

# 21

## How do European citizens cope with economic shocks? The longitudinal order of deprivation

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### 21.1 Introduction

The literature on budgeting strategies adopted by households on low income reveals a mixture of inventiveness and experience of mild to severe material deprivation (MD). Households on low income often rely on formal (such as state benefits) but also informal sources of financial/social assistance and reciprocity exchange (Dean and Shah, 2002) to maintain at least some elements of their usual lifestyles, ranging from borrowing money and exchanging favours with friends and relatives to moving back with one's parents and in-laws (Orr et al., 2006). However, despite the resilience of many of these households, there is considerable evidence that as formal resources such as income drop, MD tends to increase (Yeung and Hofferth, 1998; Saunders et al., 2006; Berthoud and Bryan, 2011) <sup>(173)</sup>. Orr et al. (2006) argue that reductions in resources caused by job loss or illness are easily absorbed only among high income households. At medium income levels, households begin to cut back on items such as holiday and rely on help from fami-

lies and friends; through minimal changes in living standards, physical assets and customary activities. However, as available resources drop even further, social capital is stretched to the limit, items previously taken for granted become unaffordable and eventually even food consumption is reduced to a minimum and a warm house becomes an unaffordable luxury. Hence, qualitative evidence shows similar MD patterns across households with similar levels of resources (Smith, 2005). Similarly, large-scale expenditure studies also suggest that as income rises among those who suffered from MD, commodity expenditure patterns converge with those of higher-income households (Farrell and O'Connor, 2003; Gregg et al., 2005).

Questions on MD available in surveys such as EU-SILC provide information on the types of goods and activities that many households go without because they cannot afford them. However, despite the large availability of MD data, little attention has been given to the order in which certain spending curtailment strategies are adopted across the EU.

Understanding how households cope with economic constraints is important to assess claims that poverty is the result of erratic spending or inefficient household budgeting: if this was the case one would for example find a substantial amount of individuals declaring that they can afford to go on holiday away from home but cannot afford two pairs of properly fitting shoes or to keep their houses warm.

Understanding the order in which deprivations are experienced also helps to establish a common language across European welfare states to describe the severity of MD. Overall, focusing on patterns of

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<sup>(173)</sup> Although there is a statistically significant negative relation between MD and income, the relation is far from perfect, due to measurement errors and the influence on MD of non-income factor, such as costs (health, housing, childcare, etc.), accumulated capital/debt, social and private transfers in kind, etc. (see Fusco et al, 2010).

curtailment in the different EU countries also enables MD research to move towards a better understanding of some of the key aspects of living conditions and the underlying processes of curtailment shared across the EU. This is in line with the Council of the European Union's definition of poverty (1985), which following Townsend (1979) defines the poor as those excluded from the minimum acceptable way of life in the country where they live.

The main contribution of this chapter is to assess the most frequent deprivation sequence at the EU and national levels, using the longitudinal component of EU-SILC. By definition, curtailment is a process that happens over time and whose study ideally requires following up the same individuals as they become more or less deprived across time. By proposing a longitudinal methodology, we extend the methodology proposed in previous papers which used cross-sectional data to determine the deprivation order, by comparing the deprivation patterns of people with different MD levels at one point in time (see Deutsch and Silber, 2008 and Deutsch et al., 2015). The use of longitudinal EU-SILC data has a cost in terms of data availability, as only a subset of MD items is available in the longitudinal dataset at the time of writing <sup>(174)</sup>. However, longitudinal data allow the assessment of the fit of different deprivation sequences by using information on how MD evolves for each individual across time. The longitudinal methodology developed in this chapter allows one to ascertain if the cross-sectional order can be considered a good proxy of the longitudinal order.

The chapter is organised as follows: Section 21.2 presents the dataset and the MD items used in the analysis. Section 21.3 aims to explain the sequencing methodology using simple descriptive statistics as well as an Item Response Theory model, which confirms and aids the interpretation of both cross-sectional and longitudinal Deprivation Sequence results. Section 21.4 concludes.

<sup>(174)</sup> We opted to use three waves of the longitudinal data set, instead of the four waves available in order to increase the sample size. Indeed EU-SILC is a rotational panel, i.e. each wave a quarter of the sample quit the panel. Following people during 3 years instead of 4 years allows working with 50 % of the sample, instead of 25 %.

## 21.2 Data

In order to estimate the order in which different items and activities are curtailed in different countries, both cross-sectional (2009) and longitudinal (2009-2011) components of EU-SILC are used.

The cross-sectional analysis is conducted on a set of 13 MD items available in the 2009 EU-SILC cross-sectional data, collected through a thematic module on MD. These 13 items were proposed by Guio, Gordon and Marlier (2012) as robust MD measures at the EU level in each individual Member State and have been advocated as candidates for a revised version of the commonly agreed current EU indicator. (See also Chapter 10 of this book and Guio et al. (2016) for more details about this amended indicator.)

