Material Deprivation in Europe: Which Expenditures Are Curtailed First?

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Abstract

This paper takes a close look at material deprivation in 27 European Union countries. Its main goal is to explore which expenditures individuals/households curtail first when facing economic difficulties. Two methodologies are applied: Item Response Theory, a psychometric method also known as latent trait analysis, and the concept of Deprivation Sequence which is an extension of the notion of "order of acquisition of durable goods". Both approaches show similar results when applied to EU-SILC material deprivation data. Overall, the order of curtailment found in the data does not differ substantially *between* EU Member states. Looking at *within* country variations, our analysis shows that the order of curtailment of the country as a whole is very similar to that of the various population subgroups.

J.E.L. Classification: I32 – O52

Key Words: durable goods - EU-SILC - European Union - Item Response Theory - material deprivation – order of acquisition

1. Introduction

Since 2009, the European Union portfolio of commonly agreed social indicators includes measures of material deprivation (Guio, 2009), defined as the enforced lack of (or the inability to afford, when desired) items and activities such as holidays once a year, keeping one's home adequately warm, facing unexpected expenses, avoiding arrears, a washing machine, TV, telephone or a car. These indicators refer to "enforced lacks", i.e. lack of an item/activity due to insufficient resources and not lack due to choices (for more details on this distinction, see, Mack and Lansley, 1985).

As explained by Marlier et al. (2007) deprivation items help capturing the underlying situation of generalized deprivation. The focus of most deprivation indicators analysis, including this, is therefore on the information the indicators convey together.

It should be stressed that since June 2010, the importance of material deprivation indicators has grown significantly with the launch of the "Europe 2020 Strategy", which set an EU social inclusion target. This target, which consists of lifting at least 20 million people out of the risk of poverty or social exclusion in the EU by 2020, is based on three indicators. One of these measures is based on the number of deprivations[1].

It has been suggested that the current list of European Union material deprivation indicators should be revised because it is based on the limited information available from the EU Statistics on Income and Living Conditions (EU-SILC) data-set and also because of the weak reliability of some of these items. Such a revision is a long process. In the 2007 Eurobarometer survey, respondents were asked to choose, out of a comprehensive list, which items are necessary to have a decent or acceptable standard of living in their country. On the basis of the results of this survey, a collection of additional "necessary" material deprivation items were added to the EU-SILC survey, through a thematic module on material deprivation. Guio, Gordon and Marlier (2012) analysed the additional items included in this 2009 module and proposed a list of 13 material deprivation items which passed robustness tests[2]. These items, presented in Table A-1 (see the Appendix), cover some key aspects of living conditions which appear to be customary in the whole

[1] Council of the European Union (2011).
[2] See also Guio and Marlier (2013).

EU and from which some people are excluded due to a lack of resources. Such items can be used to identify the prevalence of poverty across the European Union, or people whose resources are so low that they are excluded from ordinary standards of living. This conceptualization of poverty was largely inspired by Townsend's (1979) work and was adopted by the EU Council of Ministers in 1985. The main goal of this paper is to rank the 13 material deprivation items proposed by Guio, Gordon and Marlier (2012) and compare this ranking across the EU by using two different methods: Item Response Theory and the "order of acquisition of durable goods". The ranking we wish to establish indicates which items people have to go without as their resources decrease. We also explore whether this ranking (from here on defined as the Deprivation Sequence or Order of Curtailment), differs between the considered 27 EU Member States and different household types within each country and whether the two methodologies highlight a similar deprivation pattern

The rationale behind this research is to explore which commodities and social activities people have to go without as their resources decrease (and deprivation increases). This has important policy and political implications: it illustrates people's path toward deeper social exclusion with real commodities and social activities and can signal the need and the level of urgency for policy interventions to stop this process. It also provides an empirical basis for stimulating debates around the cost and social importance of material and social necessities and how different groups suffering from lack of resources may weigh these two factors when giving up necessities.

The paper is organized as follows. Section 2 reviews the two methodologies, while Section 3 presents results for the 27 Member States. Section 4 presents results for different household within each country. The last section summarizes the results and provides policy implications.

2. The Methodology

2.1. On the Concept of Order of Acquisition of Durable Goods

Forty to fifty years ago Paroush (1963, 1965 and 1973) suggested using information available on the order of acquisition of durable goods to estimate the standard of living of households. Paroush's ideas draw on Guttman's work (Guttman, 1950) and have later on be combined with ordered logit regression to estimate multidimensional poverty (see, for example, Deutsch and Silber, 2008, and Bérenger, Deutsch and Silber, forthcoming). Rather than discovering the order of acquisition of durable goods as individuals/households become richer as originally proposed, it is also possible to find out what is the order of curtailment of expenditures when individuals/households start facing economic difficulties and become deprived. Deutsch et al. (forthcoming) have thus analysed the sequence of expenditures cutbacks, in particular health expenditures, implemented by individuals facing poverty. This method is briefly illustrated below.

Let us assume, for simplicity, that we collect information on the non-ownership of three durable goods A, B and C. In this example a household can own one, two, three or none of these goods, so there are $2^3 = 8$ possible profiles of non-ownership of durable goods, as illustrated in Table 1 The number 1 indicates that the household cannot afford the corresponding durable good, a zero that it can.

Suppose we know that the least deprived households cannot afford good A, the second least deprived cannot afford goods A and B and that the most deprived ones cannot afford any of the goods while a household that has all three goods is not deprived at all. There would then be no household with the profiles 3, 4, 6 and 7 in Table 1. However, even if we assume that A, B, C is generally the Deprivation Sequence in the population (i.e. the order of necessities curtailment as household resources decrease), we cannot assume that every household will follow exactly this sequence. Some will certainly deviate from this most common ranking. To measure the extent of such deviations Paroush (1963, 1965 and 1973) suggested computing the number of changes in numbers (from 0 to 1 or from 1

to 0) necessary to bring a deviating household back to one of the profiles corresponding to a given Deprivation Sequence.

Table 1: The eight deprivation profiles when there are three durable goods.

Non Ownership Profile	The household does not own good A	The household does not own good B	The household does not own good C
1	**0**	**0**	**0**
2	**1**	**0**	**0**
3	**0**	**1**	**0**
4	**0**	**0**	**1**
5	**1**	**1**	**0**
6	**0**	**1**	**1**
7	**1**	**0**	**1**
8	**1**	**1**	**1**

Given that with K durable goods there are $(K+1)$ possible profiles for a specific Deprivation Sequence, we can define a vector v_j (composed of 1 and 0) with $v_j = [v_{j1}, \dots, v_{jk}, \dots, v_{jK}]$ where v_{jk} indicates whether in this possible profile j durable good k is absent not. Let y_i refer to the vector (composed of 1 and 0) describing the deprivation profile for individual i with $y_i = [y_{i1}, \dots, y_{ik}, \dots, y_{iK}]$.

