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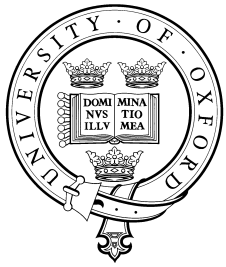

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Multidimensional Poverty in Europe 2006–2012: Illustrating a Methodology

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Abstract
Multidimensional approaches to poverty and deprivation have a long and distinguished history in conceptual and philosophical work (Sen 1992). This chapter explores multidimensional poverty using EU-SILC data from 2006 to 2012. We calculate a multidimensional poverty index based on the Alkire Foster (AF) methodology – a widely used flexible methodology which can accommodate different indicators, weights and cut-offs. We draw on existing Europe 2020 indicators, as well as on indicators of health, education and the living environment. Aggregated and country cross sectional results are presented. A short analysis of dynamics of multidimensional poverty is also included.

Keywords: Multidimensional Poverty, Poverty Analysis, Poverty Trends, EU-SILC, Poverty measurement.

JEL classification: I32, D63, H1, O52

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The Oxford Poverty and Human Development Initiative (OPHI) is a research centre within the Oxford Department of International Development, Queen Elizabeth House, at the University of Oxford. Led by Sabina Alkire, OPHI aspires to build and advance a more systematic methodological and economic framework for reducing multidimensional poverty, grounded in people's experiences and values.

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1. Introduction

Methodologies of multidimensional poverty measurement that draw on the "counting" approach have been used in policy applications since the 1970s, and are gaining greater momentum (Townsend 1979; Erikson 1993, see Atkinson 2003, Nolan and Whelan 2011, and Alkire *et al.* 2015, Chapter 4 for reviews). To date many studies have focused on understanding the structure among deprivations, and on identifying the normative, policy, and statistical tools that can best justify the collection of data on distinct indicators (Atkinson *et al.* 2002; Marlier et al 2007, Atkinson and Marlier 2010a and the references therein). Others have used statistical methods to address a different but related issue: why indicators might be aggregated into a single indicator covering one relevant dimension such as material deprivation (OECD 2008 and Guio *et al.* 2012). But how do we measure and analyse the interrelationships among explicitly diverse dimensions, each of which contributes to poverty? Drawing upon previous studies, this chapter presents a set of experimental indices of multidimensional poverty which use an adjusted headcount ratio M_0 that builds on a counting-based dual-cut-off methodology (Alkire and Foster 2011, 2011a). We show how these measures can be used to provide diverse and specific descriptive analyses, and why they may complement existing measurement approaches.

The methodology is flexible in that different indicators, cut-offs and weights can be used, including binary, ordinal and ordered categorical variables as well as those that are cardinal or ratio-scale. Unlike the headcount ratio which has been traditionally used with counting-based measures in both Europe and Latin America, the Alkire-Foster (AF) family of measures incorporate the joint distribution of deprivation and include a new feature of intensity – which shows the percentage of weighted indicators in which the average poor person is deprived. Incorporating intensity into the measure itself enables the multidimensional poverty measure to be broken down by indicator (after identification), to show the levels and composition of deprivations poor people experience. This is not possible with counting-based headcount ratios but is important for designing policies to reduce multidimensional poverty. Measured poverty also changes if intensity changes, which creates policy incentives to address those that are not near-poor only. Where data permit, the measure and each of its consistent indicators can be further broken down by subgroups such as gender, age, social groups or regions. The global Multidimensional Poverty Index (MPI) which is released by UNDP's Human Development Reports and covers 110 countries in 2015 is based on this methodology (Alkire and Santos 2010, 2014; UNDP 2010), as are official national MPIs, such as those of Colombia, Chile, Mexico, the Philippines, and Bhutan.

Among OECD countries, there have been academic efforts and in some cases political interest to estimate a multidimensional poverty index. Mexico and Chile have official multidimensional poverty indices using the AF method. One of the first applications of the AF method in Europe was implemented using the 2009 EU-SILC dataset by Whelan, Nolan and Maître (2014). This chapter extends Whelan et al.'s work by constructing AF poverty measures across time periods 2006–2012, using, necessarily, a more limited set of indicators. In doing so, we demonstrate the analysis of the multidimensional poverty indicator in one period and across time, and report its associated partial indices: headcount ratio, intensity, and indicator-specific indices. This paper thus illustrates the kinds of analyses that could be done using this methodology. It does of course require that a set of dimensions and indicators be agreed upon by a legitimate process, and that fully consistent and comparable variable definitions and data sources be used.

The paper proceeds as follows. Section 2 briefly situates this topic in the literature and Section 3 introduces the AF methodology. Section 4 introduces the data then presents an experimental index of multidimensional poverty, using cross-sectional EU-SILC data and the individual as unit of analysis to construct and describe a set of deprivations. Section 5 presents the AF results, first showing a series of poverty cut-offs across time to illustrate the likely robustness of analyses. On the basis of a particular cut-off, it then presents the overall results across all countries having data in all periods as well as component partial indices: the headcount ratio or percentage of the population identified as multi-dimensionally poor (H), and the intensity, or average percentage of weighted deprivations experienced by poor people (A), and censored headcount ratios for each component indicator.[1] Section 6 concludes.

2. Brief Literature Review

Multidimensional approaches to poverty and deprivation have a long and distinguished history in conceptual and philosophical work (Sen 1992). The late 1960s and early 1970s saw the entrance of policy applications, with the 1968 Swedish Level of Living Study (Allardt and Uusitalo 1972 and Johannson 1973); Jacques Delors' 1971 *Les indicateurs sociaux* and P.Ch. Ludz's *Materialien zum Bericht zur Lage der Nation* (1971), each providing independent impetus in different countries and across Europe for this effort.

[1] Censored headcount ratios show the percentage of people who are identified as poor and are deprived in each particular indicator.

