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ORIGINAL RESEARCH

Comparing Material and Social Deprivation Indicators: Identification of Deprived Populations

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Abstract
The new indicator for material and social deprivation validated in 2014 by the European Commission enlarged the scope of measuring social exclusion, which entails both material hardship of individuals and households, and a relevant social dimension. Using EU-SILC data, this paper compares the standard measure of material deprivation and the new indicator in terms of the sub-population they identify as suffering deprivation across Europe. In 2019, only 57% of the deprived individuals according at least one of the two indicators were so according to both, while 23% was deprived only according to the new measure and 20% was deprived only under the old indicator. We compare the micro-level determinants of inclusion into these different deprived populations, both at the aggregated level and separately for each of the 21 countries included in our sample.

Keywords Multinomial regression · Material deprivation · EU-SILC · Gender issues

1 Introduction

Poverty can be defined as a lack of resources to achieve decent living conditions according to the standards of a society (Townsend, 1979). Its measurement is traditionally based on the financial resources available to an individual or a household or on the deprivation entailed by their lack. The measurement of deprivation has attracted a growing interest both from the research community (Alkire & Foster, 2011; Atkinson, 2003) and from political institutions.

The 2030 Agenda for Sustainable Development, adopted by the United Nations Member States in 2015, asserts the importance of enhancing social protection and inclusion in its 17 Sustainable Development Goals (SDGs) (SDGs United Nations, 2015). The European Union participated actively to the preparation of the Agenda and is working to implement

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it in its social policies (Gregersen et al., 2016). The translation of the Agenda vision into policies and actions, requires the availability of indicators of deprivation and social exclusion to identify people who may be included in relief programs (Whelan & Maître, 2012) and thereby to monitor the European progress towards the goal of material and social deprivation reduction.

Specifically, the European Union adopted the 'standard measure of material deprivation' (*MD*; Guio et al., 2009) that soon became a key element in the framework of Europe 2020 agenda on smart, sustainable, and inclusive growth (Marlier, 2010).

Differently from measures focused on the lack of financial resources, deprivation reveals the extent to which the resources available to a household match the actual needs of its members (Notten & Guio, 2019); this ability not only reflects the adequacy of income but also additional assets that can or cannot be available to the household such as savings, gifts, inter-household transfers or services that can be used to finance the living standard (Israel, 2016).

The *MD* indicator is based on a concept of 'enforced lack' of a set of nine items referring to the household (see Table 1); an individual is classified as deprived if she/he lives in a household whose number of items in enforced lack is at least equal to three. The weak reliability of some of the items included in the *MD* indicator, though, has emerged in the subsequent years after its adoption (Guio et al., 2012). The process of revision in the measurement led to a new set of thirteen items that consists not only in the replacement of some items from the original set but also in the inclusion of new ones defined at the individual level. Hence, it broadened the scope of the aspects of living conditions and societal needs to consider (Guio et al., 2016). The resulting new indicator, named 'material and social deprivation indicator' (*MSD*) is based on counting and adding up the number of items which an individual or her/his household are not able to afford. An individual falls into deprivation if the correspondent count of items is five or more. Either the *MD* or *MSD* deprivation rates are then calculated as the proportion of deprived in the population, according to the relevant definition.

The two measures identify largely overlapping but not coinciding portions of the population. Guio et al. (2017) note that those deprived with respect to both indicators suffer from more severe deprivation, in terms of number of items. On the one hand, those deprived only according to *MSD* flag more items in the new set related to the individual level and the social dimension, while the same flag in most cases only two in the old set of household items (and therefore by definition they would not be considered deprived). On the other hand, those deprived only with respect to *MD* have, in most cases, only three items in deprivation (i.e. they were not deprived according to the higher threshold identifying severe material deprivation).

In this paper, we deepen this analysis by investigating how the deprived population changes when the measure moves from *MD* to *MSD*, whether these changes can be sociologically and economically interpreted and to what extent they are uniform across different countries in the EU.

Our discussion is based on data for twenty-one European countries from the 2019 EU-SILC survey. The survey includes all European countries, but we select those for which data about items of deprivation are available (for details, see Sect. 3). According to Eurostat official statistics, in 2019, estimates aggregated over the selected European countries rates are basically the same for *MD* and *MSD*. Indeed, *MD* is equal to 14%, and *MSD* is 14.7%. Interestingly, also the ranking of the countries analysed is almost the same. Sweden has the lowest *MD* and *MSD* rates (4.7% and 4.0%, respectively), while Bulgaria has the

Table 1 Items covering the ability to afford an acceptable way of life (EU-SILC)

	Items	Variable code	Standard material concept (2009)	Material and social concept (2014)	Level
1	Face unexpected expenses	HS060	X	X	hh
2	Afford one week annual holiday away from home	HS040	X	X	hh
3	Avoid arrears (in mortgage rent, utility bills and/or hire purchase instalments)	HS011 HS031	X	X	hh
4	Afford a meal with meat, chicken, fish or vegetarian equivalent every second day	HS050	X	X	hh
5	Afford keeping their home adequately warm	HH050	X	X	hh
6	Have access to a car/van for personal use	HS110	X	X	hh
7	Afford a washing machine	HS100	X		Hh
8	Afford a colour TV	HS080	X		Hh
9	Afford a telephone	HS070	X		Hh
10	Replace worn-out furniture	HD080		X	Hh
11	Replace worn-out clothes with some new ones	PD020		X	Ind
12	Have two pairs of properly fitting shoes	PD030		X	Ind
13	Spend a small amount of money each week on him/herself ("pocket money")	PD070		X	Ind
14	Have regular leisure activities	PD060		X	ind
15	Get together with friends/family for a drink/meal at least once a month	PD050		X	ind
16	Have an internet connection	PD080		X	ind

hh household level, *ind* personal level. The six personal items are collected at the "adult" level, i.e. for all persons aged 16 or over. They allow making the new indicator gender and age sensitive for adults living in the same household