We then compare the profile of individual i, (vector y_i), with every possible profile v_j in the examined deprivation sequence. Call T_i the distance of the profile of individual i to the closest profile, say v_j, in this specific deprivation sequence. We can measure this distance as

$$T_i = Min\{|y_i - v_1|, \dots, |y_i - v_j|, \dots, |y_i - v_{K+1}|\} \quad (2)$$

with

$$|y_i - v_j| = \sum_{h=1}^{K} |y_{ih} - v_{jh}| \quad (3)$$

Assume that there are N_i households having such a profile y_i and N households as a whole so that $N = \sum_{i=1}^{M} N_i$, M is the number of different profiles observed, Paroush

(1963, 1965 and 1973) suggested computing what he called the coefficient *R* of Reproducibility defined as

$$R = 1 - \left\{\left[\sum_{i=1}^{M} \frac{N_i}{N} T_i\right] / K\right\} \quad (4)$$

It can be proved that $0.5 \leq R \leq 1$ and can be thought of as the extent to which item responses in the available data can be predicted from the number of deprivations, or the extent to which the data under scrutiny agree with a given deprivation pattern.

Drawing on Guttman (1950), Paroush considered that any coefficient *R* greater than or equal to 0.9 was "acceptable".

Assume now that the profile v_c is the most common Deprivation Sequence in the population with $v_c = \{v_{c1}, \ldots, v_{ck}, \ldots, v_{cK}\}$. The distance d_{ic} between the deprivation profile of individual *i* and this most common Deprivation Sequence v_c will then be written as

$$d_{ic} = \sum_{h=1}^{K} |y_{ih} - v_{ch}| \quad (5)$$

Thus if A, B, C is the most common deprivation sequence in the population, the "distance" for an individual with profile 4 in Table 1 will be expressed as:

|0 - 1| + |0 - 1| + |1 - 1| = 2

Clearly *K* is the maximal value of the distance for an individual, assuming there are *K* durable goods. Such a distance is, for example, observed for an individual with profile 1 in Table 1).

We can also define the "standardized distance" ds_{ic} for individual *i* as

$$ds_{ic} = (d_{ic}/K) \quad (6)$$

Using our previous notations we can then compute the "average standardized distance"ds_{pop} in the population as the weighted average of the "standardized distances" for the various individuals, that is, as

$$ds_{pop} = \left\{\left[\sum_{i=1}^{M} \frac{N_i}{N} ds_{ic}\right] / K\right\} \quad (7)$$

The "proximity index" *R* will then be defined as being equal to the complement to 1 of ds_{pop}, that is, as

$$R = 1 - ds_{pop} \quad (8)$$

We have however to discover what the most common Deprivation Sequence in the population is. This implies that we should compute the distances d_{ic}, ds_{ic} and the

proximity index R for every possible Deprivation Sequence. We know that there are $K!$ possible sequences. The most commonly selected Deprivation Sequence in the population will then be the one with the highest value of the proximity index R. Discovering this most common Deprivation Sequence, requires a very high number of computations. Thus in the empirical illustration of Section 3 we have 13 items. Assume, for simplicity, that there are 10,000 individuals in the sample. As explained previously, 140,000 comparisons will then be needed, to determine the reproducibility index R for a given "deprivation sequence". The procedure has however to be repeated 13!=6227020800 times, which is the total number of possible "deprivation sequences" resulting from 13 items. We will then end up with a total number of iterations equal to $=140{,}000\times6227020800 = 8.72 \times 10^{14}$.

