models, to account for systematic differences as shown in figure 2, but excluded from the results in the above and below Tables 4, 5 and 6.

In all countries under consideration, becoming unemployed significantly increases the probability that one falls into poverty. This increase lies between 32.13 percent in Italy and 83.55 percent in Finland. Moreover, stepping out of the labour market when one is working also increases the probability of falling into poverty. However, the latter increase is often considerably smaller than the former, and this is confirmed by the third variable, which shows that (except in Denmark and the United Kingdom), exiting the labour market from unemployment decreases the probability of falling into poverty. Transitions into unemployment more often than not are involuntary and unexpected, which means that the individual does not have savings to cover for the loss of income, whereas transitions of those working, away from the labour market, includes 'voluntary'[6] or at least foreseen exits such as pensioning, taking up upon unpaid domestic work in the household, and so forth.

[5] This percentage-change of a one-unit increase in covariate x_i equals $100(\exp(\beta_i)-1)$. Note that this is only done for the statistically-significant estimators, as the interpretation of the results is limited to these estimators.

[6] In that one is not laid off by the company one works for: one might be forced by circumstances, laws such as the mandatory retirement age, social pressure, and so forth.

Save Finland, becoming single without children has a significant and positive impact upon the probability of falling into poverty. Measured in percentages, this increase varies between 20.43 percent in Denmark and 86 percent in Portugal. The only exception is Finland, where becoming single has a negative effect of almost 13 percent on the probability of falling into poverty. What is remarkable, though, is that the effect of becoming single with children, in terms of the increase in the probability of falling into poverty, is in most countries more or less of the same magnitude. This is confirmed by the dummy that shows the effect of being single with children, taking being single without children as the reference group. For most countries, the hypothesis that this estimator does not differ from zero cannot be rejected. Two of three exceptions are Italy and Portugal, where it would appear that becoming single with children means that the risk of falling into poverty increases less than when one becomes single without children. Finally, in Finland, the risk of falling into poverty increases more if one has children than if one has not. The effect of gender was taken into consideration as well, but showed to be insignificant in all countries. It was therefore omitted from the model.

In all countries, the probability of falling into poverty decreases with age. This effect ranges between -0.74 percent in France, and -1.90 percent in the United Kingdom.

In four out of seven countries considered, women have a lower probability of falling into poverty than men. This is the case in France, Portugal, Finland and the United Kingdom. In the other countries, there is no significant relation between gender and the probability of falling into poverty.

Next, a difference is made, not between natives and others, but between, natives and EU-citizens, on the one hand, and those from outside the EU, on the other (cf. Tsakloglou & Papadopoulos, 2002). In all countries but Portugal, not being a EU-citizen implies a higher probability of falling into poverty. The importance of this difference however varies between 37 percent in the United Kingdom and 96 percent in Belgium. The estimation results in Portugal even show that non-EU citizens have a lower probability of falling into poverty.

In most countries, having a lower level of education means a higher probability of falling into poverty. The percentage-effect differs between 12.5 percent in Portugal, and 32 percent in Finland. The exceptions are France, where the estimator is negative but small, and the United Kingdom, where it does not differ significantly from zero.

The variable reflecting one's health is not included in Finland, as the answer to this question was not collected for a part of the sample. For the other countries, however, there is a clear and significant relation in that a worse health increases the probability of falling into poverty. The magnitude of this effect usually is around 30 percent, but is higher in Belgium (50 percent) and the United Kingdom (almost 73 percent).

For all but one country under consideration, it is clear that becoming financially poor significantly increases the probability that one will fall into multidimensional poverty. The magnitude of this effect ranges between 14 percent in Denmark and almost 69 percent in the United Kingdom. The exception is Finland, where becoming financially poor does not increase the probability that one will fall into poverty.

It may come as no surprise that the estimators of time are negative and significant in all countries. It simply means that, the longer one manages *not* to fall into poverty, the lower the probability that one will.

7.3. Financial poverty

In the previous paragraph, the causes of multidimensional poverty were presented and discussed. Next, we turn to financial poverty. The question is whether the conclusions based on the above multidimensional measure more or less confirm conclusions based on the income-based poverty measure, in which case the latter could be used as a 'proxy' of the former. The results in Table 4 should be compared with the results of estimating the same model, save using the dynamic probability of falling into financial poverty as a dependent variable. The results of this model are shown in Table 5.

[Table 5 here]

First of all, becoming unemployed increases the probability of both financial and multidimensional poverty, so the results do not contradict. However, this increase is more important on financial poverty than multidimensional poverty, especially in the United Kingdom. A possible reason for this is that this is a typical short-term effect: if one becomes unemployed, one might fall in financial poverty. However, one might escape from multidimensional poverty by dissaving. When, after some time, this is no longer possible as well, the risk of multidimensional poverty increases.