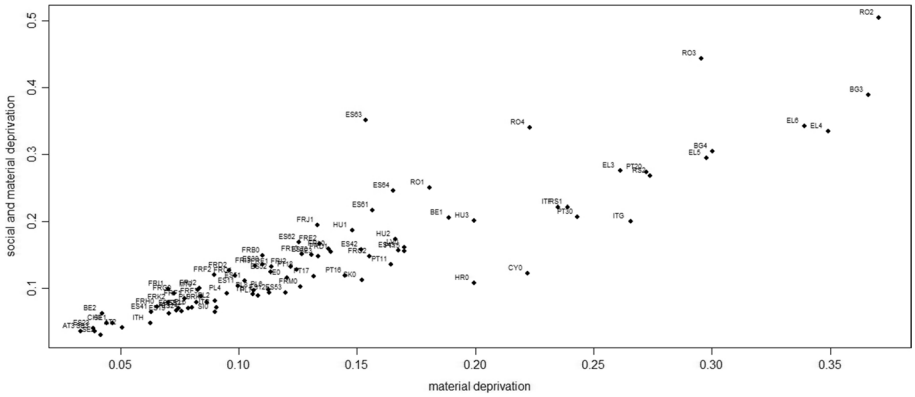

Fig. 1 Indicators' correlation across NUTS2 regions

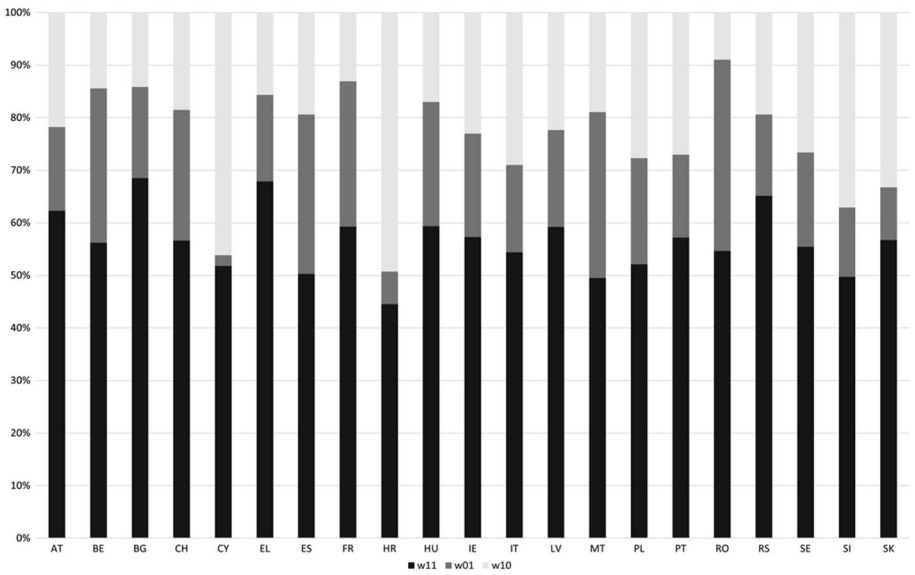

Fig. 2 Degree of overlap between indicators from our sample

highest *MD* rate (32.6%) and the second highest *MSD* (34.6%), behind Romania (39.8%).[1] Figure 1 shows the positive, strong but not exact correlation of the estimates of the two indicators computed for NUTS2 regions of Europe, using data from the 2019 EU-SILC survey.

As far as the population of those deprived with either one of the two indicators, we estimate that, in 2019, 57% is deprived according to both indicators (with a negligible standard error, *se* of 0,45%), while 23% is deprived only according to *MSD* ($se = 0{,}34\%$)

[1] Figures available online at https://ec.europa.eu/eurostat/databrowser/view/tessi080/default/table?lang=en.

and 20% is deprived under *MD* only ($se = 0{,}33\%$). Moreover, there is large heterogeneity across countries. Figure 2 illustrates the degree of overlapping for each European country: it ranges from slightly below 50% in Spain, Hungary, Malta, and Sloveina, to almost 70% in Bulgaria, Greece and Serbia.

From Table 3, that contains the estimated prevalence of deprivations at the item level, we note that, in line with Guio et al. (2017), those deprived with respect to both *MD* and *MSD* are the most fragile segment of the European population. They present larger prevalence of enforced lack for all household items and for most of individual items, in comparison with the rest of the population. The groups of those deprived according to just one indicator differ widely: those classified as deprived only according to *MD* experience very low prevalence of individual items (below 5%), while the prevalence is very large for those deprived only according to *MSD*: on average above 50%. Interestingly, there is an apparent difference in the items defined at the household level: those deprived only according to *MD* show higher average prevalence of enforced lack for household items than the deprived only according to *MSD*, with one exception that we will discuss later.

This evidence suggests a different characterization of the groups from a socio-economic point of view: beside those deprived according to both indicators who suffer from both material and social deprivations, those deprived only according to *MSD* are relatively free from the worst material household-level deprivations, while still suffering from deprivation on a broader social (inclusion) sense. On the contrary, those deprived according to *MD* only are suffering from material deprivation but are relatively free from the social deprivation dimension. These differences are consistent with an exploratory factor analysis we conduct on the sub-sample of those deprived according to either *MD* or *MSD* (see Sect. 5.2). We can conclude that, when we adopt indicator *MD* or *MSD,* the population of the deprived changes significantly, especially since the overlap between the two indicators differs a lot from country to country.

We also check whether the two indicators are associated with a different set of determinants, encompassing individual features, household structural characteristics (gender, age, education, household composition, disability, residence in urban or countryside context) as well as macroeconomic variables, such as the level and growth rate of GDP, used as proxies for the affluence of the European societies. In this set of determinants, we do not include direct precursors of deprivation, namely income or participation to the labour market. From an analysis of the literature, we know that the determinants can be expected to have a similar impact on alternative indicators, although they do not show large overlaps (e.g. Fabrizi & Mussida, 2020; Hick, 2015). This result is confirmed in our research by two parallel logistic regressions used to assess the risk of deprivation, according to the two competing definitions. We replicate the exercise separately for the twenty-one countries represented in our sample; at this more detailed geographical level, not only geographical heterogeneity but also a few meaningful differences between the two indicators pop up, especially concerning the role of gender and household composition.

Finally, we analyze the probability to fall into one deprivation group (deprived with respect to both indicators or just one of the two) conditionally on the above-mentioned determinants, using a multinomial regression model, in line with Guio et al. (2017) and Verbunt and Guio (2019).

Our conclusion is that *MD* and *MSD* identify only partially overlapping portions of the populations whose differences are meaningful from an economic, sociological, and geographical point of view. In short, *MSD* is not a perfect substitute for *MD*; however,

both provide useful information to analyze the dynamics of poverty and social exclusion in Europe. Moreover, depending on the policies under analysis, and the geographical scope involved, the largely imperfect overlap of the two indicators cannot be overlooked.

The paper proceeds as follows. Section 2 offers a review of the existing literature on the broad concept of deprivation; Sect. 3 describes data, indicators, groups and personal variables; Sect. 4 sketches the methodology, and Sect. 5 describes the results. Section 6 gives some concluding remarks and policy suggestions.

2 Literature Review

Our paper focuses on the comparison of two alternative indicators of deprivation. The subject is not new in the literature, that witnesses a strong effort at drafting the phenomenon of poverty, both in definition and measurement, converging eventually to a broad concept of deprivation, broader than simply a lack of minimum means of subsistence. According to Mack and Lansley (1985), who gave one of the most inspiring initial contribution, based on Townsend (1979) insights, to the discussion of whom can be defined poor, what are the necessities considered essential by people, what is the way of living that is 'expected and customary in society' (in the 1980s' Britain), deprivation is the enforced lack of any particular socially perceived necessity—beyond the lack of income. In addition, the authors identify different degrees of deprivation: for some people, the deprivations they face will be relatively marginal; for others, it will affect their whole way of life. According to Pérez–Mayo (2005), under a modern terminology, deprivation means an inability to get the goods, facilities, and opportunities, which are usual in the household environment.