The longitudinal analysis is estimated on six items because only six items (out of the 13-item list) are available in EU-SILC longitudinal data at the time of writing <sup>(175)</sup>. The MD items are listed in Table 21.1. The last column indicates which MD items are available in the longitudinal dataset.

Using the six items available, Table 21.2 divides the pooled sample according to individual MD trajectories across 2 consecutive years (2010 and 2011). The table shows that among those deprived in both 2010 and 2011 (3rd to 6th columns from the left), the majority experience an increase or decrease in the number of deprivations, although a non-negligible minority experience exactly the same number and the same types of deprivations (around 8 % of the sample for Austria) or experience the same number but different types of deprivations (2 % in Belgium). Overall, Table 21.2 suggests that for the vast majority of countries there is a substantial amount of change in MD profiles across just 2 years, and this chapter outlines a methodology aimed at exploring this longitudinal variation. Moreover, when looking at individual trajectories Table 21.2 suggests that a small minority of cases

<sup>(175)</sup> These six items are currently collected annually in the core EU-SILC. The seven additional items proposed by Guio, Gordon and Marlier (2012) were collected in 2009 for the first time, in 2013 on a voluntary basis for a subset of countries and in 2014 in the ad hoc module on MD for all the EU countries. In this chapter, the 2009 data are used, as the 2013 and 2014 data are not yet available.

**Table 21.1:** Deprivation rates for items used in cross-sectional and longitudinal analysis (based on 2009 EU-SILC data)

(%)

Material deprivation	% (2009)	Availability in the longitudinal analysis (2009-2011)
<b>'Household items', i.e. items collected at household level. The household MD information is assigned to all household members (including children) when the household cannot afford to:</b>		
Have 1 week annual holiday away from home	38	Yes
Face unexpected expenses	35	Yes
Replace worn-out furniture (but would like to replace (i.e. the lack is an <i>enforced</i> lack not a choice; see Chapter 10 of this book))	31	No; only available in 2009 ad hoc module
Avoid arrears (mortgage or rent, utility bills or hire purchase instalments)	12	Yes
Have a meal with meat, chicken, fish or vegetarian equivalent every second day	10	Yes
Keep home adequately warm	10	Yes
Have access to a car/van for personal use (but would like to have)	9	Yes
Have a computer and an Internet connection (but would like to have)	5	No; only available in 2009 ad hoc module
<b>'Adult items', i.e. items collected at individual adult level ('adults' are people aged 16 and above). The adult MD information is assigned to all household members (including children), when at least half the adults in the household cannot afford to:</b>		
Have regular leisure activities (but would like to have)	18	No; only available in 2009 ad hoc module
Spend a small amount of money each week on oneself without having to consult anyone (pocket money), but would like to have	17	No; only available in 2009 ad hoc module
Get together with friends/family for a drink/meal at least monthly (but would like to have)	13	No; only available in 2009 ad hoc module
Replace worn-out clothes by some new (not second-hand) ones (but would like to have)	12	No; only available in 2009 ad hoc module
Have two pairs of properly fitting shoes, including a pair of all-weather shoes (but would like to have)	3	No; only available in 2009 ad hoc module

*NB:* All the items collected at the adult level as well as the capacity to replace worn-out furniture and the availability of an Internet connection at home are not available in the longitudinal dataset.

*Reading note:* In 2009, 3 % of EU-27 citizens lack two pairs of properly fitting shoes.

*Source:* Authors' computation, UDB August 2011.

experiences the same number of deprivations and switches between items. To fully tackle the role of consumer choice and relative prices much more detailed data on the quality and price of goods owned and not owned by respondents, together with international market prices would be needed. We briefly return to these issues in the conclusion.

In the next sections, we open the black box of the MD transitions and see whether we can identify a shared pattern of curtailment across countries and methodologies. For doing so, we focus on people lacking at least one item in one of the last 3 years of the panel (2011, 2010 and 2009).