Next, consider the effect of stepping out of the labour market when one is employed: again, the probability of both financial and multidimensional poverty increases, so there is no contradiction. This increase again is more important for financial poverty than multidimensional poverty, especially in the United Kingdom and the model of financial poverty therefore overestimates the effect of stepping out of the labour market. Again, this could be a short-term effect. In explaining the effect of stepping out of the labour market, this however contradicts with the line of reasoning set up on the previous paragraph, which was that an exit out of the labour market is more often expected and/or voluntary. A line of reasoning which might explain the observation that financial poverty measures overestimates the effect of stepping out of the labour market, while being in line with the hypothesis that this exit is voluntary, introduces an underestimation of the importance of various non-labour incomes. Panel data sets traditionally underestimate both the value of real estate and of stocks and bonds which an individual or household possesses. Exactly these capital incomes typically are important for those retiring. Suppose a working individual with an observed labour-income and an unobserved capital income. If the income from labour ceases because the individual exists the labour market, the probability that he or she will fall under the threshold for financial poverty, increases. However, income generated by real estate or stocks and bonds, which is invisible to the interviewer, would emerge in the variables that underlie multidimensional poverty. In this case, the effect of stepping out of the labour market on the probability of falling into financial poverty would be important as compared to the probability of falling into multidimensional poverty.

In all cases except Finland, becoming single with or without children increases the probability of both financial and multidimensional poverty. Again, there is no contradiction in both models. However, in most cases, multidimensional poverty increases more than financial poverty. This underestimation by the model of financial poverty may be explained by considering the 'economies of scale' of living with someone else, in terms of furniture, durables and paying the bills. When someone becomes single, given disposable income, he or she has to make all these expenditures alone, which decreases ones income disposable for other expenditures.

When comparing the effect of becoming single with children, to becoming single without children, the differences are not very important and do not show a clear pattern.

An increasing age decreases the probability of falling into multidimensional as well as financial poverty. However, the magnitude of these effects are small and do not show a clear pattern as well.

Compared to men, women do not have a higher probability of either falling into multidimensional and financial poverty. This does not mean that women do not run a higher risk of falling into multidimensional and/or financial poverty, but this higher probability is fully covered by other explanatory variables, notably labour market status and level of education. Again, there are no contradictions nor is there a pattern of over or underestimation by the model describing financial poverty.

Compared to EU-citizens and in all countries but Portugal, non-EU citizens have a higher probability of falling into both multidimensional and financial poverty. This increase is stronger for financial poverty than multidimensional poverty in Belgium, France, Italy and Finland. So, there are no contradictions, but financial poverty in these countries overestimates the effect of being a non-EU citizen. Denmark and the United Kingdom show the opposite, which is caused by a limited effect of citizenship on financial poverty.

In almost all cases, with France being the exception, having a lower level of education increases the probability of falling into multidimensional as well as financial poverty. In Belgium, Denmark and Finland, the difference between the estimators is limited, but the effect on financial poverty is stronger than on multidimensional poverty in the other countries, except France. In other words, financial poverty overestimates the effect of education in three of seven countries.

In all countries considered, having a worse health clearly has a stronger increasing effect on multidimensional poverty than financial poverty, especially in Belgium and Denmark. The model of financial poverty therefore underestimates the effect of health. This might be caused by the social security schemes, which provide an income to the sick and disabled. In this short run, these sickness and disability benefits may alleviate financial poverty, but they may be not enough to prevent multidimensional poverty in the longer run. Moreover, given income, the more severe ones handicap or health situation, the more one has a need for specific –and often expensive aids or tools, and therefore the lower the welfare**.** Finally, those having a worse health run a higher risk of being deprived from social contacts with others outside the household, which is part of multidimensional poverty but not financial poverty.

In both models and controlling for the covariates, the longer one remains out of poverty, the lower the probability that one will become poor.

7.Who are at risk of being poor? A cross-sectional analysis

Can financial poverty be used as a proxy for multidimensional poverty in identifying those in poverty? The answer is found by comparing the conditional odds-ratios of several background variables, that is to see whether the conditional odds-ratios of observing multidimensional and financial poverty differ. This requires a static analysis, for instance a logit model. Table 6 below shows the odds ratios from two logit models with financial and multidimensional poverty as the respective dependent variables.

[Table 6 here]

It should be emphasized that these logit models only point at those who are vulnerable in terms of multidimensional and financial poverty. A consequence of this absence of causality is that multidimensional poverty is included in the model describing financial poverty, and vice versa.

The remainder of this paragraph will discuss whether or not the results of the models of multidimensional and financial poverty are alike. To facilitate comparison, the above Table 6 does not contain the original estimates but the odds ratios derived on the basis of the model parameters of the logistic regression (Stokes *et al.*, 1995, 168)[7]. So, the odds ratio of 2.842 for unemployment relative to having a job in Belgium should be interpreted as that the unemployed have a 2.8 times higher odds for poverty than those working. For the same reason as in both Tables 4 and 5, Table 6 does not include estimators for the intercept.

Those unemployed have a higher odd of being observed multidimensional as well as financial poor. For all countries but Denmark and Finland, the odds ratio is higher for financial poverty than multidimensional poverty. The results therefore do not contradict, but financial poverty overestimates the effect of unemployment. The effect of becoming unemployed on financial poverty is especially low in Denmark, which is a reflection of the relative generous unemployment benefit.

In Denmark and Finland, those out of the labour market have a higher log odd of multidimensional poverty than those having a job. In Belgium and Italy, the difference is not significant, and in France, Portugal and the United Kingdom, the log odd is lower. In opposition to this, the log odd of financial poverty is higher in all countries for those out of the labour market. So, the conclusions drawn on the basis of financial and multidimensional poverty in this case contradict for these last three countries. For the first four countries, the results do not contradict, but financial poverty overestimates the effect of stepping out of the labour market.