To determine which needs are essential such that a lack of resources to satisfy those needs reveal a deprivation status, they require social consensus. Poverty then not only regards how to cope with basic living conditions, or subsistence, but enlarges to the concept of 'social exclusion', shifting onto the factors that contribute to the 'precariousness that often accompanies unemployment or disengagement from the labour market' (Paugam, 1996). More generally, social exclusion reflects a lack of connectedness that is multi-dimensional, and whose elements relate to the characteristics of individuals and to the communities, and social and physical environments in which people live (DeWilde, 2004; Fusco, 2003; Nolan & Whelan, 1996). In the words of Burchardt et al. (2002) 'an individual is socially excluded if he or she does not participate in key activities in the society in which he or she lives.'

Saunders et al. (2008) reiterate that a lack of resources is deprivation's underlying cause. This implies that deprivation can help to identify who is in poverty and guide decisions about how much income is needed to avoid it. Moreover, they recognize that while the material deprivation approach has been used to better identify poverty, social exclusion offers an alternative that opens up other issues associated with the role of institutions and processes in promoting or impeding rights and responsibilities (see also DeWilde, 2008, for the role of labor market institutions in multidimensional poverty). Both approaches are related to poverty, but these links have been developed in different ways. A series of indicators of social exclusion, for example, have developed in the 2000s, in three main areas: disengagement, service exclusion, economic exclusion (Saunders et al., 2008).

The consequence of this broader view of poverty in our perspective is that measures of deprivation (at its many degrees) or social exclusion may identify different (or partially overlapping) disadvantaged groups within the populations, over societies and times. On

the issue of correctly identifying the people in need, Whelan et al. (2002) analyze the extent of persistent income poverty across countries, and how it relates to different types of material deprivation. Notably, their indicators do not identify the same set of households (or individuals) as poor. Similar results are found as well in a more recent strand of the literature, e.g. Whelan and Maître (2010) for Europe, Ayala et al. (2011) for Spain, Hick (2015) for the UK, Verbunt and Guio (2019) for Europe, and Fabrizi and Mussida (2020) for Italy.

This may diminish the potential impact of poverty reduction targets by government (see Willitts, 2006, for Britain, Combat Poverty Agency, 2002, for Ireland, Notten, 2016, for selected European countries).

Another issue relevant to our analysis is that demographic, social and economic features of individuals are correlated to diverse concepts of deprivation. As an example, Verbunt and Guio (2019) investigate the risk factors associated to income poverty and severe material deprivation. Using the 2012 cross-sectional EU-SILC data for 31 countries, they suggest that households' work intensity and educational attainments are important determinants of severe material deprivation, while households' sociodemographic characteristics, like the type of household, age and gender of the head of household, and household's migration background, mostly affect income poverty. The work by Fabrizi and Mussida (2020) which analyses the determinants of the risk of poverty, severe material deprivation and subjective poverty, suggests that structural household characteristics and household level economic variables play roles that are often different on the three measures.

The multidimensional approach produces different findings to those obtained by applying a conventional poverty framework, and these differences have an important impact on who is regarded as most at risk of disadvantage. This point applies to our research as well.

3 Data and Indicators

We use data from the EU-SILC survey, that is based on a methodology and definitions which are standardized across most members of the European Union (Eurostat, 2010). The topics covered by the survey are living conditions, income, social exclusion, housing, work, demographics, and education of individuals. We select cross-sectional data for 21 European countries in 2019, corresponding to the income year 2018. Among the countries for which EU-SILC data are available we consider only those for which all the items needed to compute *MD* and *MSD* were available in 2019.[2]

In particular, the questionnaire inquires about individual and household's capacity to conduct an acceptable or standard way of life within their own country. Heads of household may answer a number of questions of the type *Are you and your family members able to afford/face/replace/get …?* related to enforced lacks and deprivations. The items completing the questions are listed in Table 1, which distinguishes items composing the

[2] In detail, EU-SILC includes 32 countries. However, data for IS and the UK are not available in 2019, while some other countries (CZ, DE, DK, EE, FI, LT, LU, NL, NO) do not have information about the deprivation items #hs070 telephone; #hs080 tv; #hs100 washing machine. The countries in our analysis are therefore the following: AT: Austria, BE: Belgium, BG: Bulgaria, CH: Switzerland, CY: Cyprus; EL: Greece, ES: Spain, FR: France, HR: Croatia, HU: Hungary, IE: Ireland, IT: Italy, LV: Latvia, MT: Malta, PL: Poland, PT: Portugal; RO: Romania, RS: Serbia; SE: Sweden, SI: Slovenia, SK: Slovakia.

Table 2 Absolute frequency of the four groups and weights distribution

Id	(00)	(01)	(10)	(11)	Total	w01	w10	w11
AT	11,297	143	160	421	12,021	0.16	0.22	0.62
BE	13,287	566	266	1191	15,310	0.29	0.14	0.56
BG	9780	1321	962	4946	17,009	0.17	0.14	0.69
CH	13,253	187	103	297	13,840	0.25	0.19	0.57
CY	8681	57	1046	1178	10,962	0.02	0.46	0.52
EL	25,462	2503	2438	9365	39,768	0.16	0.16	0.68
ES	32,321	1838	1252	3330	38,741	0.30	0.19	0.50
FR	21,648	1089	497	2348	25,582	0.28	0.13	0.59
HR	14,836	274	2254	2009	19,373	0.06	0.49	0.45
HU	10,850	888	685	2643	15,066	0.24	0.17	0.59
IE	6786	301	234	736	8057	0.20	0.23	0.57
IT	37,781	1032	1698	2849	43,360	0.17	0.29	0.54
LV	8400	503	567	1547	11,017	0.18	0.22	0.59
MT	8273	388	197	568	9426	0.32	0.19	0.50
PL	38,221	1193	1499	3025	43,938	0.20	0.28	0.52
PT	25,888	1279	1739	4046	32,952	0.16	0.27	0.57
RO	9623	2603	653	3885	16,764	0.36	0.09	0.55
RS	10,887	794	977	3228	15,886	0.15	0.19	0.65
SE	7430	47	86	221	7784	0.18	0.27	0.55
SI	22,869	327	938	1095	25,229	0.13	0.37	0.50
SK	11,957	282	825	1579	14,643	0.10	0.33	0.57
tot	349,530	17,615	19,076	50,507	436,728	0.23	0.20	0.57

(00) people not deprived according to either indicator; (01) people deprived according to *MSD* but not according to *MD*; (10) people deprived according to *MD* but not according to *MSD*; (11) people deprived according to both indicators. w01 is the percentage of (01) within any-rate (weight). $w01 + w10 + w11 = 1$

original material deprivation index (*MD*) by those used in the definition of the new indicator (*MSD*).