**Table 21.2:** Distribution of EU-SILC respondents according to the number/type of items lacked (out of six items available in the longitudinal data) in 2010 and 2011 (%)

	Not deprived of any item in 2010 and 2011	Deprived of the same item(s) in 2010 and 2011	Deprived of more/fewer/different items in 2011 (compared with 2010)		
			More items	Fewer items	Equal number but different items
Belgium	63	10	13	12	2
Bulgaria	8	22	27	35	9
Czech Republic	39	21	18	18	4
Denmark	75	5	10	8	2
Estonia	27	21	23	23	5
Spain	42	13	17	23	4
Italy	37	7	31	20	4
Cyprus	26	16	30	23	5
Latvia	8	23	33	29	8
Lithuania	12	23	26	31	9
Luxembourg	71	7	11	11	1
Hungary	12	35	27	22	4
Malta	31	34	11	23	1
Netherlands	74	8	8	8	2
Austria	61	8	10	18	2
Poland	25	36	17	19	3
Portugal	25	21	25	25	5
Romania	12	45	20	21	3
Finland	63	9	13	12	2
United Kingdom	54	10	16	17	4

*Reading note:* Among the people present in the panel in 2010 and 2011 in Austria, 61 % do not lack any of the six items in both years, 8 % lack exactly the same items in both years, 10 % lack more items in 2011 than 2010, 18 % lack fewer items in 2011 than in 2010, and 2 % lack the same number of items but some or all these items are different.

*Source:* Authors' computation, UDB August 2013.

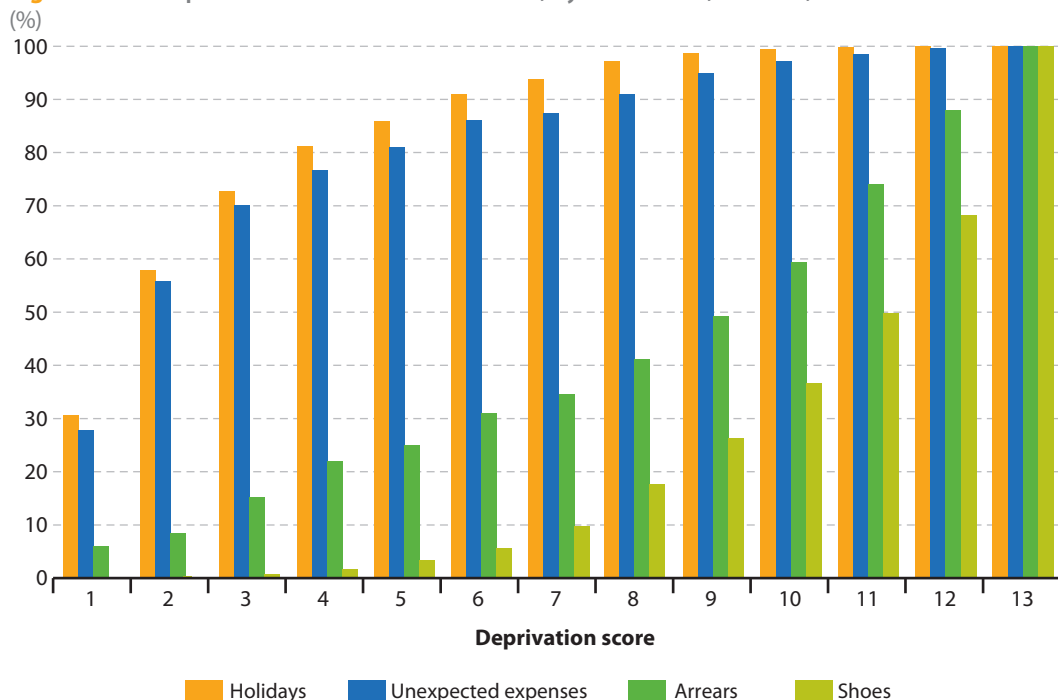
## 21.3 Deprivation sequence

### 21.3.1 Visual analysis

In the previous section, Table 21.1, based on the cross-sectional incidence of the 13 MD items available in EU-SILC 2009, suggests that the lack of two pairs of properly fitting shoes is only experienced by a small minority (3 %), particularly when compared to more common deprivations such as the lack of

1 week holiday away from home. Our analysis also shows that around 90 % of those who cannot afford two pairs of properly fitting shoes also cannot afford a holiday, while fewer than 10 % who cannot afford the latter cannot afford shoes (EU-SILC 2009, results not presented here). This would suggest that people tend to curtail their holidays first and it is only when their deprivation is extremely high that they lose the ability to afford even very basic goods like shoes. One way to corroborate this claim

**Figure 21.1: People who cannot afford each item, by level of MD, EU level, 2009**



*Reading note:* More than half of those who cannot afford two of the thirteen items considered here cannot afford holidays.

*Source:* Authors' computation, UDB August 2011.

visually is to divide respondents according to how many MD items they cannot afford (number of deprivations out of the list of 13 items proposed by Guio et al., 2012) as shown in Figure 21.1. For illustrative purposes, this figure presents the percentage of people lacking four items (holidays, shoes, inability to face unexpected expenses, arrears), by the number of items lacked. It shows that the lack of holidays and the difficulty to face unexpected expenses are much more widespread than problems of arrears and shoes deprivation across the deprivation scale. More than half of those who cannot afford two of the thirteen items covered in the figure cannot afford holidays or unexpected expenses, and this proportion grows gradually with the number of deprivations. In contrast, only a small proportion cannot afford to pay arrears or two pairs of properly fitting shoes. However, this proportion grows gradually with the number of deprivations. Most importantly, the order (first holidays, then

unexpected expenses, arrears and finally shoes) is constant across the MD scale.