Next, consider the household typology. A distinction is made between being part of a couple (either married or cohabiting), being single without children and being single with children. Those living single without children have a higher probability of being observed as multidimensional as well as financial poor, relative to those living in a couple. The results of the two models therefore do not contradict. In Belgium, France and Portugal, this effect is stronger for multidimensional poverty, whereas the opposite is the case for the United Kingdom and especially Finland. Finally, the differences are small in Denmark and Italy. So, there is no systematic difference between the two measures of poverty.

Individuals living single with children have a higher probability of being observed multidimensional as well as financial poor. The exception is Italy, where there is only an effect on multidimensional poverty. As was the case with those living without children, the results of the two models do not contradict. However, there is a systematic difference in that the odds ratio is higher for multidimensional poverty than financial poverty in all countries but the United Kingdom and Portugal. So, the model of financial poverty underestimates this difference between those being part of a couple and those being single with children.

The difference between males and females on the probability of being observed as financial or multidimensional poor, is limited in most countries. The exceptions are Portugal (where the probability of being multidimensional poor is lower for women than men) and France and the United Kingdom (where the probability of being financially poor is lower, respectively higher for women than men). On the whole, the results do not contradict nor is there a systematic difference.

[7] Note that this also facilitates the comparison with the results in Tables 4 and 5, for a percentage change equals 100 times the odds-ratio minus 1.

In most countries, non-EU citizens have a higher probability of being observed as multidimensional poor (except Italy and Portugal where the difference is insignificant) and financial poor (except Denmark, Italy and Portugal). Apart from Denmark, the results do not contradict. In Belgium, France and Finland, the odds ratio of financial poverty is larger than that of multidimensional poverty. In these countries, the model describing financial poverty overestimates the difference between EU citizens and non-EU citizens. In Denmark, the opposite is the case, and no conclusions could be drawn for the United Kingdom, Portugal and Italy.

In all countries but Denmark, those with a lower education have a higher probability of being observed multidimensional and financial poor, so the results do not contradict. In all countries but Portugal, the model of financial poverty however overestimates the difference between education groups.

In all countries, those with a worse health have a higher probability of being observed as multidimensional poor. This is in line with the higher probability of being financial poor in Belgium and Portugal. It however contradicts with the lower probability of being financial poor in Denmark and Italy. Moreover, except in Portugal, the effect on financial poverty is lower than on multidimensional poverty, so the model of financial poverty underestimates the effect of a bad health.

Finally, the results of financial poverty in the model describing multidimensional poverty, and vice versa, show a strong correlation between financial and multidimensional poverty.

8. Conclusions

The goal of this paper is to find support for the use of the simple financial poverty measures, notably the headcount-ratio, as a proxy of multidimensional poverty. For this reason, an alternative method for the multidimensional measurement of poverty has been presented and applied to the ECHP dataset of various European countries. Finally, the results were compared with the results of using a simple income –based measure of poverty.

Having compared the estimation results in Tables 4, 5 and 6, what can be said about whether or not financial poverty can be used as a proxy for multidimensional poverty? First of all and as could be expected, the conclusions on the occurrence of contradictions and over- or underestimations in Table 4 in almost all cases are in line with the conclusions based on Tables 5 and 6. Only in the case health was there a limited contradiction in the case of Italy and Denmark. It might be that those with a poor health combine a higher probability of becoming poor with a higher probability of escaping poverty in both countries. Apart from that, the results are the same. However, the models of financial poverty overestimates the effect of several explanatory variables: becoming unemployed, stepping out of the labour market (especially in Tables 6 and 7), and having a lower education. For the case of being single without children, EU-citizenship and gender, no systematic differences were found. But what is more important, the models of financial poverty underestimate the effect of being single with children, and having a bad health.

On the whole, the magnitude of effects may differ between the models describing financial and multidimensional poverty, but the effects on multidimensional poverty and financial poverty seldom stand in opposition. If financial poverty rate is to be used as a proxy of the multidimensional poverty rate, the loss in information-value therefore does not seem to outweigh the advantages (the financial poverty rate being simple, comparable, efficient, and so forth). The conclusion therefore would be that it is fine to use financial poverty as a proxy for multidimensional poverty, as long as one realizes that one a more thorough analysis would imply the consideration of more than just disposable income, especially in the case of those being single

with children, and those having a worse health and/or handicap. For, at the end of the day, almost all those working on poverty, being scientists, politicians or social workers, appreciate that poverty is a multidimensional problem which should be dealt with by a 'multidimensional policy'. Measurement and description of the problem–which is the basis of all policy- should ideally be multidimensional as well.

So, where to go from here? Methodologically speaking, an obvious next step would be to model multidimensional poverty using latent class analysis (LCA), and consider whether this would lead to different outcomes. The reason to use cluster analysis on top of confirmatory FA, which, like LCA, is a form of structural equations modelling, was the fact that it does not make many assumptions, and that it aligns with the intuitive idea of how groups or sub-samples are created. It became however also clear that cluster analysis has some drawbacks, of which the most important is that it might be difficult to compare outcomes. It is therefore possible that using LCA would overcome some of the difficulties encountered with the above two-step method.

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Appendix

Table A1: Which variables are included for which country?