Based on their difference, we group individuals in four categories: those who are not deprived according to either indicator (00), individuals deprived under *MD* but not *MSD* (10); individuals deprived under *MSD* but not according to *MD* (01) and individuals who are deprived according to both indicators (11). The group (00) is going to be used as the base category for the regression analyses. Table 2 reports the sample distribution by groups and country, as well as the proportion of the (10), (01) and (11) groups in the composition of the population, deprived according to at least one of the indicators. We denote these proportions $w01$, $w10$ and $w11$. The latters are estimated using sampling weights and the methodology outlined in Sect. 4. With respect to the population of those deprived with either one of the two indicators, we estimate that, in 2019, $w11 = 57\%$—deprived according to both indicators on average, while $w01 = 23\%$—deprived only according to *MSD* and $w10 = 20\%$, deprived under *MD* only. Moreover, there is large heterogeneity across countries. The overlapping between the two indicators of deprivation ranges from 45% in Croatia to 69% in Bulgaria. We also notice that for some countries there is a large unbalance in the percentages of deprived

with respect to just one of the indicators. In Croatia, for instance, only 6% of the individuals is deprived only according to *MSD*, while the percentage increases to 49% if we consider *MD*; nonetheless, in Romania we find a quite opposite situation: 36% are deprived only according to *MSD* while while only 9% according only *MD*. All in all, there is heterogeneity across the countries investigated both in the overlapping between indicators and in their relative prevalence.

Table 5 reports the descriptive statistics of the individual characteristics, the household features, and macroeconomic indicators used in our logistic and multinomial logit regression that will be explained in more detail in Sect. 4. The individual characteristics include age, gender and disability status. Disability, in line with the previous literature (e.g., Gannon, 2005; Oguzoglu, 2010), is defined by an individual when self-reporting limitations in daily activities. The EU-SILC survey (variable PH030) provides information on disability status based on a question about limitations in daily activities due to health problems. The respondents can choose among three alternatives: "Yes, strongly limited", "Yes, limited" or "No, not limited". Despite the debate on the reliability of such a subjective measure of disability, with some authors backing the reliability of these assessments (Burkhauser et al., 2001) and others claiming their inaccuracy (Contoyannis et al., 2004), it is commonly used (see, for instance, Mussida & Sciulli, 2019, and Calegari et al., 2022). In this paper, we investigate both direct and indirect effects of disability on material deprivation, as measured by personal disability and/or the presence of disabled members in the household, respectively.

Some of the household characteristics refer to the head of household, namely to his/her educational attainment as well as being a homeowner. Other variables refer to the household structure and specifically to whether it is mono-parental, composed by a single person, and how many children belong to the household. According to standard EU-SILC rules, we define a person as child if aged up to 18 or up to 24 but economically inactive. Finally, we consider the degree of urbanization of the area in which the household resides discriminating between densely, intermediate, and scarcely populated areas. We notice that this variable does not depend on the questionnaire but it is constructed using information on the population density associated to the address of the respondent. In the regression models of the next sections, we consider also macro-level economic variables. We include per capita GDP and per capita GDP growth, to test whether the state of the economy impacts on the exposition to social exclusion. We collect macro data at sub-national level, considering NUTS2 level data available from Eurostat databases. The reason why we include sub-national estimates is to account for the large within-country divides that characterize many European nations. In the regression analyses, country-level dummies will be included; these variables enable us to account for the role of different institutions, welfare regimes and social structures. Finally, despite their availability in the EU-SILC dataset, we decided to not include any measures for (household) income and participation to the labour market in our set of covariates. Household income and labour market participation, indeed, are significantly correlated with the indicators for material deprivation and there might be also issues of reverse causality. In general, the concept of material deprivation (both the standard indicator and the new one) is strongly related to the adequacy of income and this is further supported by the 'enforced lack' approach (European Commission, 2015). Moreover, deprivation, as suggested by the existing literature, is negatively correlated with both income and labour market participation (see, for instance, (Berthoud et al., 2004)). As a more general proxy of wealth we include, as explained above, macro level indicators, that are per capita GDP and per capita GDP growth at the regional level, as

well as country dummy variables, which allow accounting for geographical divide not only between countries but also within regions of the same country.

4 Methodology

Our analysis encompasses three separate steps. First, we estimate the prevalence of enforced lack of individual and household items separately by the subsets of the population defined as those deprived with respect to both indicators, only to *MSD*, only to *MD*, or with either of the two. The aim is characterizing the different sub-populations of deprived individuals. Estimates are obtained using EU-SILC published sampling weights. We also computed standard errors, accounting not only for varying weights but also for the clustering of individuals within households and, when the information is available, for stratification. These are not design features that can have an impact on the standard deviation but the methodology may nonetheless lead to a good approximation of the actual standard errors (Goedemé, 2013). The package survey of R is for this estimation purpose (Lumley, 2016).[3]

Second, to understand thoroughly the relationships among the items used in the definition of *MSD*, we use an exploratory factor analysis. Specifically, we first estimate the tetrachoric correlation matrix for the items (Kim, 2019) and then proceed with the analysis using the principal axis as factoring method. We carry out the analysis on the sub-sample of individuals deprived with respect to either one of the deprivation index (*MD* or *MSD*) and not on the whole available sample. The reason is that a factor analysis carried out on the entire sample would highlight the dominant role of a factor with almost constant positive scores on all items, a result confirming the reliability of *MSD* discussed in Guio et al. (2017). Focusing on the mentioned sub-sample, however, enables us to explore more specific aspects of the relationship between the indicators in the deprived population. We use the psych package of R for this analysis (Mair, 2018; Revelle, 2022).

Finally, we consider regression models to relate *MD* and *MSD* to the determinants described in Sect. 3. In the first place, we use a standard logistic regression with baseline category equal to the state of deprivation to compare the impact of determinants on the probability of leaving deprivation according to the two indicators. We carry out this analysis both on the whole sample (in this case accounting for country heterogeneity using fixed effects), and separately for each country. Note that the recourse to country dummies do not prevent the use of macro-economic variables as we consider aggregates defined at the sub-national level. When working with country specific regressions, macro-economic variables are included in models only for countries with at least three different regions. We also estimate a multinomial logit model for modelling the probability of being deprived according to just one of the indicators (either *MD* or *MSD*) or both, with respect to a baseline group defined by those not deprived. Again, the regression analysis runs over the determinants described above. In this way, we model the relative probability of being deprived by considering the degree of overlapping between the two concepts of deprivation, and we estimate the relative risk ratios of different features in the deprivation groups.