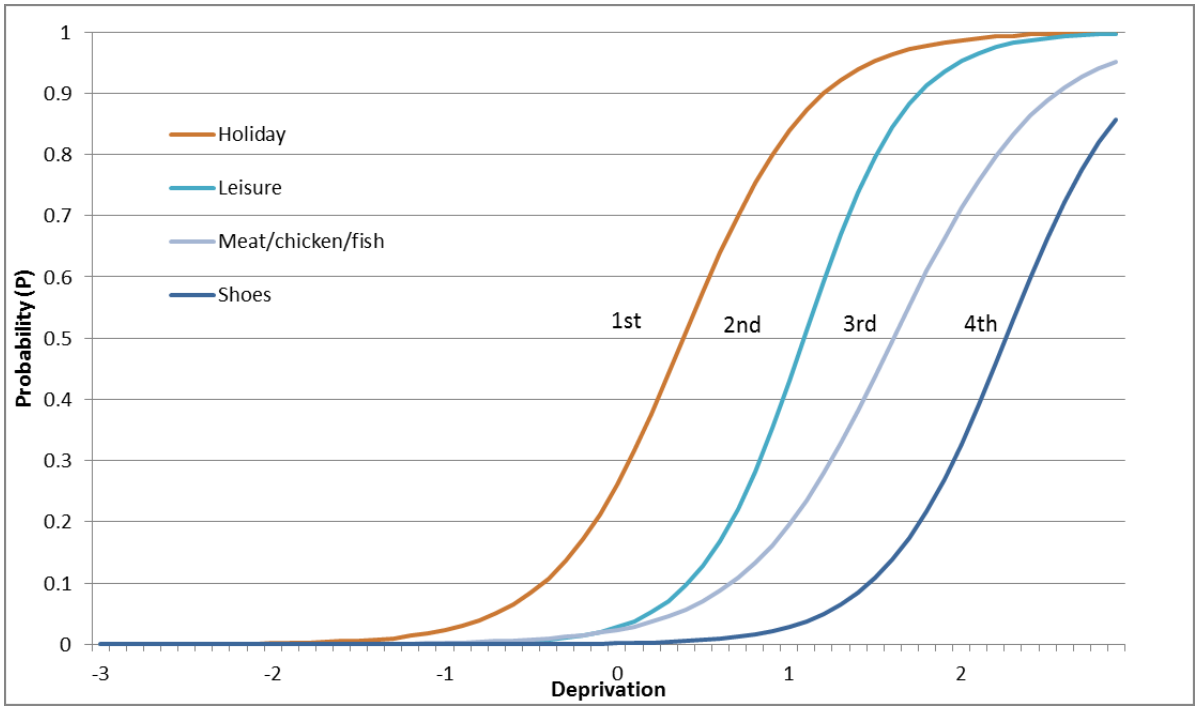
2.2. Item Response Theory

Item Response Theory (IRT) models have been used in the measurement of deprivation by, among others, Dickes (1983, 1989), Gailly and Hausman (1984), Pérez-Mayo (2004 and 2005), Cappellari and Jenkins (2006), Ayala and Navarro (2007 and 2008), Dickes and Fusco (2008), Guio, Gordon and Marlier (2012) and Szeles and Fusco (2013). Also known as Latent Trait Analysis, IRT is a set of statistical models which describe the relationship between questionnaire item responses and an unobserved latent trait, such as academic ability, level of happiness or material deprivation. Similarly to Guttman scaling and the Deprivation Sequence (DS) method previously described, IRT models rely on the assumption that the items under scrutiny measure one unobservable trait (uni-dimensionality assumption); this assumption allows these methods to postulate a relationship between each item and the underlying deprivation trait. Similarly to the DS methods outlined above, this relationship is found by searching the data, until the best model, the one with the lowest error is found[3]. For comparison purposes, one can think of the model parameters in the DS method as the deprivation pattern or rankings (from the first one to be curtailed to the very last one) associated with the model with the highest R, while in IRT these are given by the difficulty or "severity" parameters for the model with the best fit. The severity of item X is the level of deprivation θ (measured in standard

[3] In IRT this is achieved by Maximum Likelihood Estimation.

deviation units) after which an individual becomes more likely to be deprived of X than not. Figure 1 shows that the severity parameter for not being able to afford a holiday is around 0.2 standard deviations while this is 2 for not being able to afford two pairs of all-weather shoes. The severity of the other items lies between these two.

Figure 1: Item Response curves for four items, with severity ranking



This implies that the level of deprivation endured by someone who cannot afford shoes is much stronger (2 standard deviations from the sample mean deprivation) than the one endured by someone who cannot afford holidays but can afford all other items. The severity is therefore the location of the S-shaped curve along the x-axis, more specifically the position on this axis when a probability of 0.5 is reached on the y-axis. Because the curves (known as Item Response Curves, ICCs) are monotonic the model also predicts the vast majority of those who cannot afford shoes will not be able to afford holidays. Each item can therefore be ranked according to its position on the latent deprivation scale, giving a deprivation sequence highly comparable to the DS method. The second parameter (discrimination) shapes the steepness of the ICC, and shows how well each item discriminates between the deprived and non-deprived respondents, and is indirectly

incorporated in the severity ranking (as it influences the IRT estimation). The two parameters and the resulting rank of each item j is shaped by the IRT model equation:

$$P(X_{ij}=1|\theta_i,\beta_j,\alpha_j)=\frac{\exp(\alpha_j(\theta_i-\beta_j))}{1+\exp(\alpha_j(\theta_i-\beta_j))}$$

(θ = Deprivation, α = discrimination, β = Severity) and is estimated by Maximum Likelihood. The discrimination of the vast majority of the items considered in this paper is relatively similar, so the focus will be particularly on the severity parameter of each item and its ranking. Inclusion of the discrimination parameters also makes the IRT results consistent with Guio, Gordon and Marlier (2012), which is the starting point of this paper. The 2-parameter IRT model can therefore be conceptualized as a probabilistic version of the DS method explained above: in both models the probability of being deprived of an item is seen as depending on the level of deprivation[4], yet in IRT this is represented on a continuous probability scale (from 0% to 100%) by the Item Response Curve. The relationship between item and overall deprivation is therefore comparable to a logistic function in IRT and a step function in the DS model.

3. Material Deprivation in the European Union: Which Expenditures are Curtailed First?

3.1. Results based on Item Response Theory (IRT)

The four Item Characteristic Curves[5] in Figure 1 are based on the analysis of the European Union data as a whole. It appears that holidays is the first type of expenditure that individuals curtail, followed by leisure, then expenses on meat/chicken/fish. The last type of expenditures that individuals curtail is two pairs of all wheather shoes[6]. The complete sequence of "expenditures curtailment" is given in Table 2.

[4] The deprivation score ranging from 0 to *K* in the DS method and the latent trait in IRT.
[5] Drawing all the 13 curves would have made it too difficult to distinguish between the various goods.
[6] As mentioned in footnote 3 there are other items which the individuals give up between "holidays" and "leisure", between "leisure" and "meat, chicken or fish" and between "meat, chicken and fish" and "shoes".

Table 2: Order of curtailment, results based on Item Response Theory[7]

	EU-27	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	UK
Holidays	1	1	1	3	2	2	3	2	1	1	1	2	3	2	2	1	4	3	3	1	3	1	1	1	2	3	1	2
Unexp. expenses	2	2	2	4	3	3	1	1	3	3	3	1	2	1	1	2	1	1	1	4	2	2	7	6	1	1	3	1
Fur-niture	3	5	3	1	1	1	5	3	2	2	2	3	1	3	3	11	2	2	2	2	1	3	2	2	3	2	2	5
Leisure	4	3	4	7	6	5	4	6	9	4	4	6	5	6	7	3	3	6	4	5	4	4	5	3	4	4	7	4
Pocket money	5	4	5	6	8	4	6	5	4	7	5	7	4	5	6	4	5	4	6	7	5	5	3	5	5	6	5	3
Drink/ meal out	6	7	6	8	9	10	2	11	5	10	6	11	8	4	5	5	6	5	7	3	7	7	6	4	12	9	9	6
Clothes	7	8	7	5	7	8	8	4	6	8	7	5	6	7	9	6	7	7	5	6	6	6	8	8	7	5	8	7
Meat/ chicken/ fish	8	6	10	9	10	6	7	8	8	9	13	9	9	8	12	9	8	11	8	8	12	8	12	9	9	8	4	8
Home warm	9	12	11	2	4	11	9	12	13	6	9	13	11	12	8	7	9	13	10	9	11	9	4	11	11	10	12	9
Car	10	9	9	11	13	7	12	10	7	12	12	8	13	10	10	13	10	10	9	13	9	10	10	7	10	13	6	10
Arrears	11	10	8	10	5	12	11	7	10	5	8	4	7	9	4	8	12	8	12	10	8	11	13	10	6	7	13	12
Com-puter/ Internet	12	11	12	12	12	9	13	13	11	11	11	10	12	11	13	10	11	12	13	11	13	12	11	12	13	11	10	13
Shoes	13	13	13	13	11	13	10	9	12	13	10	12	10	13	11	12	13	9	11	12	10	13	9	13	8	12	11	11

Source: EU-SILC 2009 cross-sectional data, Users' database - August 2011, authors' computation.