	B	DK	D	EL	E	F	IRL	I	L	NL	A	P	FIN	S	UK
1														1	4
2			1											1	
3	5	5	1					2	1	2				1	5
4			1					2	1	2				1	
5			1					2	1	2				1	
6			1					2	1	2				1	
7	5	5	1					2	1	2				1	
8			1					2	1	2				1	
9	5		1					2	1	2		5	4	1	
10		5	1					2	1	2		5		1	1
11	5	5	1					2, 5	1	2		5	4	1	1
12						2								1	
13		5				1			1						5
14		5				5		5					5		
15	5	5											5	1	5
16	5	5				5		5					5	1	1
17		5												1	
18		5													
19		5							1					1	4
20		5	1						1			5		1	
21			1						1					1	5
22			1						1					1	
23			1						1					1	
24			1						1					1	
25		5	1						1					1	
26		5	1						1				5	1	
27			1						1			5			5
28			1						1			5		1	5
29			1												5
30	5	5	1			5		5	1			5	5		5
31			1						1						5
32			1						1			5			5
33			1						1						5
34		5	1						1				5	1	5
35			1				1		1					1	5
36			1				1		1					1	
37			1				1		1				5	1	5

1=missing

2=non-missing but country-specific recoding

3=comparable between countries after country-specific recoding

4=omitted due to a low number of non-missing combinations with other variables

5=omitted to improve the fit of the model

Table A2: fit of the confirmatory factor model

BE	**GFI**	**AGFI**	**RMR**	**PGFI**		**DK**	**GFI**	**AGFI**	**RMR**	**PGFI**
96	0.9481	0.9403	0.0888	0.8805		**96**	0.9433	0.9303	0.0938	0.8445
97	0.9474	0.9394	0.0916	0.8799		**97**	0.9389	0.9250	0.0973	0.8406
98	0.9475	0.9396	0.0908	0.8800		**98**	0.9307	0.9149	0.1059	0.8332
99	0.9425	0.9338	0.0964	0.8753		**99**	0.9224	0.9047	0.1123	0.8258
00	0.9398	0.9307	0.0994	0.8725		**00**	0.9163	0.8971	0.1151	0.8203
F						**I**				
96	0.9260	0.9169	0.0935	0.8716		**96**	0.9450	0.9378	0.0893	0.8861
97	0.9290	0.9203	0.0938	0.8745		**97**	0.9215	0.9112	0.0969	0.8640
98	0.9271	0.9182	0.0950	0.8727		**98**	0.9258	0.9160	0.0950	0.8680
99	0.9200	0.9101	0.1001	0.8660		**99**	0.9235	0.9135	0.1006	0.8659
00	0.9216	0.9120	0.0978	0.8675		**00**	0.9244	0.9145	0.0986	0.8667
P						**FIN**				
96	0.9501	0.9422	0.0961	0.8799		**96**	0.9194	0.9077	0.0910	0.8561
97	0.9522	0.9447	0.0950	0.8818		**97**	0.9109	0.8979	0.0958	0.8482
98	0.9470	0.9387	0.1013	0.8770		**98**	0.9162	0.9040	0.0982	0.8531
99	0.9469	0.9386	0.0989	0.8770		**99**	0.9076	0.8942	0.1044	0.8451
00	0.9486	0.9405	0.0980	0.8785		**00**	0.9165	0.9043	0.0981	0.8534
UK										
96	0.8980	0.8717	0.1099	0.7930						
97	0.9437	0.9292	0.0828	0.8333						
98	0.9295	0.9113	0.0911	0.8208						
99	0.9346	0.9177	0.0868	0.8253						
00	0.9237	0.9040	0.0927	0.8157						

Table 1: The indicators and the base-model

No	Description	base-model
1	Anybody in the hh* has to repay debts other than mortgage, and this is a heavy burden on the hh	1
2	The hh has (great) difficulties to make ends meet	1
3	The hh cannot afford keeping its home adequately warm	1
4	The hh cannot afford paying for a week's annual holiday away from home	1
5	The hh cannot afford replacing any worn-out furniture	1
6	The hh cannot afford buying new clothes	1
7	The hh cannot afford eating meat [...] every 2nd day	1
8	The hh cannot afford having friends or family for a drink or meal at least once a month	1
9	The hh has been unable to pay scheduled rent or mortgage payments during the past year	1
10	The hh has been unable to pay utility bills during the past year	1
11	The hh has been unable to pay hire purchase instalments or other loan repayments during the past year	1
12	There is normally no money left to save	1
13	The dwelling does not have separate kitchen	2
14	The dwelling does not have bath or shower	2
15	The dwelling does not have indoor flushing toilet	2
16	does the dwelling have hot running water	2
17	The dwelling does not have heating	2
18	The dwelling does not have a place to sit outside	2
19	The accommodation does not have shortage of space	2
20	The accommodation does not have noise from neighbours or outside	2
21	The accommodation is too dark	2
22	The accommodation lacks adequate heating facilities	2
23	The accommodation have leaky roof	2
24	The accommodation have damp walls, floors, foundations, etc.	2
25	The accommodation have rot in windows, frames, etc.	2
26	There is pollution, grime etc. caused by traffic or industry	2
27	There is crime or vandalism in the area	1
28	Housing costs are a financial burden	1
29	The hh cannot afford a car or van (for private use)	1
30	The hh cannot afford a colour tv	1
31	The hh cannot afford a video recorder	1
32	The hh cannot afford a micro wave	1
33	The hh cannot afford a dish washer	1
34	The hh cannot afford a telephone	1
35	One is not satisfied with ones work or main activity	1
36	One is not satisfied with ones financial situation	1
37	One is not satisfied with ones housing situation	1