This order is nevertheless probabilistic: although on average respondents will conform to this pattern, it does not necessarily apply perfectly to all respondents. Similarly to a model prediction, there is always some degree of difference between observed and predicted order: even when considering the four items above there is a small minority of people who cannot afford to pay arrears nor afford two pairs of shoes but who are able to afford holidays. This could be the result of misreporting, unique individual factors and/or particular resources which set this rare group of cases apart from the vast majority of the population. As the number of MD items increases the relative frequency order becomes more uncertain and the number of cases that do not confirm exactly to the best order of curtailment increases. As shown in Figure 21.2,

the order for holidays, unexpected expenses and shoes remains constant across the MD scale, while the order is less clear for other items (such as the lack of a car/van and the incapacity to avoid arrears) across the MD scale.

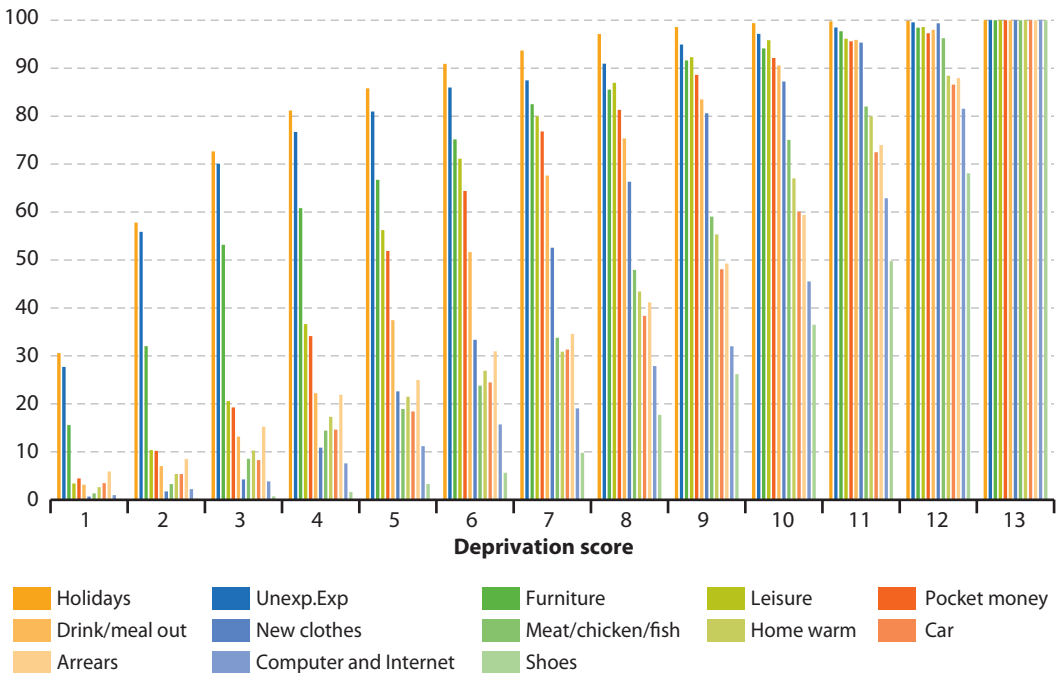
It is obviously not possible to identify visually the most representative order of curtailment for all 13 MD items in all EU countries, and more advanced methods are therefore needed.

### 21.3.2 Deprivation sequence: methodology

Understanding the determinants of the individual consumption level and the relative shares of its components is a long standing issue in economics (Engel, 1895; Working, 1943; Leser, 1963). According to classical microeconomic theory of consumption behaviour, consumers are supposed to allocate their income to the purchase of products so as to

maximize utility, given a set of prices for a group of products. Econometric studies usually use detailed individual data from household budget surveys to estimate systems of demand equations, where the share of expenditures depends on the relative prices of different goods, disposable income and individual characteristics (see among others the model proposed by Deaton and Muellbauer (1980)). Some research focuses specifically on how consumers prioritise their acquisition of durables over time as their income increases, and on whether people tend to have similar priority of acquisition patterns (Roos and Von Szelisk, 1943; Paroush, 1965, 1973; McFall, 1969; Hebden and Pickering, 1974). Deutsch and Silber (2008) use the same approach as that proposed by Paroush (1965, 1973) and Guttman (1950), but to look at the mirror image, namely to assess whether individuals facing the threat of poverty curtail their consumption of various goods in a given order. This methodology compares the deprivation order of each case in a dataset to all the possible orders and

**Figure 21.2:** Proportion of people who cannot afford the item, by level of MD, EU level, 2009 (%)



NB: See Table 21.1 for the detailed description of items.  
Source: Authors' computation, UDB August 2011.

selects the best order as the order with the smaller aggregated error.