[3] Due to large sample sizes, standard errors are small, below 0.008 in all cases and 0.003 on average. For this reason they are not reported.

Table 3 Prevalence of people in enforced lack of individual and household items

Groups	Personal items					
	PD020	PD030	PD050	PD060	PD070	PD080
Either	0.444	0.246	0.417	0.606	0.579	0.218
10	0.016	0.004	0.008	0.034	0.036	0.006
01	0.551	0.285	0.569	0.869	0.813	0.272
11	0.548	0.315	0.495	0.695	0.671	0.270
Groups	Household items						
	HS040	HS050	HS060	HH050	HS110	HD080	HS011-HS031
Either	0.908	0.374	0.895	0.383	0.268	0.782	0.370
10	0.921	0.319	0.910	0.374	0.196	0.446	0.363
01	0.779	0.058	0.737	0.051	0.075	0.837	0.085
11	0.957	0.524	0.955	0.524	0.372	0.877	0.490

The sub-populations are deprived according to either *MD* or *MSD* (either), *MD* only (10), *MSD* only (01), both (11). Standard errors, not reported, are below 0.008 in all cases, 0.003 on average

5 Results

5.1 Prevalence Analysis

Estimates of the prevalence of people with enforced lack of each item defining the indicator are reported in Table 3. As the purpose is that of characterizing the group of deprived people identified by alternative deprivation indicators, they are computed for the four categories of individuals described in Sect. 1 (i.e. individuals deprived under *MD* but not *MSD* (10); individuals deprived under *MSD* but not according to *MD* (01); individuals who are deprived according to both indicators (11); along with an 'either' group composed by those deprived according to at least one of the indicators). Table 3 reports the prevalence of items in the groups.

In the first place we notice that household-level item deprivation prevalence is on average higher than that measured at the individual level. Some of the household level items are characterized by extremely high prevalence in the deprived population. Namely, HS040 ('affording one week annual holiday away from home') and HS060 ('facing unexpected expenses') are in deprivation for more than 90% of those deprived with respect to either *MD*, *MSD* or both. We can expect these items to be of little use in discriminating among deprived sub-populations. More generally, the differences in prevalence between the (11) and the 'either' group are relatively low (around 10%), while a more marked difference emerges when the groups (10) and (01) are compared.

When compared with group 'either', those deprived only with respect to *MSD* (i.e. the (01) group) show positive differences in the prevalence for the items measured at the individual level and also for the item HD080 ('affording the replacement of worn-out furniture'), negative differences for the remaining items. On the contrary, the (10) group (those deprived only with respect to *MD*) shows negative differences for the same set of items, while for the remaining household level items, the sign of the differences are mixed.

Table 4 Scores associated to exploratory factor analysis applied to the 13 items entering the *MSD* indicator

	Factor1	Factor2	Factor3	Factor4
PD020	0.532	0.639		0.126
PD030	0.456	0.769	−0.249	0.104
PD050	0.737	0.149		
PD060	0.906	−0.13	−0.106	
PD070	0.768			
PD080	0.579	0.186		0.288
HS040	−0.125		0.63	
HS050		0.403		
HS060	−0.125		0.584	
HH050	0.284			
HS110				0.83
HD080	0.359	0.356		
HS011-HS031			0.126	

Computation based on the subsample of those deprived with respect to either *MD* or *MSD*. Only scores significantly different from 0 are reported

5.2 Factor Analysis

The aim of the factor analysis is to assess whether the prevalence patterns of Table 3 reflect an underlying structure in the data that allows to interpret the groups (01) and (10) as meaningful segments of the deprived population. From the analysis of the sub-sample deprived according to at least one of the two indicators (*MD* and *MSD*), we extract four factors according to the methodology illustrated in Sect. 4 accounting for 47% of the overall variability. Scores associated to these factors can be found in Table 4.

The first factor is dominated by items PD050, PD060, PD070, that is 'get together with friends', 'regular leisure activities', 'pocket money'. All these items are related to social interactions of the individual and the factor can therefore be labelled as 'social interaction deprivation'. Note that an intermediate weight is associated to 'affording the replacement of worn-out furniture' (HD080), that although measured at the household level is nonetheless closely related with social interactions. HH050, the ability of keeping the house adequately warm receives a significant weight and can be interpreted in the same line. The second factor relies mainly on PD020, PD030 ('replacement of worn-out clothes with new ones' and 'availability of two pairs of fitting shoes'). Two items measured at the household level but closely related to personal living conditions (having a meal with meat or the equivalent every second day, and to a lower extent replacement of worn-out furniture) receive a considerable weight. A somewhat lower load concerns the 'availability of an internet connection', and the 'get together with friends', that are in both cases related to individual freedom in today lifestyle. We think this factor can be thought as describing strictly individual deprivation.

The group we label as (01) shows, for the items involved by the first two factors, higher prevalence than in the (11)—with the statistically non significant exception of HD080—far higher than that of (10) group. On the contrary, for the items not involved by the first two factors, prevalence are well below the one in (10) and (11) groups and very markedly so for specific items. We can then label the (01) group as those people suffering from strictly

Table 5 Sample descriptive statistics of the variables used in logistic regressions

Variable	Mean	St. dev
Age*	50.31	18.26
Male	0.477	0.499
Disabled	0.067	0.250
Low educated head of household	0.370	0.483
Medium educated head of household	0.392	0.488
High educated head of household	0.217	0.412
Homeowner	0.754	0.431
Presence of disabled in the household	0.056	0.230
Densely populated area	0.373	0.484
Intermediate populated area	0.329	0.470
Thinly populated area	0.298	0.457
Mono-parental household	0.030	0.171
Single household	0.168	0.374
Number of children*	0.420	0.790

Variables marked with a * are numerical, the others are dichotomous. Estimates are weighted. Overall sample size 439,783

personal and social interaction deprivation but not (or to a much lesser extent) from material deprivation.

The third factor is related mostly to HS040, the possibility to 'afford one week annual holiday away from home' and HS060 ('face unexpected expenses'), indicators of material hardship related to the household level. Financial problems related to arrears in payment receive a significant weight and can be interpreted in the same line. We note that for these items the difference in prevalence between the (01) and (10) groups is relatively large. The highest loading of the fourth factor is associated with the household level deprivation HS110 ('have access to a car/van for personal use') and to a lower extent to the availability of an internet connection. Both factors 3 and 4 can be associated more closely with household level material deprivations than to personal level deprivations. Factor 3 is more related to financial distress and material hardship, while factor 4 is related to mobility and the capability of social connections of the household.

From this factor analysis we divide items into two groups: those measured at the personal level plus HD080 that are associated to personal and social deprivations, and the remaining associated to household level material deprivations. The difference in prevalence patterns in Table 3 allows us to interpret the group (10) as composed by those suffering only from material household level hardship but not (or to a much lesser extent) from personal and social interaction deprivations.