In more recent literature, significant attention has been paid to the relationship among deprivations, and to methodologies to validate indicators used in multidimensional indices (Nolan and Whelan 2010, 2011; Layte et al 2001; Atkinson *et al.* 2002; Gordon *et al.* 2003; Saunders and Adelman 2006; Whelan 2007; Marlier *et al.* 2007; OECD 2008 and Alkire *et al.* 2015). Drawing on the 2004 EU-SILC data, Guio (2005) proposed a multidimensional indicator of Material Deprivation, which reflected deprivations such as poor housing, lack of durable assets, and economic strain. Based on Guio *et al.* (2009), material deprivation indicators were adopted in the EU portfolio of commonly agreed social indicators in 2009. Two indicators were adopted: the first indicator provided the proportion of people lacking at least three items out of nine items covering different aspects of economic strain and lack of durables (housing deprivation was included in the EU portfolio as a separate indicator). The second indicator reflected the intensity of deprivation (i.e. the average number of items lacked by deprived people). At the EU level, material deprivation gained in importance in 2010 when the EU leaders launched the new "Europe 2020 Strategy" and set in this context an EU social inclusion target, which consisted of lifting at least 20 million people out of the risk of poverty or social exclusion in the EU by 2020. The Europe 2020 indicator of "at risk of poverty or social exclusion" on which the target is based on consisted of the union of three indicators: income poverty, severe material deprivation and (quasi-)joblessness. In this context, a "severe" deprivation indicator was introduced, which was built using a threshold set at four rather than three items. These indicators of material deprivation at EU level were based on the limited information available in the core EU-SILC survey. To enlarge the available information, a thematic module on material deprivation was collected in 2009. Using this module, Guio *et al.* (2012) propose a revised version of the official EU material deprivation indicators, with a view to enlarge the set of items and their reliability. The revised set includes thirteen deprivation items, i.e. six items included in the current EU material deprivation indicator and seven items covering new aspects, such as basic needs, social activities, access to internet etc. Based on this proposal, the 13-item list was also collected in EU-SILC 2013 and 2014 in order to analyse the evolution over time of this extended list. A set of parallel papers explored the 2009 thematic module with respect to child deprivation (Bradshaw 2009; Guio *et al.* 2012).

Whelan (2007) used the Irish component of the 2004 EU-SILC dataset to develop an 11-item "consistent poverty" index (combining material deprivation and income poverty); and Whelan and Maître (2009) use a range of statistical methods such as correlation and factor analysis; goodness of fit tests like root mean square error of approximation; and reliability tests like Cronbach's Alpha, to identify three dimensions of material deprivation (consumption, household facilities, and

neighbourhood environment) and examine their relationship to income poverty. Coromaldi and Zoli (2012) clarify the added value of non-linear principal component analysis, NLPCA, to these techniques. Naturally, this deep analysis of the structure of deprivations resulted in a set of empirical and policy studies on the relationship between income and other deprivations (Verbist and Lefebure 2008, Whelan and Maitre 2009, Jana *et al.* 2012) and also gave rise to applied AF multidimensional measures (Whelan *et al.* 2014).

The EU-SILC dataset has also been used to illustrate other multidimensional poverty measurement methodologies (Chakravarty and D'Ambrosio 2006; Bossert *et al.* 2013, among others). Brandolini (2007) explored Atkinson's (2003) counting approach using data for France, Germany and Italy and a headcount ratio associated with the minimum proportion of deprivations a person has, and compared the various deprivation measures with income poverty measures. He drew attention to the sensitivity of cross-national comparisons to weights, and to the deprivation cut-off. This chapter adds to this already significant recent literature by illustrating the rich variety of analyses that can be accomplished using one particular methodology able to capture the multiple dimensions of poverty.

3. The Alkire Foster (AF) Methodology

This section briefly introduces the class of M_α measures developed by Alkire and Foster (AF) that build on the Foster Greer Thorbecke (FGT) index (Alkire and Foster 2011). There are a total of n persons (rows) and the wellbeing of each is measured in a total of d dimensions (columns). When referring to a particular person we call them i, and a particular dimension j. The whole dataset is collected in a matrix where each cell represents the achievement level of individual i (from 1 to n) in dimension j (from 1 to d). So looking across a row of the matrix gives the full picture of achievements for one person, and looking down a column gives the full picture for a given dimension.

To focus on deprivations, at the top of each column of the matrix, we set a cut-off, z_j for that dimension of deprivation. For each dimension, an individual i is deprived in dimension j if her achievement level is lower than the dimension cut-off (z_j). A deprivation matrix (g^0) compiles this information, assigning a 1 if individual i is deprived in dimension d and a 0 if the individual is not deprived. So looking across a row of the matrix gives the full deprivation profile for one person, and looking down a column gives the deprivations for a given dimension. For each person we now look at the row and add up the positive entries weighting each dimension by its value (w_j) where values

sum to 1. The weighted sum (c_i) shows the deprivation score, or percentage of weighted deprivations suffered by person i.

Next, we identify who is multi-dimensionally poor. A person is identified as poor if their weighted deprivation score c_i is higher than the poverty cut-off k. For example, if a person is deprived in 40% of the dimensions (that is their weighted deprivation score is 40%) and the poverty cut-off is 20%, that person is identified as poor because 40% > 20%. This has been called an intermediate or dual cut-off identification method, because it uses the deprivation cut-offs z_j to determine whether a person is deprived or not in each dimension, and the poverty cut-off k to determine who is to be considered multidimensionally poor.[2]

Having identified the poor, we construct a *censored* deprivation matrix $\mathrm{g}^0(k)$ that contains solely the weighted deprivations of those persons who have been identified as poor, and replaces deprivations of non-poor people with zeros. The censored deprivation matrix is the basis of the AF multidimensional poverty measure and its associated dimensional partial indices. For example, the censored headcount ratios are simply the mean of its columns. The measure M_0 is the mean of the matrix times *d*, or equivalently, the mean of the censored vector of deprivation scores $(c_i\ (k))$. M_0 – which in other studies is called MPI to signify it is a multidimensional poverty index – can also be expressed as the product of the (multidimensional) headcount ratio (H) and the average deprivation share among the poor (A). *H* is simply the proportion of people that are poor, or q/n where q is the number of poor people. A is the average share of weighted deprivations poor people experience – $A = \sum_{\mathrm{i=1}}^{\mathrm{n}} c_i(k)/q$ – and reflects the intensity of multidimensional poverty.[3]

For tracking changes across time, the number, level and significance of changes in multidimensional poverty measures and their associated partial indices can be directly compared, and absolute and relative rates of change can be analysed. Alkire *et al.* (2015, Chapter 9) provides a systematic presentation of different methodologies for assessing poverty dynamics using repeated cross-section data.