For example, if a questionnaire contains only two MD items, say a 1-week holiday a year and two pairs of shoes, there are two possible orders of curtailment. As MD increases, households could decide to curtail holidays first and then two pairs of shoes; or they could curtail two pairs of shoes but still go on holiday. Assuming that data are collected on only these two items, and that being able to afford an item or not wanting it is scored as 0 and being deprived (unable to afford) is scored as 1, it is possible to test which order best approximates the one found among all cases in our sample.

If holidays are curtailed first followed by shoes, there are three possible patterns consistent with this order (see Table 21.3). We can then compare each case in our dataset to these three patterns, allocate errors to each case that does not follow any of the three patterns, and aggregate the total number of errors for each possible order. There are  $K!$  possible orders, where  $K$  is the number of items. In this simple example, there are only  $2!=2$  possible patterns. Respondents are either able to afford both holidays and shoes (as in the first row), or unable to afford holidays and able to afford shoes (second row), or unable to afford either (third row). Respondents who cannot afford shoes but can afford holidays (pattern: 0,1) are in this case not consistent with the considered order and would need one

change (one error) to be converted to the closest expected pattern (from 0,1 to 1,1). An error of 1 (or a residual in modelling terms) would then be allocated to this case.

If the expected order is the opposite of the one above (shoes are curtailed first), the three possible patterns in the data consistent with this order are the ones shown in Table 21.4.

Longitudinal data allow the extension of this *Deprivation Sequence* methodology by looking at information over multiple waves for the same person. Each individual MD pattern found in the data is scored against the possible patterns consistent with a given order (e.g. holiday, shoes). The main difference is that the expected patterns also allow change in MD scores across time. Each case is therefore compared against the expected patterns and allocated an error. As already mentioned, an error is the smallest change between the MD pattern of a given dataset case and an expected pattern. All cases that match any of the expected patterns of a given order are allocated an error of 0. Table 21.5 shows the longitudinal extension of order 1 shown in Table 21.3.

Similarly to the cross-sectional methodology, an aggregate error is calculated at the national/EU level, and the order with the smallest aggregated error is selected as the 'best' national/EU order.

**Table 21.3: Possible patterns for order 1**  
(holidays are curtailed first)

Holidays	Shoes
0	0
1	0
1	1

**Table 21.4: Possible patterns for order 2**  
(shoes are curtailed first)

Shoes	Holidays
0	0
1	0
1	1

**Table 21.5: Possible longitudinal patterns for order 1**  
(holidays are curtailed first)

WAVE 1		WAVE 2	
Holidays	Shoes	Holidays	Shoes
0	0	0	0
0	0	1	0
1	0	0	0
0	0	1	1
1	0	1	0
1	1	0	0
1	0	1	1
1	1	1	0
1	1	1	1

### 21.3.3 Deprivation sequence: results

#### Best EU order

Using the six items available in the longitudinal dataset (see Table 21.1), the best EU order is as follows (see Table 21.6 for national results):

1. holidays
2. unexpected expenses
3. meat/chicken/fish/vegetarian equivalent
4. home warm
5. arrears
6. car/van.

Households on average tend to first cut back on their annual holidays and then use up their savings (resulting in inability to face unexpected expenses). As their deprivation increases further they are unable to afford a meal with proteins, a warm house and paying bills, and finally a car/van. The results from the longitudinal analyses show a substantial amount of overlap with those based on cross-sectional data (see Deutsch et al. (2015) for a discussion of the cross-sectional results). At the

national level, the hierarchies show either a perfect or very close match. This suggests that the cross-sectional 13-item order can be considered a (very) good predictor of the longitudinal deprivation sequence. At EU level, this order is (see Table 21.7 for national results):

1. holidays\*
2. unexpected expenses\*
3. furniture
4. pocket money
5. leisure
6. drink/meal out
7. clothes
8. meat/chicken/fish/vegetarian equivalent\*
9. home warm\*
10. arrears\*
11. car/van\*
12. computer/internet
13. shoes.

\*Items available in the longitudinal data set (see Table 21.1).