* household

Table 2: The covariances between the two factors:

	1996	**1997**	**1998**	**1999**	**2000**
BE	0.622	0.694	0.624	0.640	0.697
DK	0.503	0.488	0.506	0.504	0.331
F	0.548	0.549	0.568	0.559	0.560
I	0.703	0.666	0.689	0.715	0.699
P	0.743	0.767	0.748	-0.743	0.747
FIN	0.616	0.598	0.636	0.580	0.617
UK	0.510	0.545	0.502	0.444	0.420

Table 3a: Interpretation of the clusters on the basis of the factor scores: Portugal, 1997.

No of Clusters	**Pseudo R^2**	**Pseudo F**	**Pseudo t^2**
1	0.54930	.	13981.78
2	0.00470	13981.78	165.70
3	0.25398	7124.52	16933.39
4	0.01718	16088.82	1017.39
5	0.00030	13532.78	33.62
Cluster	**% of sample**	**t-value ($\mu_{factor1}\neq 0$)**	**t-value ($\mu_{factor2}\neq 0$)**
1	88.94	-31.92	-82.92
2	11.06	77.68	156.03

Table 3b: Interpretation of the clusters on the basis of the factor scores: U.K, 1998.

No of Clusters	**Pseudo R2**	**Pseudo F**	**Pseudo t2**
1	0.09352	.	862.85
2	0.2432	862.85	3063.49
3	0.31567	2122.71	7816.26
4	0.01892	5231.07	254.39
5	0.00082	4268.9	15.35
6	0.01051	3427.5	199.96
7	0.00081	2996.6	16.49
Cluster	**% of sample**	**t-value ($\mu_{factor1}\neq 0$)**	**t-value ($\mu_{factor2}\neq 0$)**
1	89.6	-29.4829	-53.0986
2	5.59	17.3337	63.7927
3	4.25	81.3662	13.7557
4	0.55	29.9687	41.6609

Table 3c: Interpretation of the clusters on the basis of the factor scores: Denmark, 1998.

No of Clusters	**Pseudo R2**	**Pseudo F**	**Pseudo t2**
1	0.64408	.	7412.36
2	0.02291	7412.36	425.97
3	0.24949	4100.97	12923.93
4	0.02179	14975.75	756.97
5	0.00051	13488.84	62.26
Cluster	**% of sample**	**t-value ($\mu_{factor1}\neq 0$)**	**t-value ($\mu_{factor2}\neq 0$)**
1	83.88	-64.33	-325.87
2	13.09	55.86	-66.99
3	1.50	0.62	444.89
4	1.53	24.84	527.90

