

Article

The European Union and Material Deprivation: Measuring the Evolution of Inequalities over the 2000s

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Abstract: Since the early 2000s, the European Union has increasingly prioritized policies aimed at combating social exclusion, with a focus on efficient fund allocation for social and sustainable cohesion objectives. Given the multidimensional nature of material deprivation, synthetic indicators are frequently employed in the literature to measure this phenomenon. However, these indicators often lack suitability for temporal analysis, which is crucial for understanding the persistence of disadvantaged statuses over time and the effectiveness of national and international policies. This article offers an innovative examination of the trends in material deprivation among European Union Member States during the period of 2005–2022. It provides a structured reconstruction of the phenomenon at the NUTS-1 level, within the context of the major economic and health crises that have characterized the 21st century. This study's key innovation lies in the creation of a temporal index of material deprivation, employing the AMPI method, which incorporates a partially compensatory aggregative synthesis and allows for the monitoring of the phenomenon over time against a baseline year. This novel approach ensures the capability to analyze the evolution of material deprivation over time and across regions, with 2005 as the reference year. The findings reveal a general improvement in material deprivation levels compared to 2005, despite deteriorating conditions in the Mediterranean and Baltic regions. By maintaining 2005 as the reference year, this index facilitates the ongoing monitoring of the impacts of COVID-19 and the effects of national recovery policies, as well as the resilient and sustainable social policies promoted by the RecoverEU fund.

Keywords: material deprivation index; social convergence; European Union; multidimensional indicator; social sustainability; policy monitoring



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1. Introduction

The initial two decades of the 21st century have been characterized by significant imbalances resulting from socio-economic upheavals and global health crises, which have exacerbated disparities within and between the member states (MS) of the European Union.

Consequently, European institutions have been actively engaged since the onset of the first financial and economic downturn in 2009 in implementing measures to establish policy frameworks aimed at fostering fair and sustainable recovery across member states.

This crisis originated from the collapse of the subprime mortgage market in the United States, leading to widespread financial instability. In the EU, in particular, the crisis exacerbated existing economic vulnerabilities, resulting in severe fiscal deficits and escalating public debt.

Although among the main objectives of the European Union is the promotion of economic development of the EU area, a strategic component for its fulfilment is the process of “social convergence” [1]. This is evident in initiatives such as the formulation of

the Europe2020 strategy in 2010 [2] and, more recently, the facilitation of national recovery and resilience plans following the COVID-19 pandemic [3].

The COVID-19 pandemic, emerging in early 2020, profoundly impacted the European Union. The pandemic necessitated widespread lockdowns and restrictions, leading to an abrupt halt in economic activities. This disruption resulted in unprecedented job losses and income reductions across member states, which were worse for some countries due to the aggravation of existing socio-economic disparities.

Of the main phenomena contributing to increases in social inequality, a special emphasis has been placed on the two policy agendas directed toward material deprivation (MD). In defining the phenomenon of MD, one can refer to the description predominantly adopted in the scientific literature, formulated by Peter Townsend in 1979 [3]. According to the author, an individual experiencing material deprivation is at a disadvantage compared to their community, due to their inability to access or fully enjoy a range of goods and services deemed as essential [4].

Despite the growing interest from governments and researchers in deprivation studies over the past few decades, it remains challenging to definitively identify the contributing factors to conditions of deprivation [5,6], requiring, according to some authors, the need for an adjustment from past deprivation variables through a process of contextualizing and revisiting survey methodologies among the population [7].

Indeed, due to its complex nature, deprivation can be classified within the category of multidimensional phenomena, as its manifestation is influenced by a multitude of variables of varying natures [6,8,9].

To express this multidimensionality, some authors, as well as Eurostat, have tried to rationalize the definition by defining sub-dimensions like household deprivation, economic stress, and an enforced lack of durable goods [10,11]. Considering the last two, Eurostat defines economic stress as a severe disadvantage suffered by an individual, such that it leads to their social exclusion from the context in which they find themselves. On the other hand, an enforced lack of durable goods indicates the inability of an individual to have access to certain goods, regardless of their will.

Due to the co-presence of a large number of variables operating simultaneously in time and space, a consolidating approach in the literature sees the construction of synthetic indicators, which can combine the different dimensions involved in material deprivation and simplify their interpretation [10,12–14].