**Table 21.6:** Best order of curtailment, longitudinal (2011) and cross-sectional data (2009)

		EU	BE	BG	CZ	DK	EE	ES	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	FI	UK
Holidays	CS	1	1	2	1	2	1	1	1	1	2	2	2	2	1	2	2	1	1	1	2	2
	LONGI	1	1	2	1	2	1	1	1	1	2	2	2	2	1	2	2	1	1	1	1	2
Unexpected expenses	CS	2	2	3	2	1	2	2	2	2	1	1	1	1	2	1	1	2	3	3	1	1
	LONGI	2	2	3	2	1	2	2	2	2	1	1	1	1	2	1	1	2	3	2	1	1
Meat/chicken/fish/vegetarian equiv.	CS	3	5	4	3	4	4	6	4	5	3	3	4	3	3	6	3	3	5	4	4	4
	LONGI	3	5	4	4	4	4	5	5	5	3	4	4	3	3	5	3	3	6	6	5	5
Home warm	CS	4	4	1	5	6	6	4	3	3	6	4	5	6	4	5	6	4	2	5	6	3
	LONGI	4	4	1	5	5	6	4	4	3	6	3	5	6	6	4	6	4	2	5	6	4
Arrears	CS	5	3	5	6	3	5	3	5	4	5	6	3	4	5	3	4	5	6	6	3	5
	LONGI	5	3	5	6	3	3	3	3	4	5	6	3	4	4	3	4	5	5	4	3	3
Car/van	CS	6	6	6	4	5	3	5	6	6	4	5	6	5	6	4	5	6	4	2	5	6
	LONGI	6	6	6	3	6	5	6	6	6	4	5	6	5	5	6	5	6	4	3	4	6

NB: CS refers to the cross-sectional orders and LONGI to the longitudinal orders. The cross-sectional orders are based on the original results from Deutsch et al. (2015) calculated on the full 13-item list. The seven items not available in the longitudinal dataset were omitted and the rank reallocated to the six remaining items. The longitudinal order was in contrast estimated directly on the six items. All cases with no deprivation (a sum score of 0) and the few cases who suffered from all deprivations (sum score of 6) were excluded during estimation, as they provide no information for the purposes of this model.

Reading note: In both the cross-sectional and longitudinal orders, the first item curtailed in Austria is the capacity to face unexpected expenses, and the last one is the capacity to keep one's home adequately warm.

Source: Authors' computation, EU-SILC 2009 cross-sectional data (UDB August 2011) and EU-SILC 2011 longitudinal data (UDB August 2013).

### Homogeneity of national deprivation orders across the EU

In Table 21.6, there is a large degree of overlap between national hierarchies: going on holidays and the capacity to face unexpected expenses are generally the first items to be curtailed across all countries. As for the other items, most countries have an order similar to the EU one, but the variation is much more noticeable. Bulgaria and Portugal for example are the only countries where the lack of an adequately warm house is first and second respectively. Similarly, access to a car/van is the second (cross-sectional)/third (longitudinal) item in Romania.

Focusing on the differences between national best orders however hides the fact that the EU order fits most countries relatively well. A more sensible strategy is to store the aggregate errors for each of the 720 (6!) possible hierarchies and then rank them. As shown in Table 21.8, out of 720 possible longitudinal hierarchies the EU order has a rank of less than 55 in all countries apart from Denmark

and Finland. This means that the EU order may not be the best fitting one but it fits better than 92 % (i.e. (720-55)/720) of all the other possible orders in all but two countries. The orders that fit marginally better are very small variations of the EU order. For Denmark and Finland, the EU order is still better than the vast majority of orders but the rank is much lower (134th and 154th respectively). The third column of the table also shows that any order with holidays and unexpected expenses at end of the order fits all countries badly.

The key message from these results is that whereas the order of curtailment for holidays and unexpected expenses is very similar across all countries, the other four items (meat/chicken/fish/vegetarian equivalent, home warm, arrears and car/van) show more variability (both in cross-sectional and longitudinal analysis). Nevertheless, the EU order revealed by the cross-sectional and longitudinal deprivation sequence methods provides a good approximation of the order of curtailment of these four items.

**Table 21.7:** Best order of curtailment, cross-sectional data, by country, 2009

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

Reading note: The first item curtailed in Austria is 'capacity to face unexpected expenses', and the last item is 'shoes'.

Source: The cross-sectional orders are based on the original results from Deutsch et al. (2015) calculated on the full 13-item list available in EU-SILC 2009 cross-sectional data, UDB-August 2011.

Aggregate longitudinal analysis also suggests a similar pattern of curtailment: a large proportion of those entering MD in a given year ( $N$ ) were already lacking holidays or could not face unexpected expenses the previous year ( $N-1$ ), but the majority of them did not experience the other four deprivations.