Figure 1: multidimensional poverty in European countries

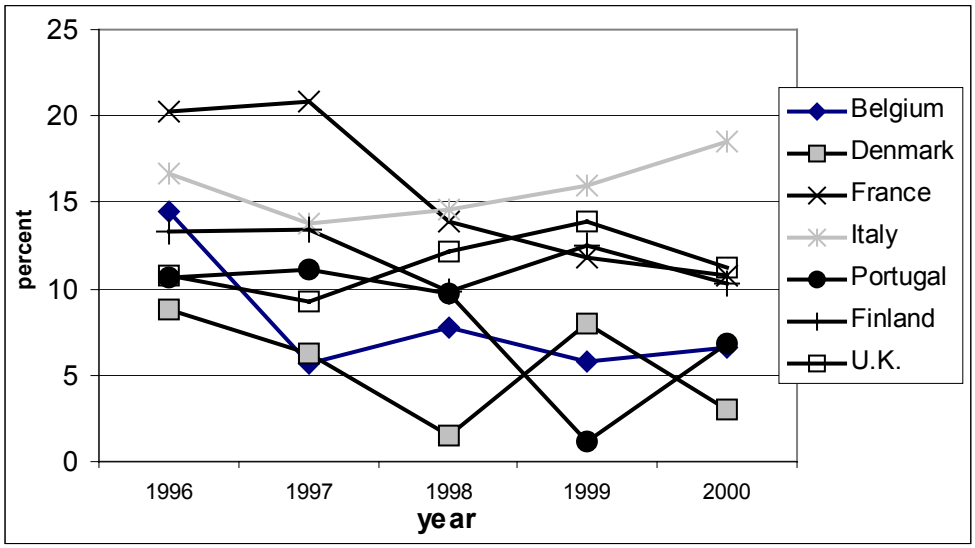
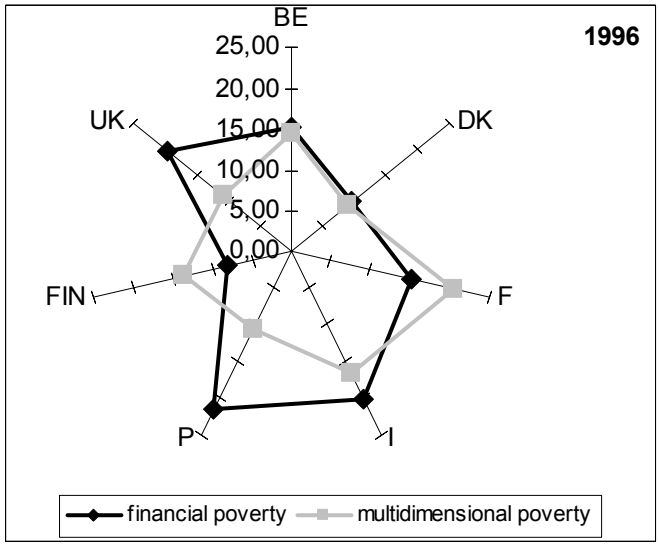
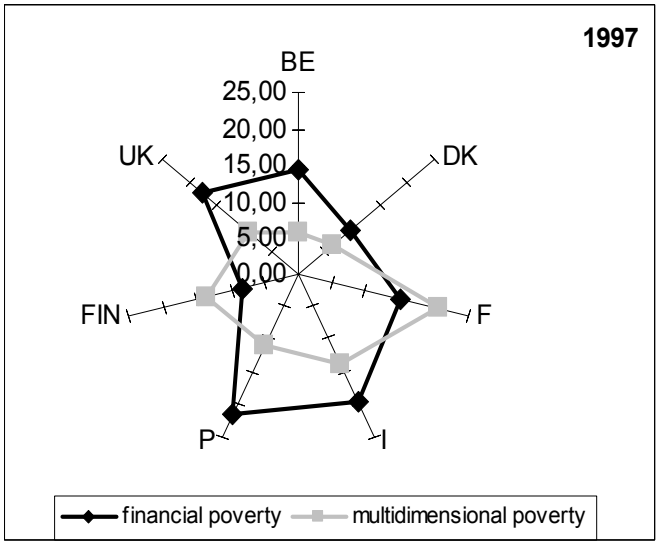
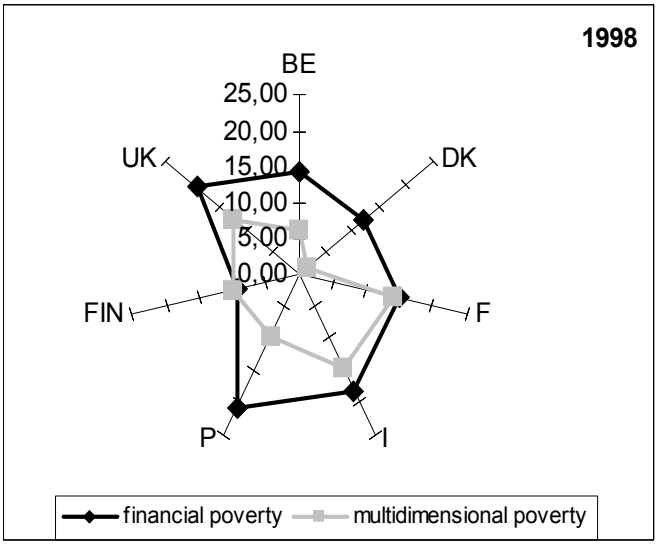
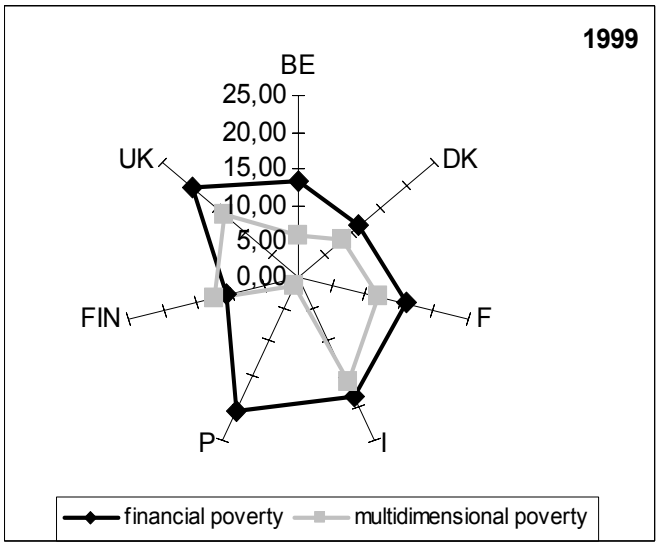