[7] The country to which each symbol refers to is given in Table A-2 in the Appendix.

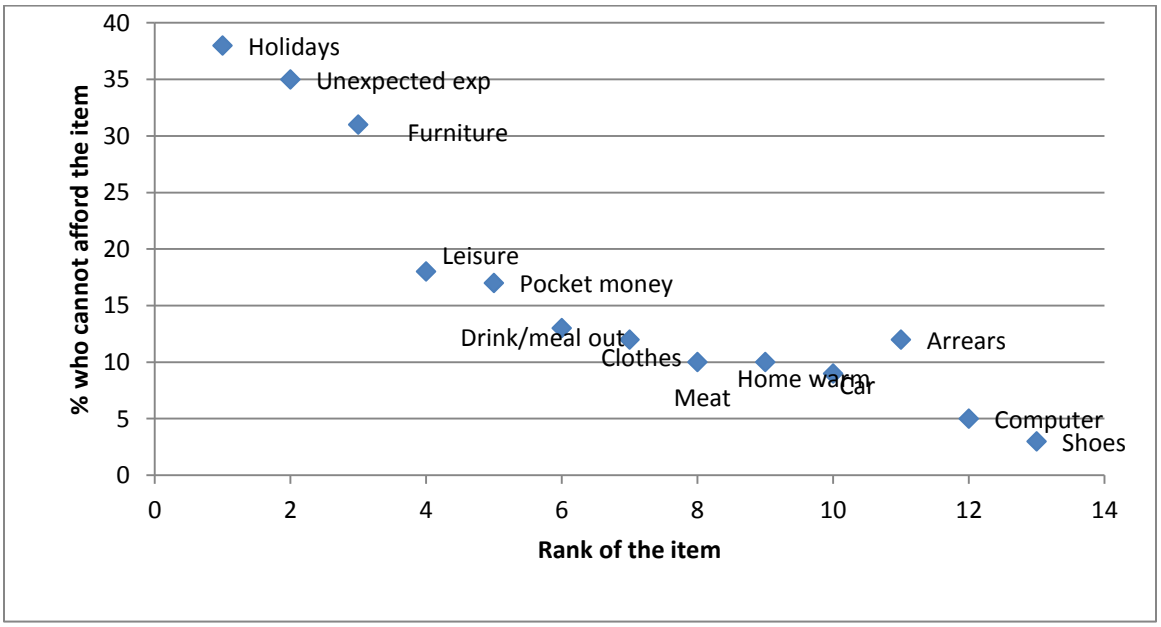
It appears that the sequence of curtailment for the European Union as a whole is as follows:

1) Holidays 2) Unexpected expenses 3) Furniture 4) Leisure 5) Pocket money
6) Drink/meal out 7) Clothes 8) Meat/chicken/fish 9) Home warm 10) Car 11) Arrears 12) Computer/Internet 13) Shoes.

If we now take a closer look at Table 2 and examine the sequence specific to each country we observe that holidays is always one of the first three types of expenditures to be curtailed together with the ability to face "Unexpected expenses" in most countries. Two pairs of all-weather shoes, on the contrary, are at least the eighth item to be given up and "computer/internet" at least the ninth item. Table 2, presented as a heat-map, shows Item Response Theory severity rankings, and conveys the high degree of similarity between the curtailment sequences in the different countries, red colors referring to the first items that are given up and green to the last ones.

In Figure 2 we have plotted, for the European Union as a whole, the relationship between the sequence of curtailment and the percentage of individuals who give up a specific item. The negative correlation is very strong: the higher the rank of an item (i.e. the earlier it is curtailed), the greater the percentage of individuals who cannot afford it in the general population. The only exception concerns the item "arrears" as may be observed in Figure 2.

Figure 2: The Dominant Deprivation Pattern in the European Union
(Results based on IRT)



This pattern is also shown in the relationship between item deprivation and equivalised household income and overall deprivation score (see Figure A-1 in the Appendix). The probability of deprivation across income and deprivation levels follows the ranking found above. As deprivation increases (and resources such as income decrease) the percentage of households that can afford items decrease. This process occurs by following the found deprivation pattern, yet it is not always consistent. The two methods explained above explore all alternative rankings and confirm that this is nevertheless the most robust representation of the overall order of curtailment; like all models the parameters entail a small degree of error in exchange for greater generalization and understanding.

3.2. Results based on the concept of Deprivation Sequence

The results based on the concept of "Deprivation Sequence" are given in Table 3.
The Reproducibility (*R*) indexes are very satisfactory (higher than 0.90 in all countries, except in Romania and Bulgaria where the index values are 0.88 and 0.89 respectively).

The order of expenditures curtailment is almost identical to that obtained on the basis of Item Response Theory. This order is:

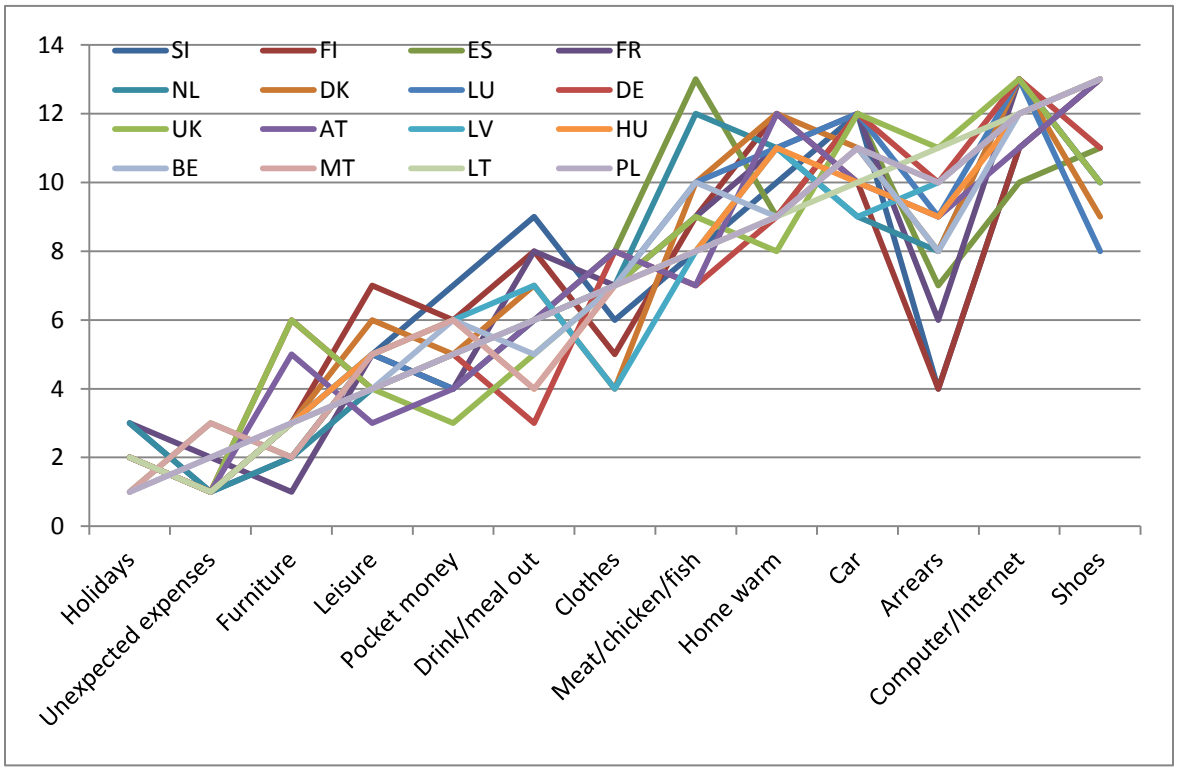
1) Holidays 2) Unexpected expenses 3) Furniture 4) Pocket Money 5) Leisure
6) Drink/meal out 7) Clothes 8) Meat/chicken/fish 9) Home warm 10) Arrears 11) Car 12) Computer/Internet 13) Shoes

The differences are that according to the Deprivation Sequence method pocket money is curtailed before and not after leisure expenditures and that arrears occupies the 11^{th} position instead of the 10^{th} position. The heat map in Table 3 shows country-specific results, which are very similar to those observed in Table 2. Out of the 351 cells in the table, more than half (196) match exactly. In Austria (AT), Bulgaria (BG), Cyprus (CY), Germany (DE), Spain (ES), France (FR), Hungary (HU), Italy (IT), the Netherlands (NL), Poland (PL), Portugal (PT) and Romania (RO), the ranking differ by only one rank. In other countries, the greatest difference is of two ranks, except in Estonia (EE) and Slovenia (SI) where it is three and Denmark (DK), Ireland (IE) and Sweden (SE) where it is four. A one-week annual holiday is always among the first three expenditures to be curtailed and this is also the case for unexpected expenses, at the exception of two countries, Portugal and Romania. Similarly shoes are again at least the eighth item to be given up and this is also true for expenditures on access to internet or computer. Overall, the "heat map" shows the very high similarity between the deprivation sequences in the different countries.

Table A-3 in the Appendix substantiates these findings by showing the rank correlations between the Deprivation Sequences in the various EU countries. Many coefficients are higher than 0.9. Portugal stands out as the only country with an average rank correlation with other countries of 0.55, and most importantly with extremely low correlation with most other countries: e.g. less than 0.4 with Slovakia (SK), Italy (IT), Ireland (IE), Sweden (SE), Bulgaria (BG), Cyprus (CY), Greece (EL), Slovenia (SI) and Finland (FI). Figure 3 shows the ranking of a group of 16 countries with extremely high pairwise correlation (0.7 or higher). The strong upward linear trend combined with the small range of deviations from it confirms the shared rank order and the high pairwise correlation.

The other countries also share a similar pattern, and the correlation with the EU ranking is higher than 0.70 for all countries, except for Portugal. We therefore conclude that the ranking is relatively homogeneous across all 27 EU countries. As their resources decrease, households first cut back on their annual holidays, new furniture, leisure and social activities and as their resources decrease even further they are even unable to afford meals, a warm house and paying the bills, and eventually even two pairs of all weather shoes. Interpreting the inability to afford access to a computer or the internet requires a much more complex explanation we choose not to discuss in this paper, but such an inability is generally associated with very high levels of deprivation. In other words, not having access to or not being able to afford a set of such widespread and increasingly crucial commodities signals a strong social disadvantage, found among only a small minority of people.

Figure 3: Order of curtailment for each item by country, data provided for a cluster of 16 countries with high correlation



Source: EU-SILC 2009 cross-sectional data, Users' database - August 2011, authors'computation

Table 3: Order of curtailment, results based on the concept of "deprivation sequence"[8]

	EU-27	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	UK
Holidays	1	2	1	3	2	2	2	2	1	2	1	2	3	2	2	1	2	2	2	1	3	1	1	1	2	3	1	2
Unexp. expenses	2	1	2	4	3	3	1	1	3	3	3	1	2	1	1	2	1	1	1	3	1	2	8	7	1	1	3	1
Furniture	3	5	3	1	1	1	6	3	2	1	2	3	1	3	3	11	3	3	3	2	2	3	2	2	6	2	2	6
Leisure	5	3	4	8	6	6	4	6	7	6	5	7	5	5	7	4	4	5	5	5	4	4	5	4	5	5	7	4
Pocket money	4	4	6	6	8	5	5	5	5	8	4	6	4	6	5	3	5	4	6	6	5	5	4	5	4	7	6	3
Drink/ meal out	6	6	5	7	9	10	3	7	8	9	6	8	8	4	6	5	6	6	7	4	6	6	6	3	8	9	8	5
Clothes	7	8	7	5	7	9	8	4	6	7	8	5	7	7	13	6	7	7	4	7	7	7	7	8	7	6	9	7
Meat/ chicken/ fish	8	7	10	9	10	4	7	10	9	10	13	9	9	8	11	8	8	10	8	8	12	8	12	9	11	8	4	9
Home warm	9	12	9	2	4	11	9	12	13	5	9	12	11	11	9	7	9	11	11	9	11	9	3	10	12	10	13	8
Car	11	10	11	11	12	7	12	11	4	12	12	10	12	10	8	13	10	12	9	11	9	11	10	6	9	12	5	12
Arrears	10	9	8	10	5	12	10	8	10	4	7	4	6	9	4	9	11	9	10	10	8	10	13	11	3	4	11	11
Computer Internet	12	11	12	12	13	8	13	13	11	11	10	11	13	12	10	10	12	13	12	12	13	12	11	12	13	11	10	13
Shoes	13	13	13	13	11	13	11	9	12	13	11	13	10	13	12	12	13	8	13	13	10	13	9	13	10	13	12	10
R	0.94	0.96	0.96	0.89	0.95	0.95	0.96	0.98	0.94	0.92	0.96	0.98	0.96	0.91	0.96	0.96	0.91	0.98	0.90	0.94	0.98	0.92	0.93	0.88	0.98	0.95	0.93	0.96

Source: EU-SILC 2009 cross-sectional data, Users' database - August 2011, authors' computation.