Theoretical Framework of the European Experience in Temporal Material Deprivation Analysis

Although traditional studies on deprivation often overlook the opportunity to trace its historical progression through timely analyses, the recent literature has introduced innovative statistical tools that incorporate a temporal dimension [10,14–16]. A key characteristic of material deprivation is its enduring nature, marked by a persistent lack of resources [17]. The development of temporal indices holds the promise of more accurately monitoring the changing levels of social exclusion within member countries, identifying regions within the European territory that are particularly vulnerable to external shocks induced by crises and providing policymakers with comprehensive and contextualized information for crafting effective public policies [14,16,18,19].

Recent years have seen a notable emphasis placed on exploring the potential of historical analysis in understanding social exclusion. One such significant contribution was made by Paul Norman in 2010 [14]. Leveraging the extensive literature on the Townsend Index, Norman showcased its efficacy in supporting the formulation and implementation of local public policies in the UK context.

More recently, in 2022, the author also addresses the work of Llyoid et al. [20], in which the trend of material deprivation in English constituencies from 1971 to 2020 was reconstructed, including, in this case, the major socioeconomic shocks that have affected the country since the 1970s, with the aim of understanding through a combination of the

English Material Deprivation Index and the Townsend Index the response of the English population.

Within the Italian framework, Landi et al. [12] introduced an original index in 2018 aimed at studying the evolving impact of social exclusion on the living standards of Genoa's populace. Following a similar "small area" methodology as Norman, the Genoa Deprivation Index (GDI) offers a novel and adaptable approach to data aggregation, particularly at the level of urban units.

Expanding the scope nationally, Dudek and Szczesny conducted a study that applied the index methodology to the entirety of Poland [21]. Utilizing fuzzy logic techniques to gauge shifts in deprivation levels within the Polish population, the authors provided insights into the effects of social policies and reforms initiated by the Polish Government in 2016, aligning with the objectives outlined in the EU2020 strategy.

In recent years, following the outbreak of the pandemic crisis in 2020, several authors have sought to understand the possible effects produced by the pandemic on the levels of material deprivation [22–24]. The relationship between health status and material deprivation has well-established origins [25–27], however, the magnitude assumed by the pandemic on the world economies needs further investigation in order to determine its actual relation.

Moreover, further studies have demonstrated the existence of a relationship between material deprivation, health status, and exposure to unfavorable environmental conditions (e.g., air pollution and greenness) [28,29]. In the context of promoting an economic and social recovery inspired by sustainability goals, identifying the areas most critical in terms of material deprivation could also influence the formulation of European green policies.

In agreement with what emerged in the previous paragraph, this study endeavors to construct a temporal index of material deprivation within the European Union spanning the years from 2005 to 2022. Considering how the main contributions in the literature tend to approach the study of material deprivation at the local or national level, the present article means to elucidate the impact of the phenomenon at the community level among the EU member states, attempting to understand the trend of the phenomenon during the first two decades of the 21st century.

In this way, it is possible to understand, at the macroscopic level, whether the individual actions of states have led to a domestic improvement in socio-economic conditions and what repercussions have occurred at the supranational level during the period affected, on the one hand, by the implementation of the 10-year agenda of equitable and sustainable recovery EU2020, and on the other hand, by the major socio-economic shocks that have afflicted the European population.

By synthesizing data from the Eurostat database, including the MD dimensions of economic stress and enforced lack of durable goods, a comprehensive partially compensatory index will be formulated to gauge the extent of material deprivation across the EU member states over time.

Through rigorous statistical analysis, this research aims to unveil temporal trends, patterns, and spatial disparities between member states, thereby offering valuable tools for monitoring the phenomena over time and evaluating the intervention at the national and European level.

Compared to previous studies offered in the literature, in this article, the phenomenon is studied in a broader sense, both in terms of the area of application of the index, extending it to all EU member states, and from the point of view of the vast time frame. In addition, as will be addressed in the following paragraphs, thanks to the used methodology, besides benefiting from simplicity in the interpretation of the results, it also allows ease of updating the index by maintaining the scores calculated for previous years as valid and, therefore, depends only on the availability and updating of the dataset.