[2] This identification strategy can also be represented, following Bourguignon and Chakravarty (2003), by an *identification function* $\varrho: R_+^d \times R_{++}^d \rightarrow \{0,1\}$, which maps from person i's achievement vector $y_i \in R_+^d$ and cut-off vector z in R_{++}^d to an indicator variable in such a way that $\varrho(y_i; z) = 1$ if person i is poor and $\varrho(y_i; z) = 0$ if person i is not poor.

[3] M_0 satisfies a number of useful axioms, specifically: replication invariance, symmetry, poverty focus, deprivation focus, weak monotonicity, non-triviality, normalisation, dimensional monotonicity, subgroup decomposability, dimensional breakdown, ordinality and weak re-arrangement (Alkire and Foster 2011, 2016).

4. Data and Measurement Design

This chapter uses data from the European Union Statistics on Income and Living Conditions (EU-SILC) to generate and compare a multidimensional poverty measure made from 12 indicators across time and space. It is important to note that this illustrative measure is limited by variable definition (comparable variables must be present across time periods and must be accurate at the unit level rather than only on average) as well as by data availability (missing values in any variable must be low).

The indicators of these measures are data constrained. EU-SILC indicators tend to be defined in the space of resources, in the case of At-Risk-Of-Poverty indicator ("AROP", relative income), severe material deprivation or housing – or common proxies for functionings, such as levels of schooling and employment status. Particular challenges are evident in the educational indicator, because the years of schooling that correspond to primary education vary across EU-SILC countries as may educational quality. Some indicators draw upon self-assessments – for example, evaluations of noise and safety and health – which may not reflect the objective risk of violence or noise vibrations in a neighbourhood or objective health status. If a measure is intended to reflect deprivations in the functionings or capabilities that poor people experience (Sen 1992), then it would be necessary to examine in what way each indicator could be interpreted to proxy functionings and the anticipated accuracy of such proxies for diverse individuals. Rather than doing so, in this case we draw upon the rich existing literature justifying the EU-SILC indicators (Atkinson and Marlier 2010).

Where aggregate figures are reported, these include information only from countries with data available across all years. The aggregate figures include (population-weighted) data of Austria, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and United Kingdom. On grounds of incomplete information across years[4], we excluded from the aggregate results information of Belgium (2012), Bulgaria (2006), Croatia (2006-2010), Ireland (2012), Malta (2006-2007), Romania (2006) and Switzerland (2006-2007). Additionally, due to irregularities in the education variable PE040 (Highest ISCED level attained), Finland (2007) was also excluded. Finland shows that all individuals have primary education across all years except in

[4] In cases of incomplete information, missing years by country are presented next to each country in parenthesis.

2007. In 2007, 18% of the population did not have primary education. For national results, we include all countries.[5]

In this analysis, we have adopted a rigorous approach to the treatment of missing values. At the country level we excluded countries with unavailable or inconsistent data across periods from aggregate results. At the individual level, we drop respondents having a missing value in any indicator. For a subset of register countries (Denmark, Finland, Iceland, Netherlands, Norway, Slovenia and Sweden), which only collect individual information for one adult in the household (i.e. "the selected respondent"), the measure is constructed only from respondents with information in all indicators and using the specific sampling weight for this subgroup of selected respondents (PB060). The EU-SILC data for the retained sample are then adjusted for missing observations using sampling weights. By reweighted the retained sample, we maintain the original population of each country. Regarding the analysis of standard errors, we followed Goedemé (2013).

4.1 Unit of Analysis

Different units of analysis are possible using the EU-SILC dataset: individual adults; adults or children by household, and households. Here we use the individual as a unit of analysis, i.e. persons aged 16 years or more, for which the individual questionnaire was collected. That is, the individual's achievements in health and education are used to identify their own deprivations. Household level variables are used to identify individuals as deprived or non-deprived in terms of at risk of income poverty, severe material deprivations, (quasi) joblessness, housing, noise, crime and pollution. This way of proceeding is useful because the resulting measures can be disaggregated by gender and age. However normatively using the individual adult as a unit of identification overlooks (and does not foster) intra-household sharing and caring in the individually measured dimensions. For example, having a chronic disability in a household which can effectively care for such a person is very different than having the same health condition and living alone. Some policy aims support a household focus, but we have chosen an individual focus for several reasons. In the EU-SILC dataset, a household approach generates a larger sample drop because of missing variables, particularly in register countries. Furthermore, household structures vary across Europe (Iacovou and Skew 2010). Also, the appropriate "cut-off" for household level indicators built with individual

[5] We also observed uncommon changes in housing in Hungary (2008) and Bulgaria (2007-2008) and unmet Medical Needs in Portugal (2007) but numbers were contrasted and corroborated with official statistics.

education and health data would require separate analysis.[6] Finally, in the EU-context, social rights tend to be individually based. For that reason, in this experimental measure the individual is taken as a unit of identification, with the consequence of not including child poverty.

It would be possible to use the household as a unit of analysis with EU-SILC data in non-register countries. In this case, all household members would be deprived in education, and health indicators depending upon the joint deprivations of those household members (which might include children) for whom data were available. This method – which was used for example in the global MPI (Alkire and Santos 2014) – can reflect intra-household sharing and child deprivations. In this case, the results still can be aggregated using individual sampling weights such that the unit of analysis (individual) reflects the proportion of people who are poor.

4.2 Dimensions, Indicators and Weights

The dimensions and indicators of deprivation in this chapter draw upon three earlier papers in which we implemented more than seven experimental measures, each having three to six dimensions and a variety of differently defined indicators (Alkire, Apablaza and Jung 2014,). The experimental index presented in this chapter has six equally weighted dimensions, and each indicator within a dimension is likewise equally weighted. Dimensions of health and education and some form of economic welfare are present in most descriptions of multidimensional poverty (Alkire 2002). Drawing on the arguments provided in Whelan et al (2014) and Guio and Maquet (2006), our measure adds to these a dimension of the living environment, which includes housing and neighbourhood considerations: noise, pollution and safety. In this measure, each indicator related to the Europe 2020 social inclusion target becomes its own separate dimension and education, health, and the living environment each enter as separate dimensions making a total of six dimensions, with 50% of the weight on Europe-2020-related indicators.