5.3 Regression Analyses

We start considering the results of the two parallel logistic regressions used to assess the impact of the determinants listed in Table 5 on *MD* and *MSD*. The results (specifically, odds ratios) pertaining to estimation for the whole sample and for specific countries are

Table 6 Odds Ratios of escaping MD or MSD by country

	AT		BE		BG		CH		CY		EL		ES		FR		HR		HU		IE	
	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD
Individual characteristics																						
Age	1.41	1.40	1.50	1.22	0.78	0.74	1.37	1.20	1.65	1.62	1.29	1.31	1.20	*1.01*	1.34	1.18	1.10	0.92	1.31	0.04	1.38	1.29
Age^2	1.18	1.22	1.26	1.16	0.87	0.88	1.16	*1.10*	1.36	1.46	1.20	1.25	1.16	1.07	1.18	1.10	1.13	1.19	1.24	0.03	1.29	1.18
Male	*1.02*	*1.07*	*0.95*	1.04	*1.01*	1.08	*1.10*	*0.99*	*1.04*	*0.96*	*1.03*	1.06	1.06	1.15	1.12	1.20	*0.93*	*0.96*	*1.01*	*0.05*	*1.04*	*1.06*
Disabled	0.21	0.20	0.29	0.24	0.57	0.78	0.23	0.22	0.35	0.36	0.56	0.64	0.40	0.42	0.40	0.36	0.49	0.36	0.42	0.03	0.30	0.24
Household characteristics																						
Low educated head of househod	0.31	0.31	0.75	0.72	0.29	0.32	0.55	0.44	0.57	0.57	0.44	0.45	0.44	0.40	0.58	0.51	0.53	0.45	0.30	0.02	0.62	0.71
High educated head of household	2.31	2.23	2.61	2.57	2.30	2.38	2.03	2.78	3.56	3.41	2.84	3.05	2.32	2.81	2.68	2.96	3.05	4.56	5.02	0.39	2.38	2.52
Homeowner	2.85	2.95	6.60	5.97	1.55	1.34	11.03	7.75	1.66	1.98	1.72	1.70	4.56	3.85	4.84	3.97	1.89	2.43	2.56	0.19	4.59	4.29
Disabled in the household	0.33	0.40	0.32	0.35	0.66	0.69	0.41	0.36	0.46	0.51	0.62	0.68	0.46	0.47	0.49	0.47	0.65	0.47	0.58	0.04	0.31	0.25
Monoparental household	0.25	0.19	0.26	0.31	0.36	0.42	0.19	0.27	0.32	0.26	0.27	0.32	0.43	0.44	0.37	0.32	0.20	0.18	0.41	0.04	0.18	0.21
Single household	0.38	0.33	0.42	0.43	0.24	0.36	0.39	0.46	0.60	0.63	0.61	0.78	0.71	0.65	0.51	0.47	0.42	0.38	0.51	0.03	0.33	0.39
Number of children	0.75	0.70	0.87	0.76	0.92	0.81	0.65	0.61	0.76	0.68	0.90	0.83	0.78	0.67	0.77	0.73	0.95	*0.96*	0.68	0.02	0.82	0.72
Region characterisitcs																						
Densely populated area	0.67	0.59	0.63	0.75	*0.95*	*0.97*	*0.92*	*0.93*	1.99	2.03	*0.97*	0.90	0.81	0.78	0.84	*0.97*	*1.00*	0.62	1.20	*0.07*	1.22	1.51
Intermediate populated area	*1.21*	*1.12*	0.79	*1.00*	*0.92*	0.91	*0.96*	*1.00*	1.55	1.56	1.17	1.15	*1.10*	*1.09*	*0.93*	*0.94*	*1.01*	*0.92*	*0.92*	0.04	*1.21*	1.23
Macro indicators																						
GDP growth	0.41	0.59	0.00	0.00							1.05	1.04	*1.00*	*1.06*	1.51	0.98	1.16		0.91	0.03		
GDP level	2.30	*1.95*	0.00	0.00	1.15	1.21					0.87	0.94	*0.97*	0.92	0.48	*1*	1.01		0.91	0.03		

Table 6 (continued)

	IT		LV		MT		PL		PT		RO		RS		SE		SI		SK		TOTAL	
	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD	MD	MSD
Individual characteristics																						
Age	1.07	*1.00*	*0.98*	*0.99*	1.21	*0.98*	*1.01*	*0.99*	1.21	1.09	1.02	0.84	*0.97*	0.92	1.37	1.28	0.91	0.79	*1.05*	*1.03*	1.09	1.02
Age^2	1.04	1.07	1.06	1.10	1.15	*1.04*	1.10	1.11	1.11	1.10	1.06	*0.97*	*1.02*	*1.02*	1.27	1.27	*1.04*	1.00	1.07	1.09	1.11	1.10
Male	1.14	1.14	*1.07*	1.16	*1.12*	1.19	*0.98*	*1.05*	*1.03*	1.15	0.97	*1.06*	*0.98*	*1.07*	*1.02*	*0.99*	*1.02*	1.04	*0.98*	*1.00*	1.02	1.07
Disabled	0.43	0.42	0.38	0.38	0.34	0.47	0.39	0.40	0.43	0.40	0.60	0.55	0.55	*0.48*	0.23	0.29	0.44	0.39	0.37	0.35	0.44	0.46
Household characteristics																						
Low educated head of household	0.46	0.38	0.70	0.71	0.58	0.41	0.53	0.55	0.30	0.33	0.47	0.52	0.56	0.50	0.35	0.26	0.49	0.48	0.32	0.29	0.45	0.43
High educated head of household	2.09	2.07	2.74	2.94	3.57	2.22	*1.27*	*1.02*	4.65	4.79	4.12	6.27	3.29	3.11	1.03	*0.81*	4.34	5.38	3.04	3.98	2.69	2.76
Homeowner	2.86	2.66	2.09	2.01	3.73	3.94	3.18	2.77	3.00	2.97	2.03	1.56	1.90	2.20	16.52	12.08	2.00	2.39	3.08	3.13	2.20	2.25
Disabled in the household	0.52	0.45	0.51	0.44	0.30	0.39	0.46	0.55	0.49	0.44	0.81	0.72	0.63	0.60	0.13	0.12	0.43	0.42	0.48	0.52	0.51	0.52
Monoparental household	0.65	0.53	0.33	0.31	0.23	0.28	0.34	0.32	0.39	0.38	0.43	0.47	0.31	0.34	0.44	0.56	0.28	0.26	0.36	0.29	0.40	0.38
Single household	0.70	0.71	0.39	0.45	*0.77*	*1.01*	0.40	0.45	0.51	0.55	0.46	0.56	0.41	0.48	0.60	0.61	0.41	0.45	0.37	0.42	0.53	0.58
Number of children	0.94	0.85	*0.94*	*0.95*	0.80	0.69	*1.01*	*0.97*	0.92	0.80	0.81	0.77	0.93	0.92	0.67	0.68	0.97	0.93	0.77	0.67	0.87	0.82
Region characterisitcs																						
Densely populated area	0.79	0.79	*1.19*	*1.06*	*0.88*	1.08	1.21	1.34	0.79	0.75	*1.03*	0.76	*1.08*	1.24	*1.11*	*1.19*			1.42	1.52	1.05	0.99
Intermediate populated area	1.24	*1.07*	*0.96*	1.14	1.01	1.02	*0.93*	1.12	0.91	*0.93*	0.79	0.59	1.26	1.33	*0.89*	*0.78*			1.14	1.19	0.94	0.91
Macro indicators																						
GDP growth	3.12	2.95					1.13	*1.09*	*1.00*	1.32	0.54	0.54	2.03	2.05	*2.59*	0.04					0.89	0.84
GDP level	0.95	0.92					0.91	*0.96*	*1.10*	0.85	*0.99*	0.94	1.01	1.05	*0.82*	3.92					0.95	0.96