Figure 2: financial and multidimensional poverty









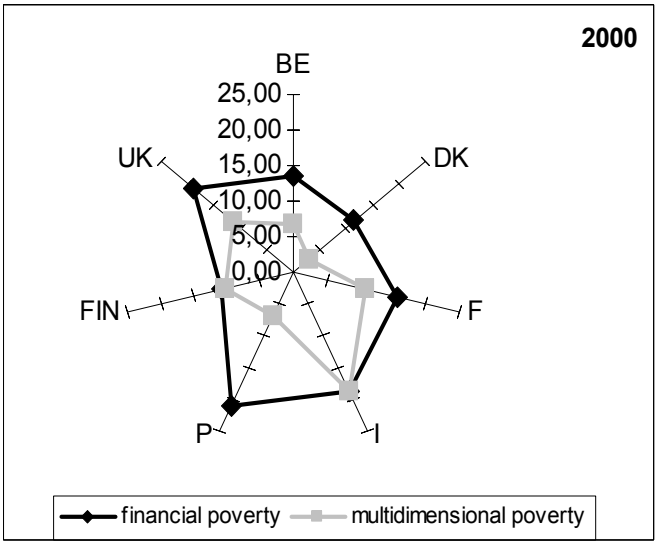


Table 4: Estimation results of a survival model explaining poverty

	BE		DK		F		I	
	Estimate	**%**	**estimate**	**%**	**Estimate**	**%**	**estimate**	**%**
Unemployment ←working	0.453***	57.350	0.355***	42.547	0.322***	37.961	0.279***	32.128
Out of labour m. ←Working	0.290***	33.656	0.293***	34.031	0.161***	17.515	0.026***	2.644
Out of labour m. ← unemployment	-0.163**	-15.041	-0.062		-0.160***	-14.820	-0.253***	-22.315
Single no children←couple	0.212***	23.652	0.186***	20.430	0.239***	27.059	0.290***	33.643
Single w. children←couple	0.091		0.174**	19.003	0.178***	19.522	0.180***	19.680
Single w. children← Single no children	-0.121		-0.012		-0.061		-0.110**	-10.452
Age	-0.009***	-0.858	-0.014***	-1.390	-0.007***	-0.740	-0.010***	-0.947
Gender	-0.043		-0.038		-0.077***	-7.420	-0.032	
EU-citizenship	0.675***	96.403	0.461***	58.518	0.412***	50.968	0.389**	47.580
Level of education	0.193***	21.337	0.218***	24.334	-0.060***	-5.795	0.274***	31.574
Health	0.407***	50.291	0.261***	29.823	0.322***	37.988	0.294***	34.111
Financial poverty	0.311***	36.424	0.136**	14.603	0.337***	40.018	0.367***	44.340
Year	-0.286***	-24.851	-0.410***	-33.635	-0.546***	-42.074	-0.251***	-22.206
Likelihood	860.635***		1136.137***		2946.183***		2099.527***	
Score	862.515***		1083.993***		2646.084***		2076.323***	
Wald	848.970***		1024.749***		2402.309***		2040.217***	
Transitions	3290		2908		6277		9953	
No transitions	19135		16211		33777		49374	
	P		**FIN**		**UK**			
	estimate	**%**	**estimate**	**%**	**Estimate**	**%**		
Unemployment ←working	0.420***	52.181	0.607***	83.547	0.478***	61.236		
Out of labour m. ←Working	0.249***	28.326	0.303***	35.337	0.358***	43.018		
Out of labour m. ← unemployment	-0.171*	-15.678	-0.305***	-26.272	-0.120			
Single no children←couple	0.621***	86.004	-0.137***	-12.826	0.364***	43.838		
Single w. children←couple	0.217***	24.259	0.123**	13.034	0.275***	31.675		
Single w. children← Single no children	-0.403***	-33.196	0.260***	29.667	-0.088			
Age	-0.009***	-0.896	-0.017***	-1.666	-0.019***	-1.902		
Gender	-0.140***	-13.082	-0.124***	-11.680	-0.153***	-14.178		
EU-citizenship	-1.121***	-67.388	0.386**	47.064	0.317***	37.259		
Level of education	0.118***	12.491	0.279***	32.181	0.015			
Health	0.249***	28.313	-		0.547***	72.772		
Financial poverty	0.358***	43.061	0.049		0.523***	68.658		
Year	-0.499***	-39.256	-0.128***	-12.050	-0.267***	-23.425		
Likelihood	2307.175***		1120.235***		1234.324***			
Score	2154.887***		1130.794***		1310.905***			
Wald	2023.386***		1217.900***		1286.349***			
Transitions	4531		2865		3336			
No transitions	46045		22031		30340			