Terminologically, dimensions are organising concepts that in this case govern the weights attached to indicators. They may also be used to communicate the results in public. Once again, the discussion of the appropriate dimensions to organise the measurement of deprivation has a long history, which can inform present discussions. Because the index is experimental we do not provide an extensive normative justification of the dimensions drawing on people's own values, the theoretical literature, the policy purpose of the measure, and other considerations. Such an extensive

[6] The aggregation of intra-household data and the setting of deprivation cut-offs require normative, policy, and empirical exploration to justify. Assumptions of intra-household sharing must be considered (Alkire and Santos 2014).

justification is provided in the case of official multidimensional poverty measures. Alkire, Apablaza and Jung (2014) provide a set of dimensions and in some cases indicators that have been used in the European context (see also Atkinson *et al.* 2002).

Table 1 describes each component indicator of the experimental measure, its deprivation cut-off and evolution over time. Several notes may be in order. First, other studies have not necessarily included education, perhaps due to country differences in the definition of levels of education. These measures retain education because of its importance, and consider a person to be deprived if they have not completed primary school. But the indicator is not necessarily comparable, because the same levels of education may correspond to differing number of years in different countries. As for the Europe 2020 severe material deprivation indicator, because of data limitations we are not able to implement the 2009 severe material deprivation index with improved indicators proposed in (Guio *et al.* 2012). In our indicator, people severely deprived are those living in a household that experiences at least four out of the nine following deprivation items – the household cannot afford (i) to pay rent or utility bills, (ii) to keep home adequately warm, (iii) to face unexpected expenses, (iv) to eat meat, fish or a protein equivalent every second day, (v) to have a week holiday away from home during the year, (vi) to have access to a car, (vii) to have a washing machine, (viii) to have a colour TV, or (ix) to have a telephone. For income poverty and material deprivation our indicators are constructed following the Europe 2020 multidimensional poverty measure component indicators. The At-Risk-Of-Poverty indicator follows the Europe 2020 standards, and considers a person at risk of poverty (AROP) if their household income is less than 60% of the national median equivalised disposable income. The lack of detailed information regarding part-time jobs before 2009 renders impossible the precise replication of the Europe 2020 quasi-joblessness indicator, but does provide comparability across years for a similar indicator. In our (quasi) joblessness indicator, we extend the quasi-joblessness condition to all members of the household. Households that exclusively contain persons out of the reference group are considered non-deprived. In other words, we identify all individuals in jobless households as deprived; and identify households with only elderly people, or only students as non-deprived.

4.3 Uncensored Headcount Ratios of Deprivations in Each Indicator

The deprivation rates in all indicators in the years 2006 and 2012 are reported in Table 1. The table includes all deprivations of all individuals for whom no data on any indicator is missing, and covers EU countries with consistent data between 2006 and 2012. There are several points to note. First,

the AROP percentages roughly match those published in other sources (see the Eurostat website, Nolan et al 2010).[7]

Second, in the aggregate data, of the three indicators used in the Europe 2020 poverty measure, deprivations in income tend to be the highest although this varies by country. The indicators that tend to have the highest incidence overall are perceptual data of chronic health status, and the self-reported incidence of noise. However, incidence varies considerably across countries. The challenges inherent in interpreting the subjective indicator levels and trends are biased from personality and adaptive preferences or knowledge asymmetries – that may evolve over time. The fact that these indicators carry a lighter weight may ease interpretation of the trends somewhat.

In education we merely remind the reader that educational deprivations depend in part upon the definition of primary school, and the duration thereof varies across the included countries.

Several empirical techniques that are useful to understand the interrelationships between indicators have been explored in the longer papers but are not detailed here (Alkire Apablaza and Jung 2014). It may only be worth mentioning headline results from a measure of redundancy represented by the percentage of the population experiencing both deprivations, divided by the lower of the two marginal headcount ratios of deprivation (Alkire *et al.* 2015). For example: in the case of **(quasi-) joblessness and at-risk-of-poverty**, only 27% of the people who are quasi-jobless are also at-risk-of-poverty. The highest redundancy value of 55% is found between morbidity and health – that is, 55% of those who are deprived in terms of morbidity have low self-reported health, but in 45% of cases, persons who report deprivations in morbidity do *not* experience low self-reported health, and for this reason, both variables are retained.

[7] We are grateful to Brian Nolan and Bernard Maître for direction in constructing this variable.

Table 1: Dimensions, Indicators, Weights and Uncensored Headcount per dimension between 2006 and 2012 (percentage of individuals in EU countries with consistent data in all years as discussed in Section 4)