2. Materials and Methods

2.1. Selection of Data and Application Area

Aiming to trace the trend of material deprivation in the European Union during the new millennium, the construction of a synthetic index for the period of 2005–2022 is proposed.

To ensure complete data availability for the period, data selection was carried out using the EU-SILC module of the Eurostat database, thanks to which, it is possible to ensure the comparability of the results obtained in time and space by the member states. Starting in 2004–2005, the European Union has begun to include the study and measurement of material deprivation within policy agendas in a structured way [30]. Although the real formalization of deprivation indicators dates back to 2009, Eurostat's subsequent populating of indicators from the year 2005 onward therefore makes it possible to trace the evolution of the phenomenon for a wide time span.

All indicators within the EU-SILC can be categorized as “lifestyle deprivation elements” [6]. This designation is justified by their fulfillment of criteria, such as consensus and uniformity in data collection methods, ensuring comparability across different geographical regions, and their consistent availability over time.

Based on previous experience from the recent literature, 10 material deprivation variables were identified and classified as “economic stress” and “enforced lack of durable goods” [10] (Table 1).

Table 1. Overview on material deprivation variables selected. Source: EU-SILC database, Eurostat.

MD Dimension	AMPI+ Range	EU-SILC Cod.
Enforced lack of durable goods	Inability to afford a telephone	Ilc_mddu01
	Inability to own a color TV	Ilc_mddu02
	Inability to afford a washing machine	Ilc_mddu04
	Inability to afford one's own car	Ilc_mddu05
Economic stress	Inability to heat adequately one's own home	Ilc_mdcs01
	Inability to take one week's holiday a year	Ilc_mdcs02
	Inability to afford a protein meal, or vegetarian alternative, every two days	Ilc_mdcs03
	Inability to cope with unforeseen expenses	Ilc_mdcs04
	Inability to meet overdue payments	Ilc_mdcs05
	Inability to make ends meet	Ilc_mdcs09

Some authors, in addition to these two established dimensions of deprivation, proposed also considering “Housing” aspects for the study of material deprivation and related phenomena such as poverty [31]. However, due to the strong internal heterogeneity within the Housing dimension, other authors preferred to focus the study of the first two dimensions, limiting the study to the nine main indicators of economic stress and an enforced lack of durable goods [30], seeking a unidimensional synthesis of material deprivation. However, it remains to be considered how housing market trends, as well as the main characteristics of states, represent a useful proxy for understanding and predicting the internal tightness of a country's social fabric.

The chosen variables represent a set of factors considered in the European Union as consolidated for the study of material deprivation within member states and included within the EU2020 strategy. Over the past few years, some authors have supplemented the initial data set with additional indicators through a subjective selection of deprivation dimensions, which would allow the concept of material deprivation to evolve [7]. However, it is necessary to consider, from the perspective of comparison between very large territorial areas, the need to include in the study indicators and dimensions that are commonly accepted as causes of social exclusion among all member states, in order to not misinterpret the socio-cultural characteristics of a particular community in relation to others (e.g., “ecological fallacy”) [10,32].

Using the definition proposed by Eurostat to describe the two dimensions, we understand how, on the one hand, economic stress refers to the financial difficulties that households face in managing their necessary expenses. This includes affording unexpected costs, paying bills on time, and making ends meet. It is an indicator of financial vulnerability and insecurity.

An enforced lack of durable goods, on the other hand, indicates households' inability to afford essential items like a washing machine, color TV, telephone, and car. This lack is due to financial constraints, not choice, and contributes to the status of material deprivation.

In order to investigate the country dimension assumed by social exclusion, the EU territory was partitioned considering the political boundaries of the member states corresponding to the NUTS-1 classification. In accordance with the availability of data over the period investigated, the choice fell on the study of the EU26 countries, excluding Croatia and Great Britain. Although the exclusion of the two countries could lead to an approximation of the results by impacting the average trend of the scores over time, it should be considered that the lack of data for the period of 2005–2009 in the case of Croatia and the incompleteness of the dataset for some post-2018 variables in the case of the United Kingdom would lead to an additional risk of error in the index calculation due to the estimation of values for the two states for these two periods.