### 21.3.4 Item response theory

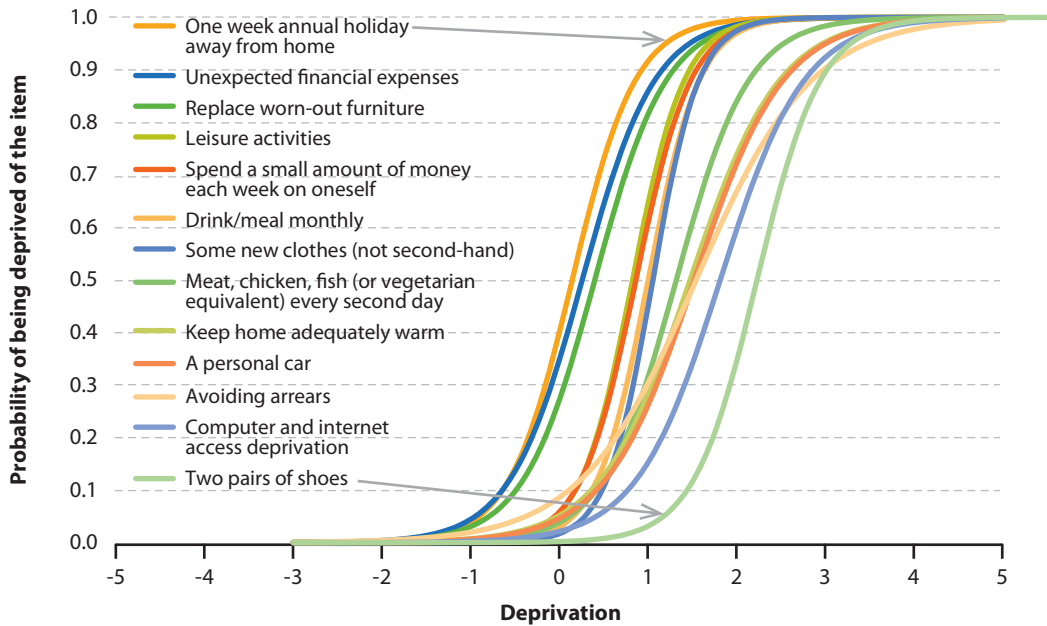
Item Response Theory (IRT) models have been used in the measurement of MD by, among others, Dickes (1983, 1989), Gailly and Hausman (1984), Pérez-Mayo (2004), Cappellari and Jenkins (2007), Ayala and Navarro (2007 and 2008), Fusco and Dickes (2008), Guio, Gordon and Marlier (2012) and Szeles and Fusco (2013). Also known as Latent Trait Analysis, IRT is a set of statistical models that describe the relationship between questionnaire item

**Table 21.8:** Rank of the EU order in each country, longitudinal data, 2011

Country	Rank of EU order	Highest rank of order with holidays and unexpected expenses as last (5th and 6th item respectively)
Poland	1	515
Czech Republic	3	435
Malta	4	517
Italy	6	478
Bulgaria	8	483
Romania	13	498
Estonia	15	520
Hungary	16	519
Belgium	17	478
Lithuania	17	429
Spain	19	431
Austria	20	478
Cyprus	30	425
Latvia	30	541
United Kingdom	33	466
Portugal	46	381
Luxembourg	53	343
Netherlands	54	415
Denmark	134	355
Finland	162	251

*Reading note:* Out of 720 possible longitudinal hierarchies, the best EU longitudinal order ((1) Holidays; 2) Unexpected expenses; 3) Meat/chicken/fish/vegetarian equivalent; 4) Home warm; 5) Arrears; 6) Car/van) is the best 20th rank in Austria. Any order with holidays and unexpected expenses at end of the order is the best 478th order.

*Source:* Authors' computation, UDB August 2013.

**Figure 21.3:** Item characteristic curves (ICCs), 13 items (cross-sectional data), EU level, 2009

*Reading note:* Each Item Characteristic Curve shows the probability of being deprived of an item (Y-axis) for a given level of MD (X-axis). For example, those enduring a level of MD which is one standard deviation greater than the mean EU level of MD will on average almost certainly be unable to pay unexpected financial expenses while they will have a 50 % probability of being unable to afford meat/chicken/fish/vegetarian equivalent every second day.

*Source:* Authors' computation, UDB August 2011.

responses and an unobserved latent trait, such as academic ability, level of happiness or MD. IRT postulates a relationship between each item and the underlying MD trait, and this is best represented using Item Characteristic Curves (ICCs).