[8] The country to which each symbol refers to is given in Table A-2 in the Appendix.

4. Looking at specific population subgroups

In this section we check whether the results obtained previously, regarding the order in which individuals/households curtail their expenditures vary within a given country from one population subgroup to the other. We derived the Deprivation Sequence for five population subgroups within each country: households with two adults or more with and without children, single households, single households older or younger than 65. The within-country rank correlation is above 0.6 for the vast majority of groups (437 out of 450 pairwise correlations). Most importantly we applied to each population subgroup the deprivation sequence of the country to which it belongs and computed then the reproducibility coefficient of the subgroups. Most coefficients were higher than 0.9. We can therefore conclude that the country Deprivation Sequence can be applied to the different population subgroups for the vast majority of subgroups. It also shows that those countries with an overall index below 0.9 are also more likely to have subgroup *R* indices below this threshold. In other words, those countries where establishing a representative deprivation pattern is marginally harder than in other countries also have subgroup deprivation patterns with an *R* index below 0.9. Lone parents in particular emerge as having deprivation patterns which conform slightly less to the national pattern. Nevertheless, all indices are either above or just below 0.9, showing a large degree of conformity across all five groups with the respective national deprivation sequence.

Table 4: Reproducibility coefficients for the various population subgroups within a country, assuming the Deprivation Sequence is that of the country as a whole.

Country	Households without children	Households with children	Single households	Single households older than 65	Single households 65 years old or less	Overall[9]
AT	0.97	0.96	0.92	0.94	0.95	0.96
BE	0.97	0.97	0.91	0.95	0.93	0.96
BG	0.88	0.89	0.89	0.89	0.89	0.89
CY	0.95	0.96	0.93	0.93	0.94	0.95
CZ	0.96	0.96	0.90	0.95	0.94	0.95
DE	0.96	0.96	0.91	0.95	0.94	0.96
DK	0.99	0.98	0.94	0.97	0.96	0.98
EE	0.94	0.95	0.92	0.93	0.92	0.94
EL	0.92	0.93	0.89	0.91	0.91	0.92
ES	0.96	0.96	0.93	0.96	0.95	0.96
FI	0.98	0.98	0.95	0.95	0.95	0.98
FR	0.96	0.96	0.92	0.95	0.94	0.96
HU	0.92	0.91	0.89	0.90	0.90	0.91
IE	0.97	0.96	0.90	0.97	0.94	0.96
IT	0.97	0.96	0.95	0.96	0.96	0.96
LT	0.90	0.91	0.88	0.89	0.89	0.91
LU	0.99	0.98	0.94	0.99	0.97	0.98
LV	0.90	0.90	0.87	0.88	0.88	0.90
MT	0.95	0.94	0.91	0.94	0.93	0.94
NL	0.99	0.99	0.95	0.98	0.96	0.98
PL	0.92	0.93	0.88	0.91	0.90	0.92
PT	0.93	0.93	0.89	0.92	0.92	0.93
RO	0.88	0.88	0.86	0.86	0.87	0.88
SE	0.98	0.98	0.96	0.96	0.97	0.98
SI	0.94	0.95	0.92	0.92	0.92	0.95
SK	0.93	0.93	0.90	0.90	0.91	0.93
UK	0.97	0.96	0.91	0.97	0.95	0.96

Source: EU-SILC 2009 cross-sectional data, Users' database - August 2011, authors'computation

[9] See Table 3, bottom row.

5. Concluding Comments

This paper aimed at taking a closer look at material deprivation in the various countries of the European Union, on the basis of a list of thirteen items which have recently been proposed to be used as indicators of material deprivation at the EU level by Guio, Marlier and Gordon (2012). More precisely, for the first time at the EU level, the goal of this study was to find out which expenditures households curtail first when facing economic difficulties. In order to establish an order of curtailment we used two methodologies: Item Response Theory and the Deprivation Sequence approach, a simple extension of an algorithm which originally aimed at detecting the order in which households acquire durable goods, as they get richer. Both methodologies show similar results when applied to EU-SILC data covering each of the Member States of the European Union. The deprivation pattern does not differ substantially *between* EU Member states. The rank correlation between countries and the heat maps show homogeneity between national rankings. Looking at *within* country variations, our analysis shows that the Deprivation Sequence of the country as a whole is very similar to that of the various population subgroups.

Overall, our results show that households first cut back on their annual holidays, new furniture, leisure and social activities and as their resources decrease even further they are even unable to afford meals, a warm house and paying the bills, and eventually even two pairs of shoes. We aim to consolidate this analysis with longitudinal data, yet the cross-sectional analysis in this article provides some strong evidence towards the prevalence of this pattern across countries and groups. It shows empirically that the social importance of material and social necessities do not differ between countries and household types, despite large national and household group variations in deprivation levels. This therefore provides further support for the use of these items to analyze material deprivation across the whole EU.

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Appendix

Table A-1: List of Deprivation Items

A. 'Adult items', i.e. items collected at individual adult level (people aged 16+, living in private households). We assigned the adult deprivation information to all household members (including children), if at least half the adults (for which the information is available) were deprived:

1. To replace worn-out clothes by some new (not second-hand) ones
2. Two pairs of properly fitting shoes, including a pair of all-weather shoes
3. To spend a small amount of money each week on oneself without having to consult anyone (hereafter referred to as "pocket money")
4. To get together with friends/family for a drink/meal at least monthly
5. To have regular leisure activities

B. 'Household items', i.e. items collected at household level. We assigned the household deprivation information to all household members when the household cannot afford:

6. To replace worn-out furniture (but would like to have)
7. A meal with meat, chicken, fish or vegetarian equivalent every second day
8. To face unexpected expenses
9. To keep home adequately warm
10. One week annual holiday away from home
11. To avoid arrears (mortgage or rent, utility bills or hire purchase instalments)
12. A car/van for private use (but would like to have)
13. A computer and an internet connection (but would like to have)