Italic means the estimate is not statistically significant

shown in Table 6. Notice that in all cases the baseline category is the state of deprivation so coefficients shown are the odds ratios of leaving this status.

Although the coefficients look similar at first glance, some relevant differences comparing the two indicators and the various countries emerge. If we consider the impact of age, linear and quadratic terms are significant in almost all the regressions. For the whole sample and for most of the countries the relationship is U shaped with a minimum corresponding to a somehow early age: 43 years for *MSD* and 36 for *MD* at the whole sample level: these are the ages for which the probability of leaving deprivation is minimum, all the rest being equal. Notably this minimum is reached markedly earlier in some countries: for *MSD* especially, in Switzerland the minimum occurs at 24 years age, France at 25 years, and Austria at 26 years. This evidence shows that the young are particularly exposed to the risk of deprivation: this may depend on their difficult entry in the labour market and is in line with the relationship between material deprivation and permanent income (Whelan and Maître, 2010). About the shape of the relationship of age to *MSD* and *MD* we notice that, interestingly, we observe an inverted U shape only in Bulgaria and Romania. In the former, the probability of exiting the deprivation status reaches a maximum around 18 years (and at 9 years for *MD*), while for Romania the curve is decreasing (with no maximum) for *MSD* and with a maximum for *MD* at 54 years.

The relative risk associated to 'male' is not always significant but when it does, it is positive. This means that, all the rest being equal, males have a higher chance of leaving deprivation than females. Moreover, the coefficient is systematically higher for the regressions on *MSD* rather than *MD*: the relative advantage of males is stronger in the case of material and social deprivation. The disadvantage of females is confirmed by the existing literature, which focused on the effect on female head of household, not only for *MD* but also for income poverty and more generally, social exclusion (Fabrizi & Mussida, 2020; Mussida & Parisi, 2020). The probability of leaving deprivation decreases as the number of children in the household grows. We observe this effect consistently across the countries explored; with the only expection of Sweden (where the effects are basically identical) we also have that the effect is systematically more severe on *MD* than on *MSD*.

Living in a densely populated (or intermediate) area decreases the probability of leaving the deprivation status with respect to the baseline category represented by poorly populated areas, at least for the whole sample. The higher costs faced by urban population may be a possible interpretation for this evidence (see, for instance, Ayala et al., 2021). This is in line with the coefficients observed for home ownership that, although always significant and above 1, are generally higher in rich countries than in poorer ones. If we look at the results about the degrees of urbanization for individual countries we notice that the coefficient associated to living in a densely populated area is sometimes above 1, sometimes below and in some other cases non significantly different from 1. A geographical pattern is not easily recognizable as we notice that the countries where the coefficient is positive are located in the Centre (Poland and Slovakia), the East (Serbia and Cyprus) and West (Ireland). No clear differences between the two indicators emerge.

Coefficients associated to other structural characteristics of individuals and households have impacts in line with expectations and systematic differences between the two indicators do not emerge. As to disability, we notice significant and negative relative risks (lower than 1) for both personal disability and the presence of disabled in the household. The negative association of disability (both direct and indirect effects) with employment and, more in general, labour market attainment and material deprivation is supported by the literature (see, for instance, Mussida and Sciulli (2019); Mussida and Parisi (2020)). Here we add evidence for the social dimension of deprivation as measured by *MSD*. The

role of high education, especially tertiary educational attainment, in increasing the risk of leaving the status of deprivation, clearly emerges and confirms previous studies (see, for instance, Calegari et al., 2022). As to household structure, we notice a disadvantage for monoparental and single households for all the risks explored. For the whole sample, the impact of both GDP and GDP growth is negative, although both risks are not far from 1. Nonetheless, we find that per capita GDP growth and level do not exert a clear role on the risk of escaping all deprivations when turning separately to the 21 European countries of this study. The coefficients associated with both indicators are above and below 1, sometimes significant or not significant. This effect might be due to the heterogeneity of country-level GDP, as the estimates on the whole set of countries show; moreover, we will sketch below a clear negative association between the two indicators for GDP and deprivations.[4]

Table 7 reports the estimates of the multinomial logit regression model for the overall sample of European countries. We do not report country specific results both for simplicity and because sample sizes associated to (01) and (10) groups would be small in many cases. The aim of this exercise is to consider the degree of overlapping between the two concepts of deprivation, by showing the relative risk ratios (RRR) of being deprived under *MD* (but not *MSD*), i.e. group (10); the RRR of being deprived under *MSD* (but not *MD*); and the RRR of being deprived according to both indicators (11). The baseline in this case is the group of non-deprived (00). In this way, we consider the different categories according to the identification as deprived or not in each definition.

The probability being both in a condition of household material and social hardship (*MSD*) and household material hardship (*MD*), group (11), has an inverted U-shaped relationship with a maximum reached around 36 years of age, in line with the results we described for the separate logistic regressions (where we estimated the RRR of escaping deprivations and we found a U-shaped relationship).[5] The negative association that holds for most of the people's lifespan is supported by the literature (e.g. Verbunt & Guio, 2019).

The coefficients associated to being male are negative and significant for all the risks investigated, especially for *MSD*. This might suggest a relatively high advantage of male over female on personal deprivation items. Intra-household inequality and incomplete share of resources can be a possible explanation for this evidence (Burchardt & Karagiannaki, 2020).

Individual disability is positively associated with the risk of all deprivations. The probability of being deprived according to both deprivations is much higher than escaping either *MSD* or *MD*; about the latter two, the positive effect is more marked for *MD* than for *MSD*. Yet, disability is strongly associated to deprivation in the household. This result is consistent with the existing literature on material deprivation (e.g. Ayala et al., 2011; Fabrizi & Mussida, 2020). Similarly, the presence of a disabled person in the the household has a positive impact.