***p<1%, **p<5%, *p<10%

Table 5: Estimation results of a survival model explaining financial poverty

	BE		DK		F		I	
	Estimate	**%**	**Estimate**	**%**	**Estimate**	**%**	**Estimate**	**%**
Unemployment ←working	0.622***	86.265	0.481***	61.818	0.490***	63.199	0.501***	65.037
Out of labour m. ←Working	0.367***	44.282	0.557***	74.578	0.384***	46.844	0.151***	16.346
Out of labour m. ← unemployment	-0.255***	-22.537	0.076		-0.106*	-10.013	-0.350***	-29.496
Single no children←couple	0.096*	10.036	0.302***	35.209	0.123***	13.129	0.249***	28.302
Single w. children←couple	0.093		0.019		0.121***	12.913	0.071*	7.357
Single w. children← Single no children	-0.003		-0.282**	-24.603	-0.002		-0.178***	-16.331
Age	-0.005***	-0.452	-0.012***	-1.232	-0.009***	-0.945	-0.013***	-1.321
Gender	-0.052		-0.060		-0.109***	-10.354	-0.044**	-4.295
EU-citizenship	0.848***	133.544	0.409**	50.456	0.729***	107.218	0.457**	57.901
Level of education	0.208***	23.072	0.244***	27.685	-0.009		0.314***	36.930
Health	0.256***	29.201	0.102		0.229***	25.722	0.141***	15.119
Year	-0.266***	-23.325	-0.431***	-34.995	-0.390***	-32.294	-0.299***	-25.822
Likelihood	769.903***		1333.159***		1756.771***		2209.673***	
Score	771.410***		1268.568***		1677.999***		2120.875***	
Wald	750.417***		1192.087***		1586.354***		2094.048***	
Transitions	3216		2895		5723		9305	
No transitions	15209		14988		35022		47834	
	P		**FIN**		**UK**			
	Estimate	**%**	**Estimate**	**%**	**Estimate**	**%**		
Unemployment ←working	0.617***	85.280	0.446***	56.221	0.891***	143.781		
Out of labour m. ←Working	0.390***	47.669	0.400***	49.182	0.726***	106.742		
Out of labour m. ← unemployment	-0.227***		-0.046		-0.165*			
Single no children←couple	0.300***	35.040	-0.108**	-10.216	0.347***	41.452		
Single w. children←couple	0.039		-0.009		0.224***	25.101		
Single w. children← Single no children	-0.261**	-22.995	0.098		-0.123			
Age	-0.009***	-0.930	-0.020***	-1.951	-0.022***	-2.205		
Gender	-0.064***	-6.162	-0.126***	-11.874	-0.103***	-9.751		
EU-citizenship	1.552***	372.043	0.533***	70.353	0.232**	26.125		
Level of education	0.322***	38.030	0.299***	34.864	0.104***	10.982		
Health	0.186***	20.466	-		0.436***	54.635		
Year	-0.391***	-32.376	-0.123***	-11.538	-0.268***	-23.525		
Likelihood	1769.090***		1244.655***		1099.313***			
Score	1625.790***		1269.289***		1149.593***			
Wald	1531.979***		1376.635***		1131.079***			
Transitions	5068		5569		3043			
No transitions	35881		22408		29549			

***p<1%, **p<5%, *p<10%

Table 6: Who are the poor? The conditional odds-ratio of some categories of individuals compared

multidimensional poverty	BE	DK	F	I	P	FIN	UK
Unemployment ←working	2.842***	3.186***	2.940***	1.970***	1.210**	3.515***	2.515***
Out of labour m. ←Working	0.898	1.142*	0.817***	0.981	0.924*	1.151***	0.845***
Out of labour m. ← Unemployment	0.316***	0.358***	0.278***	0.498***	0.764***	0.327***	0.336***
Single no children←couple	2.725***	2.050***	1.749***	1.112***	2.841***	2.483***	1.620***
Single w. children←couple	3.343***	3.082***	2.034***	1.285***	1.560***	2.920***	2.739***
Single w. children← Single no children	1.227**	1.503***	1.163*	1.156***	0.549***	1.176**	1.690***
Gender	1.050	0.935	0.956	0.976	0.903***	0.996	0.973
EU-citizenship	1.936***	2.309***	2.478***	1.150	1.224	1.808***	1.692***
Level of education	1.542***	1.058	1.233***	1.642***	6.640***	1.061**	1.041*
Health	2.666***	2.070***	2.145***	2.037***	1.622***	-	2.037***
Financial poverty	3.439***	1.707***	3.535***	3.421***	2.974***	2.506***	2.314***
Likelihood	1478.609***	444.8527***	3581.27***	4624.37***	3103.13***	2081.04***	1335.89***
Score	1918.639***	565.302***	4318. 57***	5193.60***	3281.74***	2525.49***	1599.61***
Wald	1413.449***	492.4221***	3430.09***	4479.76***	2306.51***	2055.53***	1393.53***
Poor	1498.26	1090.17	6720.41	9472.15	3593.79	3544.75	3421.83
Non-poor	18326.05	18879.24	37873.92	52967.81	40567.39	27195.77	27552.50
financial poverty	BE	DK	F	I	P	FIN	UK
Unemployment ←working	4.359***	1.561***	3.178***	5.870***	1.493***	2.804***	5.180***
Out of labour m. ←Working	2.809***	4.771***	2.346***	1.604***	1.590***	1.867***	3.148***
Out of labour m. ← unemployment	0.644***	3.057***	0.738***	0.273***	1.065	0.666***	0.608***
Single no children←couple	1.403***	3.595***	1.422***	1.206***	2.400***	5.766***	2.330***
Single w. children←couple	1.220**	1.472***	1.349***	1.007	1.423***	1.373***	2.928***
Single w. children← Single no children	1.403	0.409***	0.948	0.835***	0.593***	0.238***	1.256***
Gender	0.985	0.936	0.904***	1.006	1.012	1.033	1.103***
EU-citizenship	2.599***	1.097	5.209***	1.299	1.262	3.591***	1.909***
Level of education	1.782***	1.553***	1.601***	1.980***	2.824***	1.415***	1.339***
Health	1.185**	0.849**	1.002	0.797***	1.666***	-	1.042
multidimensional poverty	3.424***	1.755***	3.566***	3.435***	2.965***	2.547***	2.330***
Likelihood	2038.83***	2506.88***	4323.87***	6601.27***	4855.73***	3667.18***	1335.89***
Score	2194.99***	2742.19***	4850.61***	7138.11***	4910.79***	4187.29***	1599.61***
Wald	1705.62***	2085.93***	3781.16***	5752.35***	3844.55***	3117.25***	1393.53***
Poor	2476.32	2343.68	5927.75	11328.37	8907.15	3164.50	4646.46
Non-poor	17347.99	17625.73	38666.59	51081.59	35254.03	27576.02	26327.87

***p<1%, **p<5%, *p<10%

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