Dimension	Variable	Respondent is not deprived if:	2006	2007	2008	2009	2010	2011	2012
Income	AROP (1/6)	The respondent lives in a household whose equivalised disposable income is above 60% of the national median	15.1%	15.3%	14.9%	14.9%	15.1%	15.5%	15.5%
Employment	Quasi-Joblessness (1/6)	The respondent lives in household where the ratio of the total number of months that all household members aged 16-59 have worked during the income reference year and the total number of months the same household members theoretically could have worked in the same period is higher than 0.2	10.1%	9.5%	9.0%	9.3%	9.6%	9.5%	9.5%
Material Deprivation	Severe material deprivation (1/6)	The respondent has at least six of the following achievements: the ability to avoid arrears; to afford one week of holidays; a meal with meat, chicken, fish or vegetarian equivalent; to face unexpected expenses; and to keep home adequately warm; owns a car; a colour TV; a washing machine; a telephone.	7.7%	6.9%	6.6%	6.2%	6.4%	7.0%	8.0%
Education	Education (1/6)	The respondent has completed primary education	15.8%	14.4%	14.5%	13.9%	14.0%	13.0%	12.3%
Environment	Noise (1/24)	The respondent lives in a household that experiences low noise from neighbourhood or from the street	23.0%	22.7%	21.6%	22.0%	20.2%	19.6%	18.6%
	Pollution (1/24)	The respondent lives in a household that experiences low pollution, grime or other environmental problems	17.4%	17.1%	16.2%	16.4%	14.7%	15.1%	13.9%
	Crime (1/24)	The respondent lives in a household that experiences low crime, violence or vandalism in the area	15.5%	15.5%	14.2%	15.2%	13.5%	13.4%	13.2%
	Housing (1/24)	The respondent lives in a dwelling with no leaking roof, damp walls, rot in window frames or floor	17.9%	17.2%	16.0%	15.1%	15.3%	14.7%	14.4%
Health	Health (1/24)	The respondent considers her own health as fair or above	10.4%	10.0%	9.3%	9.4%	9.1%	9.3%	9.5%
	Chronic Illness (1/24)	The respondent has no chronic illness or long-term health condition	31.2%	30.5%	31.4%	31.8%	31.9%	32.2%	31.7%
	Morbidity (1/24)	The respondent reports no limitations due to health problems	7.6%	7.6%	8.0%	8.1%	7.9%	8.0%	8.6%
	Unmet Medical Needs (1/24)	The respondent does not report unmet medical needs	7.7%	6.4%	6.1%	6.7%	6.4%	6.4%	6.2%

Note: Belgium, Bulgaria, Ireland, Croatia, Malta, Romania, Iceland, Norway and Switzerland not included.
Source: EU-SILC users' database of March 2014.

5. Results

Before identifying who is poor and constructing a poverty measure, we first describe some regional trends for multiple poverty cut-offs. Figure 12.1a compares the level of multidimensional poverty in 2012 of four geographic regions according to United Nations' definitions across a range of poverty cut-offs.[8] Clearly, Northern and Western Europe are significantly the two least poor regions (respectively) regardless the year and cut-off. Southern Europe is the poorest region up to the 50% cut–off. At 50% and more, differences between Eastern and Southern Europe are not significant.

Figure 1b analyses the pooled information of EU countries with consistent and available information for multiple poverty cut-offs. We display results for a range of plausible poverty cut-offs 15% to 35%. It can be useful to consider trends in two periods: 2006-2009, and 2009-2012. As expected multidimensional poverty was reduced in the pre-crisis period, with significant reductions in 2006 and 2007. The beneficial trend was brought to an end by the crisis. After 2008, dominance is not clear and the reduction of multidimensional poverty is almost insignificant 2009-2012, with significant change only in 2012. For poverty cut-offs above 40%, there is no clear dominance in any pair of consecutive years. Aggregate results hide significant differences in regional trends (Figure 1a).

In Eastern Europe poverty reduction is faster during the first years. Southern Europe shows a parsimonious reduction only until 2010 and an insignificant increase in multidimensional poverty from 2010 onwards. Western Europe does not show any significant change in any period except 2010-2012. Northern Europe presents slight ups and downs 2006-2008 and no significant changes subsequently (Alkire, Apablaza and Jung 2014 present full results).

In what follows we have selected a poverty cut-off of 34% which require a person to be poor in strictly greater than two dimensions or the equivalent sum of weighted deprivations drawn from several dimensions. This definition coheres with popular understandings of "multidimensional" poverty.[9]

Between 2006 and 2009, the level of multidimensional poverty drops from 0.048 to 0.041 mainly based on reductions in the share of poor individuals and not necessarily in the intensity of poverty. From 2009 onwards, there are no significant changes (2010-2011) or there are significant increments (2011-2012). Across consecutive years, the intensity only shows insignificant changes.

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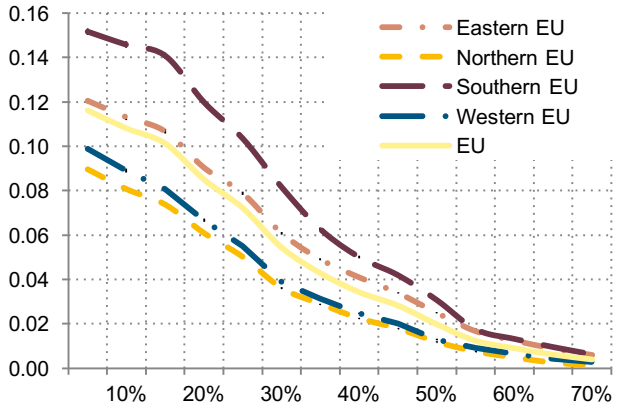
[8] http://millenniumindicators.un.org/unsd/methods/m49/m49regin.htm. United Nations classify Cyprus as Western Asia; however, we included it into Southern Europe as otherwise Cyprus would have been excluded.

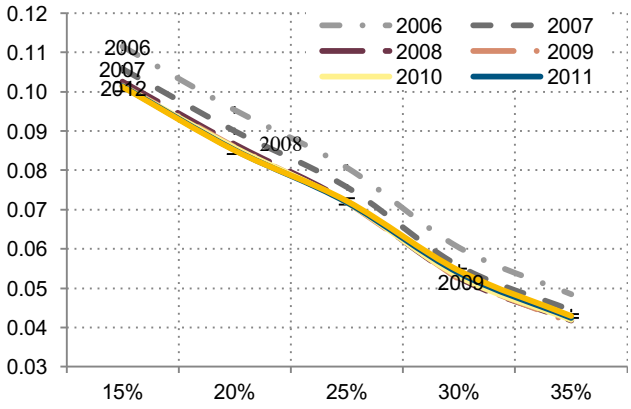
[9] We are grateful to Tony Atkinson for suggesting that this conceptual issue needs to be addressed and, when the purpose of the measure permits, satisfied.

Figure 1: Multidimensional Poverty by UN regions (2012) and Years (2006-2012) (level of multidimensional poverty)

a) Multidimensional poverty M_0 by regions and poverty cut-offs (2012)



b) Multidimensional poverty M_0 by years and poverty cut-offs



Reading note: Graph a) compares levels of multidimensional poverty across European geographic areas. Graph b) shows the evolution of multidimensional poverty for all possible poverty cut-offs across years for countries with available and consistent data.
Note: Belgium, Bulgaria, Ireland, Croatia, Malta, Romania, Iceland, Norway and Switzerland are not included.
Source: EU-SILC users' database of March 2014.