Figure 21.3 shows 13 ICCs, which illustrate the relationship between the underlying MD trait (comparable to a standardised version of the MD score shown in Figure 21.1) and the probability of being deprived of each item: as MD (shown on the X-axis, expressed in standard deviations (s.d.) from the mean) increases, the probability of being deprived of an item (shown on the Y-axis) increases. The further to the right the ICC the more severe the MD. The curves are ordered according to the EU (cross-sectional) MD order (see Table 21.7, EU column). The ICCs for the first two items in the order (i.e. holidays and unexpected expenses) show variation between -1 and 1 s.d.: as shown above these items detect the first signs of MD, and the vast

majority of those who suffer from more extreme levels of MD (i.e. above 1 s.d.) cannot afford these. The horizontal distance between the curves (which reflects the range of MD severity and is shown by the dashed horizontal line) shows that the ICCs for these two items are close together but far apart from the other four items (meat/chicken/fish/vegetarian equivalent, home warm, car/van and arrears) which were included in our longitudinal MD order. This means that the severity of MD associated with these two deprivations is distinctively lower than that of the other four items. However, at higher levels of MD the probabilities of being deprived of the four items at the bottom of the order (meat/chicken/fish/vegetarian equivalent, home warm, car/van and arrears) are very similar; the curves are so close together that it is difficult to tell them apart, and it could be argued that the order of curtailment for these items is therefore much harder to establish. These results give a potential explanation of why there is greater variability in the order of

curtailment of these items at national level and yet the EU order shows on average a good fit across most countries. These four items indicate more severe levels of MD than holidays and unexpected expenses, but their respective ranks in the order seem interchangeable.

The ICCs also corroborate the results presented above: not being able to afford two pairs of properly fitting shoes is associated with extremely high level of MD (above 1 s.d.), and therefore this represents the very last item to be curtailed for most countries and population subgroups. The ICCs also reiterate the need to have a broad range of items that capture all levels of MD, in both the cross-sectional and longitudinal components of the survey. Among the 13 items proposed by Guio, Gordon and Marlier (2012), those which were not yet collected in the core EU-SILC are crucial to capture adequately the full range of MD severity.

## 21.4 Conclusions

The *Deprivation Sequence* methodology developed by Deutsch and Silber (2008) in the context of MD research proves to be an insightful methodology to detect orders of curtailment. As shown in this chapter, its simple and data-driven logic can easily accommodate longitudinal data. Item Response Theory can also be used to explore some of these findings further and to identify the overlap in national MD ranks across the EU.

The analysis presented in this chapter shows that MD data can be used to build an insightful narrative of the way people are gradually excluded from some of the key aspects of living conditions of each Member State. Cross-sectional analyses show that people generally first cut back on their annual holidays, then their savings to face unexpected expenses, new furniture, leisure and social activities. Those experiencing higher levels of MD tend to also be unable to afford a meal with proteins, a warm house and paying bills, and eventually even two pairs of properly fitting shoes. Although using a smaller set of items (because of data availability in the longitudinal dataset at the time of writing), the main contribution of this chapter is to extend the cross-sectional methodology developed by

Deutsch et al. (2015) using longitudinal data. The analysis confirms that the same MD pattern is also found when following the same people across time and that the cross-sectional order can be used as a reasonable proxy of the longitudinal order when data are not available. Across the EU, the bad fit of a MD order in which expenditure on holidays away from home is given priority over other goods and activities provides clear evidence against claims that poverty is the result of erratic spending or inefficient household budgeting: the vast majority of those who cannot afford basic items (e.g. meals every second day or two pairs of shoes) do not go on holiday nor have they enough money to face unexpected expenses. It also highlights the importance of social activities such as a monthly drink or meal with friends or family and reiterates the importance of seeing poverty as a form of exclusion from ordinary living patterns, customs and activities (Townsend, 1979).

This type of analysis is also extremely important to confirm the validity and reliability of the EU MD measures in general, and of the 13-item scale proposed by Guio, Gordon and Marlier (2012) in particular (see Chapter 10 of this book). The analysis shows that these 13 items can be used to capture a large range of MD severity, which is not perfectly well captured by the items currently collected in EU-SILC. It shows, for example, that questions on extreme MD such as two pairs of shoes are needed in the longitudinal element of EU-SILC to further corroborate the cross-sectional results and more generally for capturing extreme levels of MD.

Although theories of consumption behaviour and relative prices may be useful to analyse detailed expenditure studies which collect information on the cost and quality of household goods, we argue that MD items available in surveys such as EU-SILC are less suited to empirical exploration of such theories; detailed expenditure data for example may show how the purchase/quality of certain goods is cut down as resources decrease and how individuals are (un)able to find cheaper goods, while MD items simply signal the enforced lack of these. The strength of much of the available MD items lies in their ability to detect the exclusion from shared living patterns, customs and activities because of lack of resources. Nevertheless, future research

could use relative price theories to track changes in MD across several years when more data are available and could use MD data in conjunction with expenditure data to unify these two subject areas (see Chapter 13 of this book for an example of such an approach). Finally, we acknowledge that the issues we have raised deserve further exploration, particularly in understanding which formal and informal resources prevent people from experiencing extreme levels of MD.

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