Table A-2: Codes of the various countries in the European Union

Country	Code
Austria	AT
Belgium	BE
Bulgaria	BG
Croatia	HR
Cyprus	CY
Czech Republic	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	EL
Hungary	HU
Ireland	IE
Italy	IT
Latvia	LV
Lithuania	LT
Luxembourg	LU
Malta	MT
Netherlands	NL
Poland	PL
Portugal	PT
Romania	RO
Slovenia	SI
Slovakia	SK
Spain	ES
Sweden	SE
United Kingdom	UK

Figure A-1 Proportion of people who can't afford the item, by level of income (top, from richer to poorer) and level of deprivation (from least deprived to extremely deprived)

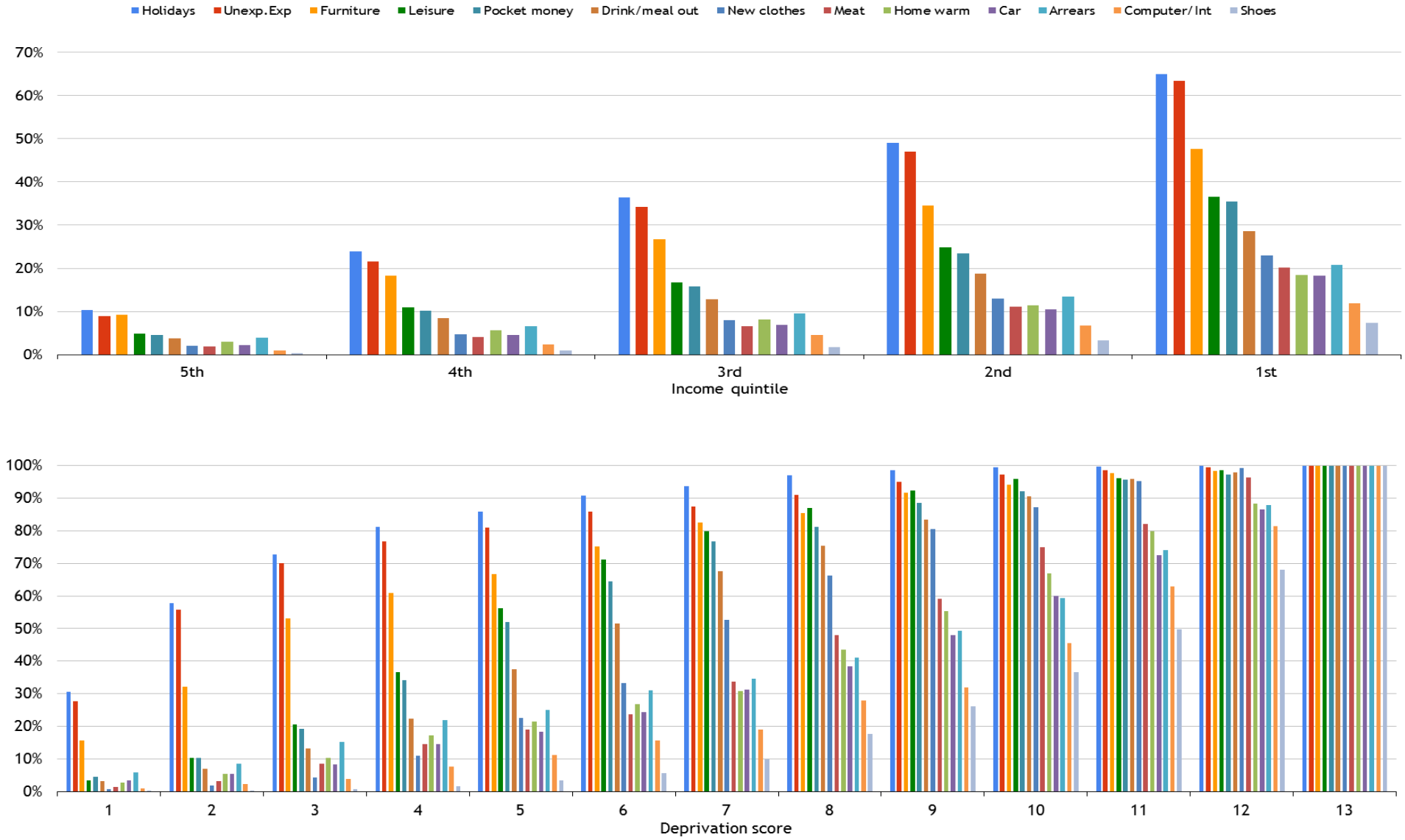

Table A-3: Between countries Rank Correlation for Deprivation Sequences

	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IE
AT	1.000	0.907	0.527	0.571	0.769	0.907	0.830	0.775	0.610	0.791	0.819	0.841	0.945	0.720
BE	0.907	1.000	0.753	0.808	0.648	0.901	0.874	0.742	0.824	0.923	0.857	0.885	0.962	0.780
BG	0.527	0.753	1.000	0.852	0.522	0.626	0.610	0.500	0.819	0.692	0.577	0.643	0.670	0.495
CY	0.571	0.808	0.852	1.000	0.445	0.621	0.703	0.478	0.973	0.791	0.736	0.802	0.681	0.681
CZ	0.769	0.648	0.522	0.445	1.000	0.577	0.582	0.813	0.495	0.549	0.621	0.637	0.725	0.549
DE	0.907	0.901	0.626	0.621	0.577	1.000	0.802	0.593	0.593	0.764	0.687	0.780	0.923	0.643
DK	0.830	0.874	0.610	0.703	0.582	0.802	1.000	0.780	0.681	0.841	0.885	0.929	0.879	0.626
EE	0.775	0.742	0.500	0.478	0.813	0.593	0.780	1.000	0.505	0.670	0.775	0.714	0.802	0.637
EL	0.610	0.824	0.819	0.973	0.495	0.593	0.681	0.505	1.000	0.813	0.802	0.797	0.703	0.731
ES	0.791	0.923	0.692	0.791	0.549	0.764	0.841	0.670	0.813	1.000	0.808	0.885	0.835	0.819
FI	0.819	0.857	0.577	0.736	0.621	0.687	0.885	0.775	0.802	0.808	1.000	0.890	0.857	0.758
FR	0.841	0.885	0.643	0.802	0.637	0.780	0.929	0.714	0.797	0.885	0.890	1.000	0.863	0.747
HU	0.945	0.962	0.670	0.681	0.725	0.923	0.879	0.802	0.703	0.835	0.857	0.863	1.000	0.747
IE	0.720	0.780	0.495	0.681	0.549	0.643	0.626	0.637	0.731	0.819	0.758	0.747	0.747	1.000
IT	0.775	0.747	0.522	0.484	0.379	0.846	0.632	0.385	0.495	0.659	0.571	0.571	0.703	0.473
LT	0.940	0.951	0.758	0.714	0.786	0.918	0.852	0.791	0.714	0.830	0.786	0.846	0.962	0.692
LU	0.857	0.890	0.610	0.703	0.588	0.879	0.956	0.709	0.659	0.885	0.791	0.934	0.885	0.692
LV	0.907	0.912	0.698	0.676	0.769	0.830	0.912	0.868	0.692	0.775	0.874	0.846	0.945	0.610
MT	0.890	0.967	0.786	0.747	0.725	0.912	0.835	0.753	0.753	0.857	0.786	0.841	0.967	0.698
NL	0.852	0.918	0.615	0.725	0.593	0.808	0.929	0.802	0.709	0.901	0.835	0.918	0.901	0.775
PL	0.940	0.973	0.769	0.758	0.764	0.923	0.863	0.769	0.764	0.868	0.813	0.874	0.962	0.709
PT	0.445	0.654	0.791	0.632	0.418	0.560	0.511	0.456	0.555	0.703	0.302	0.516	0.527	0.385
RO	0.764	0.813	0.599	0.500	0.681	0.725	0.643	0.808	0.505	0.714	0.582	0.643	0.824	0.604
SE	0.791	0.797	0.396	0.654	0.429	0.692	0.857	0.687	0.670	0.797	0.890	0.863	0.764	0.786
SI	0.808	0.868	0.648	0.841	0.626	0.703	0.835	0.648	0.896	0.808	0.951	0.912	0.835	0.736