Table 2: Multidimensional Poverty in Europe 2006-2012, *k=34%*
(level and percentage of individuals in EU countries with consistent data – linearized std. errors in brackets)

	2006	2007	2008	2009	2010	2011	2012
Multidimensional Poverty (M_0)	0.0484	0.0443	0.0418	0.0413	0.0419	0.0424	0.0429
	(0.0012)	(0.0011)	(0.0012)	(0.0012)	(0.0011)	(0.0011)	(0.0011)
Headcount Ratio (H)	10.04%	9.24%	8.77%	8.63%	8.67%	8.75%	8.81%
	(0.0012)	(0.0012)	(0.0013)	(0.0013)	(0.0013)	(0.0012)	(0.0013)
Intensity of Poverty (A)	48.18%	47.99%	47.73%	47.80%	48.30%	48.45%	48.62%
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0006)
Contribution of each dimension to total multidimensional poverty							
Income	24.23%	24.58%	25.23%	25.67%	25.36%	25.25%	25.33%
Employment	18.40%	18.69%	18.31%	18.69%	19.88%	19.63%	19.45%
Material Deprivation	16.13%	15.83%	15.56%	14.97%	15.31%	16.43%	17.92%
Education	17.94%	17.46%	17.90%	17.38%	16.86%	16.22%	15.44%
Environment	11.80%	12.07%	11.34%	11.58%	11.16%	10.77%	10.39%
Health	11.50%	11.38%	11.66%	11.72%	11.42%	11.70%	11.48%

Note: Belgium, Bulgaria, Ireland, Croatia, Malta, Romania, Iceland, Norway and Switzerland not included.
Source: EU-SILC users' database of March 2014.

As before, results seem to follow two different trends. From 2006 to 2009, there is a reduction in multidimensional poverty based on a lower percentage of poor individuals and the intensity of poverty. From 2009 to 2012, on the other hand, there are significant increments in the level of multidimensional poverty.

In particular, the intensity of that poverty is statistically higher in 2012 compared to 2009, showing that each poor person experiences more simultaneous disadvantages. Regarding the percentage contribution of each dimension, the Europe 2020 indicators contribute more than 50% to multidimensional poverty with AROP the indicator contributing most. Education contributes - in average - around 15%, environment 10% and health, 12% to overall poverty in 2012 (for detailed results see Table 2). It is this indicator-specific analysis that provides information for policy design.

5.1 Results per Country

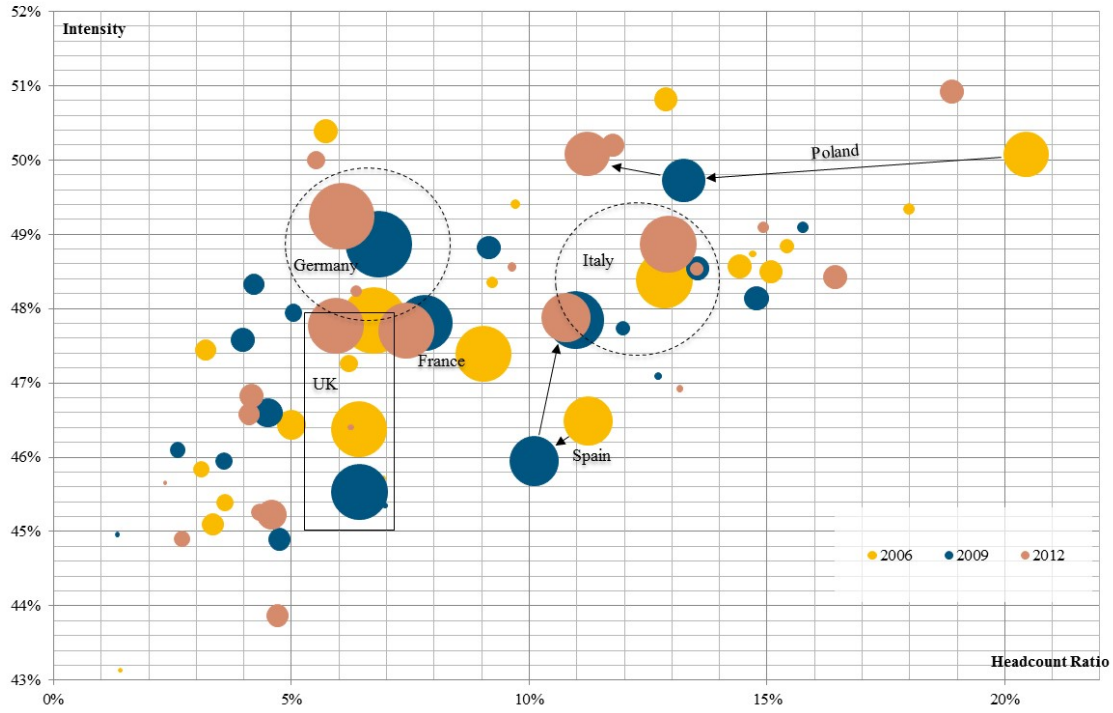
This section presents and discusses national results. For each measure, we present the level of Multidimensional Poverty M_0 as well as its associated partial indices (H) and (A). Results show a significant dispersion across countries. Bulgaria and Greece consistently are the poorest and Iceland the least poor according to the level of multidimensional poverty. However, intensity is not necessarily highest in the countries with highest poverty, a finding that contrasts with other studies.

As highlighted in Figure 2 and Table 3, Poland, Latvia, Slovenia, the Czech Republic and France – had the largest absolute reduction in poverty (M_0) between 2006 and 2012, followed by Cyprus. Lithuania, Hungary and Luxemburg had insignificant reductions. Germany, Estonia, Spain, Italy, Netherlands, Slovakia, Finland, UK, Iceland, Denmark, Austria and Norway, on the other hand, remained stable without significant changes. Greece showed the highest increase in poverty. Portugal, and Sweden, also, presented significant poverty increments. As before we see different trends in two clear periods. Between 2006 and 2009, sixteen of the countries experienced significant reductions in their poverty levels but seven (Denmark, Austria, Iceland, Sweden, Portugal and Greece) have higher multidimensional poverty levels. During the period between 2009 and 2012, only twelve countries reduced their poverty levels, eight did not have significant changes and other four increased marginally poverty. Some of this apparent decrease may be due to drops in the (relative) AROP poverty rates due to the financial crisis, illustrating the need for care in interpreting relative indicators, or a switch to (more) absolute indicators. Patterns vary considerably by country.