[4] We run our estimates also on two groups of countries identified according to their GDP level in 2019 into 'less affluent' and 'more affluent' countries. Results concerning the macro-economic indicators are heterogeneous in the two groups. For instance, the GDP level increases the risk of escaping deprivation for poor countries, while it does not exert a role on deprivation in rich countries. Given that for other covariates the differences between the groups are negligible, we decide to not report these estimates. These, however, are available upon request.

[5] For the probability of being in household material and social hardship (01) and household material hardship (10), we do not find significant quadratic terms for age (see Table 7).

Table 7 Benchmark multinomial model: RRR of being deprived or not according to each definition

	Dependent variable		
	10	01	11
Individual characteristics			
Age	0.910***	1.109***	0.891***
	(0.009)	(0.011)	(0.006)
Age squared	0.988	1.007	0.874***
	(0.007)	(0.011)	(0.011)
Male	0.973*	0.842***	0.953***
	(0.015)	(0.013)	(0.010)
Disabled	1.990***	1.839***	2.671***
	(0.054)	(0.053)	(0.050)
Household characteristics			
Lower educated head	1.772***	1.641***	2.498***
	(0.033)	(0.030)	(0.031)
Higher educated head	0.547***	0.445***	0.328***
	(0.015)	(0.012)	(0.008)
Homeowner	0.476***	0.484***	0.317***
	(0.009)	(0.010)	(0.004)
Presence of disabled	1.706***	1.581***	2.143***
	(0.047)	(0.046)	(0.039)
Mono-parental	2.231***	2.452***	3.924***
	(0.087)	(0.092)	(0.094)
Single	1.643***	1.005	2.154***
	(0.038)	(0.026)	(0.034)
Number of kids	1.008***	1.887	1.245***
	(0.011)	(0.011)	(0.008)
Region characteristics			
Densely populated	0.933***	1.031	1.103***
	(0.019)	(0.021)	(0.015)
Intermediate	0.987	1.011	1.015**
	(0.019)	(0.020)	(0.014)
Macro indicators			
pc GDP growth	0.922***	0.894***	0.908***
	(0.013)	(0.012)	(0.008)
GDP level	1.062***	1.087***	1.117***
	(0.008)	(0.009)	(0.006)
Country dummies		Yes	

(10) individuals deprived under *MD* but not *MSD*; (01) individuals deprived under *MSD* but not according to *MD*; (11) individuals deprived according to both indicators

*$p<0.1$; **$p<0.05$; ***$p<0.01$

As far as household features are concerned, the results are the following. Tertiary education of the head of household strongly decreases the relative probability to escape both *MSD* and *MD* in line with the existing literature (Whelan & Maître, 2010; Verbunt & Guio, 2019), and estimates of Table 6. We notice that the negative effect on leaving *MSD* status is

stronger than that on leaving *MD*. Possessing a home is also beneficial to reduce the risk of either *MSD, MD* or both.

Both single individuals and single parents have higher relative probabilities of being both *MSD* and *MD* as well as either *MD* or *MSD*. As the number of children increases, we notice an increase of the probability to escape both *MSD* and *MD* (as supported by the literature, i.e. Whelan et al. (2004); Fabrizi and Mussida (2020)) or to escape *MD* or *MSD* only.

We do not find a clear role for the degree of urbanization of the area of residence (even though the RRR are not far from 1): living in densely populated areas reduces the probability of being deprived according to MD only, while it slightly increases the probability of being deprived according to both indicators, compared to living in scarcely populated areas. Finally, the per-capita GDP growth reduces the probabilities of being deprived under all the definitions considered, while the effect of per capita GDP level is positive. Nonetheless, the RRR associated with both the categories of GDP indicators are not far from 1.

Notably, our analysis reveals that the two indicators (old and new) provide different information about the characteristics of the groups related to deprivations. This information differs both in quantity (value of the relative risk), and statistical significance. Moreover, when we separate our estimates by country, the analysis of the data provides some distinctive country-related results, which are not hindered by individual and household status of deprivation. Being deprived in one country is evidently due also to institutional, social or other macroeconomic factors.

6 Concluding Remarks

Ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth. Since the adoption of the Europe 2020 agenda on smart, sustainable and inclusive growth, a 'standard measure of material deprivation' has been officially adopted in the European Union (since 2009). Such indicator is based on a concept of 'enforced lack'. By definition, the MD indicator focuses on material deprivation assessed at the household level. In subsequent years, the interest in measuring material deprivation has risen and so has research on possible improvements and updates of the MD indicator. Notably, beside the lack of material resources, lacking social activities was identified as an essential component of deprivation. The new indicator (*MSD)* introduces two innovations: 1. revising items proposed in the survey, updating them where necessary; 2. including individual dimension in reporting lacking items. The original indicator was based on household level information only. Through innovation 1 we still have continuity in collecting information from the origin (2009). Innovation 2 modifies the focus of the survey: personal and household items may be indicated. In this paper, we aim at pinpointing whether the two indicators identify the same set of individuals as materially deprived, and whether there is heterogeneity across countries. The findings from the prevalence analysis suggest that household-level item deprivation prevalence is on average higher than that measured at the individual level. Two household-level items, i.e. 'affording one week annual holiday away from home' and 'facing unexpected expenses', show an extremely high prevalence in the deprived population. More generally, the differences in prevalence according to both indicators and those according to either one, are relatively

low, while a more marked difference emerges when we compare the groups of those deprived only with respect to *MSD* and *MD*. Our factor analysis confirms that personal and household level deprivation items play a quite different role in the deprivation groups. The deprived only according to *MD*, for instance, include those suffering from material household-level hardship and not from personal and social interaction deprivations.

From the estimates by country, some distinctive country-related results emerge, which are not hindered by individual and household status of deprivation. For instance, we found differences for the role of age and the shape of its relation with the two indicators across countries, differences of the extent of the relative advantage of males, which appears stronger for *MSD*, and a different role of urbanization across indicators.

Being deprived in a country, therefore, is evidently due also to institutional, social, macroeconomic and political choice factors.

Our conclusion is that *MD* and *MSD* identify overlapping but not corresponding groups of individuals, whose differences can be sociologically interpreted. Depending on the policies under analysis, and the geographical scope involved, this largely imperfect overlap cannot be overlooked. If we replace the original *MD* indicator with the new one, there is a serious risk of capturing different sets of individuals or, even worse, ignoring a significant portion of individuals who would be left outside social policy targets. The detailed investigation of the new indicator for *MSD* suggests the relevance of personal and social interaction deprivations that were neglected by the original concept of deprivation (at least in the EU). Policies aimed at fighting poverty and social exclusion might encompass not only the economic but also the social dimensions of deprivation. The growing importance of social policies, as a result of society becoming increasingly polarized, is a matter of fact both at the EU and national level.

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Declarations

Conflict of interests The authors declare no conflict of interest.

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