SK	0.780	0.654	0.418	0.385	0.940	0.610	0.632	0.896	0.418	0.516	0.659	0.632	0.769	0.588
UK	0.874	0.885	0.681	0.648	0.560	0.956	0.841	0.610	0.599	0.813	0.665	0.802	0.868	0.610

Source: EU-SILC 2009 cross-sectional data, Users' database - August 2011, authors' computation

Table A-3 (cont.): Between countries Rank Correlation for Deprivation Sequences.

	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	UK	ALL(27)
AT	0.775	0.940	0.857	0.907	0.890	0.852	0.940	0.445	0.764	0.791	0.808	0.780	0.874	0.934
BE	0.747	0.951	0.890	0.912	0.967	0.918	0.973	0.654	0.813	0.797	0.868	0.654	0.885	0.962
BG	0.522	0.758	0.610	0.698	0.786	0.615	0.769	0.791	0.599	0.396	0.648	0.418	0.681	0.780
CY	0.484	0.714	0.703	0.676	0.747	0.725	0.758	0.632	0.500	0.654	0.841	0.385	0.648	0.747
CZ	0.379	0.786	0.588	0.769	0.725	0.593	0.764	0.418	0.681	0.429	0.626	0.940	0.560	0.769
DE	0.846	0.918	0.879	0.830	0.912	0.808	0.923	0.560	0.725	0.692	0.703	0.610	0.956	0.918
DK	0.632	0.852	0.956	0.912	0.835	0.929	0.863	0.511	0.643	0.857	0.835	0.632	0.841	0.868
EE	0.385	0.791	0.709	0.868	0.753	0.802	0.769	0.456	0.808	0.687	0.648	0.896	0.610	0.780
EL	0.495	0.714	0.659	0.692	0.753	0.709	0.764	0.555	0.505	0.670	0.896	0.418	0.599	0.753
ES	0.659	0.830	0.885	0.775	0.857	0.901	0.868	0.703	0.714	0.797	0.808	0.516	0.813	0.874
FI	0.571	0.786	0.791	0.874	0.786	0.835	0.813	0.302	0.582	0.890	0.951	0.659	0.665	0.819
FR	0.571	0.846	0.934	0.846	0.841	0.918	0.874	0.516	0.643	0.863	0.912	0.632	0.802	0.879
HU	0.703	0.962	0.885	0.945	0.967	0.901	0.962	0.527	0.824	0.764	0.835	0.769	0.868	0.956
IE	0.473	0.692	0.692	0.610	0.698	0.775	0.709	0.385	0.604	0.786	0.736	0.588	0.610	0.720
IT	1.000	0.742	0.681	0.665	0.703	0.577	0.769	0.484	0.489	0.621	0.571	0.346	0.868	0.775
LT	0.742	1.000	0.879	0.951	0.962	0.885	0.989	0.654	0.819	0.703	0.802	0.764	0.918	0.984
LU	0.681	0.879	1.000	0.852	0.863	0.940	0.890	0.604	0.676	0.824	0.780	0.615	0.918	0.896
LV	0.665	0.951	0.852	1.000	0.912	0.879	0.940	0.527	0.769	0.747	0.841	0.786	0.830	0.934
MT	0.703	0.962	0.863	0.912	1.000	0.857	0.978	0.692	0.868	0.665	0.797	0.731	0.874	0.973
NL	0.577	0.885	0.940	0.879	0.857	1.000	0.879	0.588	0.758	0.863	0.808	0.637	0.841	0.874
PL	0.769	0.989	0.890	0.940	0.978	0.879	1.000	0.676	0.824	0.731	0.835	0.742	0.918	0.995
PT	0.484	0.654	0.604	0.527	0.692	0.588	0.676	1.000	0.703	0.291	0.346	0.330	0.681	0.681
RO	0.489	0.819	0.676	0.769	0.868	0.758	0.824	0.703	1.000	0.527	0.527	0.747	0.692	0.819
SE	0.621	0.703	0.824	0.747	0.665	0.863	0.731	0.291	0.527	1.000	0.824	0.516	0.714	0.736
SI	0.571	0.802	0.780	0.841	0.797	0.808	0.835	0.346	0.527	0.824	1.000	0.593	0.676	0.824
SK	0.346	0.764	0.615	0.786	0.731	0.637	0.742	0.330	0.747	0.516	0.593	1.000	0.549	0.747
UK	0.868	0.918	0.918	0.830	0.874	0.841	0.918	0.681	0.692	0.714	0.676	0.549	1.000	0.923

Source: EU-SILC 2009 cross-sectional data, Users' database - August 2011, authors' computation