2.2. Synthesis of the Indicator Adjusted Mazziotta and Pareto Index (AMPI)

To conduct a hierarchical comparative analysis, numerous authors have devised analytical systems based on the partially non-compensatory method known as the Adjusted Mazziotta and Pareto Index (AMPI[±]). This method represents a variation of the earlier Mazziotta Pareto Index (MPI), with each iteration developed by Mazziotta and Pareto [33–36].

The AMPI[±] method—used by the Italian Institute of Statistics (I.Stat) to measure well-being—presents some features that make it extremely versatile, easily replicable, and suitable for the study of complex phenomena over time [37–39]. The construction of the index involves a stepwise process with features that render it highly versatile (penalty component), easily reproducible, and applicable for studying complex phenomena over time. One notable aspect is the utilization of a constrained version of the re-scaling method during the normalization phase. This approach helps to overcome common Min–Max normalization challenges, such as sensitivity to outlier values and the inability to center the average. In addition, a number of contributions in recent years have tested the use of AMPI versus other methodologies for the study of well-being and inequality, identifying AMPI as a valuable alternative due to the possibility of constructing an easily interpretable and employable index for comparison over time and space among multiple spatial units [40,41].

By addressing these issues through the incorporation of key properties of the indexing method, the indicators are normalized within a defined range of variation and centered around a reference point, such as the average.

By establishing two benchmark values calculated in the reference year, all unit values across different time periods are expressed relative to these benchmarks, enabling comparisons across both time and space. Another noteworthy aspect contributing to the widespread adoption of the AMPI method for deprivation studies is its capacity, during the aggregation phase, to apply penalties based on the nature of the measured phenomenon.

From a mathematical point of view, the synthesis of the index is presented as follows.

Firstly, the transformation of the original data matrix $X = \{x_{ijt}\}$ into a normalized one $R = \{r_{ijt}\}$ is performed, where r_{ijt} is the normalized value and x_{ijt} is the value of the indicator j th for the unit i th at the time t th, while Min_{x_j} and Max_{x_j} indicate the “goalposts” for the indicator j .

$$r_{ijt} = \frac{x_{ijt} - Min_{x_j}}{Max_{x_j} - Min_{x_j}} * 60 + 70, \quad (1)$$

After the normalization, the second step is dedicated to the definition of the “goalposts”.

$$Ref_{ijt} \pm \Delta \text{ with } \Delta = \frac{Sup_{xj} - Inf_{xj}}{2}, \quad (2)$$

Ref_{xj} is the reference value, i.e., the value of the indicator j th in a specific unit i th at a specific time t th, and Inf_{xj} and Sup_{xj} are, respectively, the minimum and the maximum value of the indicator j th in all units and all time periods. For this index, the goalposts are calculated by assuming 2005 as a reference (the first year of data collection). In this way, each indicator assumes the value of 100 for the reference unit considered in the time occasion considered in all basic indicators; all the other values of each unit for all the time occasions will be expressed about this value, allowing for a comparison in time and space. Using this normalization, the range of the normalized values is [70:130].

The last step consists in the aggregation of the AMPI index:

$$AMPI_i^{\pm} = \mu_{ri} \pm \sigma_{ri}cv_i, \quad (3)$$

The AMPI divides each unit’s score into two components: the mean level (μ_{ri}) and a penalty ($\sigma_{ri}cv_i$). The penalty is based on the variability of the indicators relative to the mean value (‘horizontal variability’) and serves to penalize the units. The objective is to reward units that, with the same mean, show a greater balance among their indicator values.

In the MD case, all the composite indices are negative in nature, i.e., increasing values of each index correspond to negative variations in the phenomenon, so it is necessary to correct the average of the standardized indicators by “pushing” it up with a positive penalty [10,39].

2.3. Influence Analysis

As a consequence of the subjective choices that the researcher has to make throughout the different phases for the construction of a synthetic index, it is required to test its robustness [42,43]. The validation of an index allows for testing the sensitivity of the results and rankings achieved with respect to possible variations in its structure, through techniques such as the Uncertainty Analysis (UA).

The uncertainty analysis method [44], on the other hand, investigates how the level of uncertainty present in the basic indicators impacts the entire structure of the composite index. An alternative version of the UA is the Influence Analysis (IA), an approach by which the robustness of the material deprivation index proposed here was assessed [45].