Normally the poverty analyses are undertaken at the country level to facilitate national policy design. However, it can be quite interesting to look across countries, and see where the people who are identified as poor live, and what proportion of poverty each country contributes to the whole.

Due to their size, Italy, France, Spain, Poland and Germany dominate multidimensional poverty trends in Europe. The proportion of European poverty for which Italy is responsible falls during the whole period except 2011. France's and Spain's contribution consistently falls only from 2010.

Figure 2: Evolution of Multidimensional Poverty in EU Countries (2006-2009-2012), *k=34%*
[Percentage of multi-dimensionally poor people (H) and Intensity of Poverty (A)]



Reading note: Figure 12.2 shows the percentage of poor people (H) in the x-axis, and in the, y-axis the intensity of the poverty (A). The size of each circle represents the population of the country. For each country, the lightest circle shows results for 2006 and the darkest give results for the last available year (2012). For full details, see Table 12.3.
Source: EU-SILC users' database of March 2014.

The percentage contribution of education varies greatly across countries and is strikingly higher in the poorer countries. This reflects differences in achievements, but also in definitions of primary school, so unfortunately is not strictly comparable. The relative contribution of (quasi) joblessness declines as overall multidimensional poverty in a country increases, as do the relative contributions of the health variables. In general, in the least poor countries the relative contribution of educational deprivations is lower and of Europe 2020 indicators (with some exceptions) is higher. This interesting finding draws attention to the need to consider non-Europe-2020 indicators, particularly in the countries that are poorest by the Europe 2020 measures themselves. Their double-burden of economic and social deprivations can be more accurately depicted and addressed using such a multidimensional poverty measure.

Table 3: Multidimensional Poverty in Europe be country 2006-2012, *k =34%*
(level and percentage of individuals in EU countries)

	2006			2007			2008			2009			2010			2011			2012		
	M_0	H	A	M_0	H	A	M_0	H	A	M_0	H	A	M_0	H	A	M_0	H	A	M_0	H	A
Belgium	0.044	9.0%	48.9%	0.044	8.9%	48.7%	0.042	8.5%	48.7%	0.047	9.6%	49.2%	0.047	9.4%	50.2%	0.05	10.0%	49.9%			
Bulgaria				0.129	24.1%	53.7%	0.104	20.3%	51.2%	0.09	17.9%	50.4%	0.083	16.4%	50.7%	0.089	17.3%	51.3%	0.083	16.3%	51.1%
Czech Republic	0.029	5.7%	50.4%	0.022	4.6%	48.8%	0.019	4.0%	48.1%	0.019	4.0%	47.6%	0.018	3.8%	47.3%	0.019	4.0%	47.7%	0.019	4.2%	46.8%
Denmark	0.016	3.6%	45.4%	0.018	3.8%	46.3%	0.013	2.9%	44.5%	0.016	3.6%	45.9%	0.018	3.8%	47.2%	0.018	4.1%	44.2%	0.02	4.3%	45.3%
Germany	0.032	6.7%	47.8%	0.034	7.0%	47.9%	0.033	6.9%	48.1%	0.033	6.8%	48.9%	0.032	6.6%	48.8%	0.032	6.5%	49.3%	0.03	6.1%	49.2%
Estonia	0.048	9.7%	49.4%	0.046	9.4%	48.6%	0.042	8.8%	47.9%	0.037	7.7%	47.9%	0.042	8.6%	48.3%	0.045	9.2%	49.0%	0.047	9.6%	48.6%
Ireland	0.052	10.6%	49.2%	0.054	11.3%	47.6%	0.048	9.9%	47.9%	0.055	11.8%	46.7%	0.045	9.6%	46.9%	0.05	10.7%	47.2%			
Greece	0.073	15.1%	48.5%	0.071	14.5%	48.7%	0.067	13.6%	49.2%	0.066	13.5%	48.5%	0.068	13.9%	48.5%	0.085	16.9%	50.1%	0.096	18.9%	50.9%
Spain	0.052	11.2%	46.5%	0.048	10.3%	46.2%	0.046	10.1%	45.2%	0.046	10.1%	46.0%	0.05	10.8%	46.3%	0.05	10.5%	47.6%	0.052	10.8%	47.9%
France	0.043	9.0%	47.4%	0.037	7.9%	46.9%	0.038	8.1%	47.4%	0.037	7.8%	47.8%	0.044	9.0%	48.8%	0.038	7.9%	48.3%	0.035	7.4%	47.7%
Croatia																0.081	16.1%	50.1%	0.069	13.8%	49.9%
Italy	0.062	12.8%	48.4%	0.059	12.2%	48.3%	0.056	11.6%	48.7%	0.053	11.0%	47.8%	0.05	10.3%	48.2%	0.062	12.7%	48.6%	0.063	12.9%	48.9%
Cyprus	0.072	14.7%	48.7%	0.073	14.8%	49.6%	0.059	12.1%	48.3%	0.06	12.7%	47.1%	0.065	13.9%	46.9%	0.061	12.9%	47.3%	0.062	13.2%	46.9%
Latvia	0.089	18.0%	49.3%	0.079	15.8%	49.7%	0.077	15.4%	50.1%	0.077	15.8%	49.1%	0.083	16.7%	49.9%	0.081	16.4%	49.3%	0.073	14.9%	49.1%
Lithuania	0.075	15.4%	48.8%	0.057	11.5%	49.4%	0.048	10.1%	47.7%	0.057	12.0%	47.7%	0.056	11.7%	47.9%	0.064	13.3%	48.4%	0.066	13.5%	48.5%
Luxemburg	0.032	6.9%	45.7%	0.028	6.3%	45.0%	0.028	6.2%	45.9%	0.032	7.0%	45.3%	0.027	5.9%	45.5%	0.029	6.2%	46.5%	0.029	6.2%	46.4%
Hungary	0.065	12.9%	50.8%	0.051	10.3%	49.2%	0.051	10.5%	49.0%	0.045	9.2%	48.8%	0.05	10.1%	49.1%	0.055	11.1%	50.0%	0.059	11.8%	50.2%
Malta							0.041	8.7%	46.9%	0.045	9.4%	47.5%	0.051	10.8%	47.5%	0.049	10.6%	46.8%	0.045	9.5%	47.3%
Netherlands	0.023	5.0%	46.4%	0.024	5.2%	45.7%	0.021	4.4%	47.2%	0.021	4.5%	46.6%	0.02	4.3%	46.6%	0.02	4.2%	46.6%	0.021	4.6%	45.2%
Austria	0.015	3.2%	47.4%	0.017	3.5%	48.7%	0.024	5.0%	47.9%	0.02	4.2%	48.3%	0.024	4.9%	48.1%	0.021	4.6%	47.0%	0.019	4.1%	46.6%
Poland	0.102	20.4%	50.1%	0.083	16.7%	49.7%	0.069	13.9%	49.4%	0.066	13.2%	49.7%	0.063	12.5%	50.0%	0.057	11.6%	49.5%	0.056	11.2%	50.1%
Portugal	0.07	14.4%	48.6%	0.081	16.4%	49.3%	0.068	14.1%	48.4%	0.071	14.8%	48.1%	0.075	15.3%	49.3%	0.068	14.0%	48.8%	0.08	16.4%	48.4%
Romania				0.097	19.7%	49.1%	0.076	15.7%	48.4%	0.072	15.0%	48.1%	0.068	14.2%	47.9%	0.068	14.2%	47.5%	0.063	13.2%	47.7%
Slovenia	0.045	9.2%	48.4%	0.027	5.6%	48.1%	0.031	6.3%	48.4%	0.026	5.5%	47.9%	0.031	6.5%	47.7%	0.032	6.7%	47.8%	0.031	6.4%	48.2%
Slovakia	0.029	6.2%	47.3%	0.026	5.4%	47.7%	0.022	4.7%	46.3%	0.024	5.0%	47.9%	0.028	5.8%	48.7%	0.026	5.4%	48.6%	0.028	5.5%	50.0%
Finland	0.02	4.3%	46.3%	0.041	9.0%	45.9%	0.018	4.0%	45.5%	0.02	4.3%	46.4%	0.019	4.1%	46.1%	0.019	4.3%	45.4%	0.019	4.3%	45.0%
Sweden	0.015	3.4%	45.1%	0.014	3.2%	45.0%	0.017	3.9%	43.7%	0.021	4.7%	44.9%	0.016	3.7%	44.5%	0.018	4.2%	44.4%	0.021	4.7%	43.9%
United Kingdom	0.03	6.4%	46.4%	0.027	5.7%	46.9%	0.026	5.7%	45.3%	0.029	6.4%	45.5%	0.028	5.9%	47.5%	0.025	5.4%	46.4%	0.028	5.9%	47.8%
Iceland	0.006	1.4%	43.1%	0.006	1.3%	45.2%	0.007	1.7%	42.4%	0.006	1.3%	45.0%	0.01	2.2%	44.2%	0.01	2.2%	44.0%	0.011	2.3%	45.7%
Norway	0.014	3.1%	45.8%	0.012	2.7%	46.0%	0.011	2.4%	46.5%	0.012	2.6%	46.1%	0.013	2.9%	45.9%	0.012	2.5%	49.1%	0.012	2.7%	44.9%
Switzerland							0.024	5.4%	44.8%	0.025	5.6%	44.9%	0.023	5.1%	45.4%	0.025	5.4%	45.1%	0.024	5.5%	44.4%

Source: EU-SILC users' database of March 2014.

6. Concluding Remarks

This chapter has presented an experimental AF multidimensional poverty index, which has been implemented with the EU-SILC datasets for seven waves from 2006-2012. The aggregate data across Europe show that multidimensional poverty decreased between 2006 and 2009 which resulted from a fall in the percentage of multi-dimensionally poor people. This trend then came to an end, and from 2009 to 2012, there were marginal increases in poverty due to an increase in the intensity of poverty among poor people. Results show that the poorest region is Southern Europe followed by Eastern Europe. Results also show that Northern Europe is consistently the least poor region regardless of the cut-off. Evidence coincides with the aggregate results. There is a stronger reduction in poverty during the first triennium. Regional subgroup decompositions show that the variability of the aggregate measure is mainly explained by changes in East Europe and South Europe, and country specific trends provide a more detailed analysis.

Across countries, results show the heterogeneous behaviour of the countries. Across the entire period, sixteen countries reduce poverty and six show an increase. However, reductions are significant (95% of confidence) in only five countries (Czech Republic, France, Latvia, Poland and Slovenia) and increments in 3 countries (Greece, Portugal and Sweden).

Results suggest two patterns of poverty alleviation before and after 2009. Between 2006 and 2009 the average reduction reached 14.6%. On the other hand, between 2009 and 2012, there is an average increment of 4.9%. Only Poland shows a consistent and substantive improvement across most years. On the extremes, Portugal, Greece and Bulgaria vie for the position of the poorest country in the included datasets. Norway and Iceland are the least poor countries. Regarding the composition of poverty, we explored the relevance of the construction and the implication for the analysis. The relative contribution of education increases as overall poverty in a country increases, pointing out the need for multidimensional analyses to consider the indicator composition of poverty, as well as its levels (for detailed tables see Alkire, Apablaza and Jung, 2014).

This study also drew attention to incomparabilities in definitions of the educational variables, and subjective issues in health and environment indicators. It would be desirable for EU-SILC to include comparable indicators for non-economic dimensions of poverty that cohere with poor people's understandings of social exclusion as well as with policy priorities. Such measures could be used for policy design as well as for monitoring, analysis, and evaluation. The analysis contained in this chapter has sought to provide a very brief overview of how a multidimensional poverty measure, and its

consistent partial indices, could contribute to reducing poverty and social exclusion in its many dimensions.

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