Through the iteration of the reconstruction of the index in several variants, excluding, from time to time, a different indicator from the set, it is possible to evaluate the kindness of an index by investigating the influence exerted by the component on the final output, focusing on the dimension of the absolute mean deviation of the ranks in the new rankings compared to the one initially obtained [40,41]:

$$\overline{R}_s = \frac{1}{M} \sum_{c=1}^M |\text{Rank}_{\text{reference}}(AMPI_c) - \text{Rank}(AMPI_c)| \quad (4)$$

The results of the robustness analysis are usually presented as country rankings along with their associated uncertainty bounds. These bounds account for inherent uncertainties, enabling users to grasp the plausible range of composite indicator values for each country. The evaluation of the robustness of the deprivation index shows that the average deviation from the ranks reported by the influence analysis is extremely low (0.55). Therefore, it can be said that the index developed is very robust from the point of view of its composition and useful for the realization of the analysis object of the chapter.

3. Results

After calculating the AMPI⁺ scores throughout the period, the rankings for each year were constructed by assigning the first rank to the country with the highest score, corresponding to higher levels of social exclusion (Table 2).

Table 2. Extract of the results and rankings obtained following the application of the index to EU26 countries.

EU26 MS	2005		2008		2013		2018		2022	
	AMPI ⁺	Rank	AMPI ⁺	Rank	AMPI ⁺	Rank	AMPI ⁺	Rank	AMPI ⁺	Rank
Austria	89	24	91	18	90	23	76	24	89	19
Belgium	92	19	91	19	93	19	92	15	91	15
Bulgaria	144	1	125	1	126	1	167	2	104	3
Cyprus	102	10	104	6	111	6	133	4	96	4
Czech Republic	97	14	93	15	97	16	79	21	86	25
Denmark	91	21	89	23	92	20	81	19	88	20
Estonia	101	11	93	16	97	15	92	16	90	17
Finland	91	22	89	24	91	22	81	18	88	21
France	91	23	90	21	90	24	86	17	92	13
Germany	91	20	90	20	91	21	76	22	91	14
Greece	99	13	101	10	113	5	169	1	112	1
Hungary	107	7	105	5	116	3	119	7	95	5
Italy	99	12	102	9	105	8	105	10	92	12
Latvia	121	2	105	4	116	4	123	5	94	7
Lithuania	113	5	98	11	102	11	120	6	93	10
Luxembourg	92	18	90	22	93	18	70	26	87	24
Malta	103	9	98	12	103	9	81	20	90	18
Netherlands	88	25	86	26	89	25	72	25	86	26
Poland	115	4	103	7	99	14	95	13	90	16
Portugal	104	8	107	3	105	7	107	8	93	9
Republic of Ireland	94	17	91	17	100	12	94	12	92	11
Romania	121	3	125	2	124	2	152	3	105	2
Slovakia	109	6	102	8	103	10	107	9	94	8
Slovenia	94	16	94	14	107	17	93	14	88	22
Spain	95	15	94	13	122	13	100	11	95	6
Sweden	87	26	87	25	73	26	74	23	87	23

The highest ranking is assigned in relation to greater levels of deprivation (high AMPI⁺ score).

Cluster Analysis

For an optimal representation of the spatial distribution and overall magnitude of the phenomenon, the AMPI scores were categorized into classes through cluster analysis.

The use of a graphical representation of the spatial and temporal distribution of inequality, through the construction of cartograms, makes it possible to provide a simpler and more immediate identification of the most critical areas, as often highlighted in the study of poverty and inequality at the regional and urban levels [46]. In the present study, the identification of the countries that, at the macroscopic level, suffer most from the effects of material deprivation would enable the proper targeting of community funds for improvements in social conditions and reductions in inequalities between member states.

A technique proposed by the literature is the Ward Method, which represents a regrouping technique that develops on the basis of the statistical principle of the decomposition of the deviation into deviations between groups and deviations into groups [47]. In this way, thanks to the high proximity of the internal individual coefficients and high variance between groups, versus a contained in-group variance, the individual hierarchical partitions experience a greater homogeneity from the viewpoint of the elements of which they are composed, which are constituted by MS experiencing a similar grade of deprivation [48]. By cutting the graph to the first partition obtained from the dendrogram, there is a transition from 27 units to 5 partitions of different compositions (Figure 1).

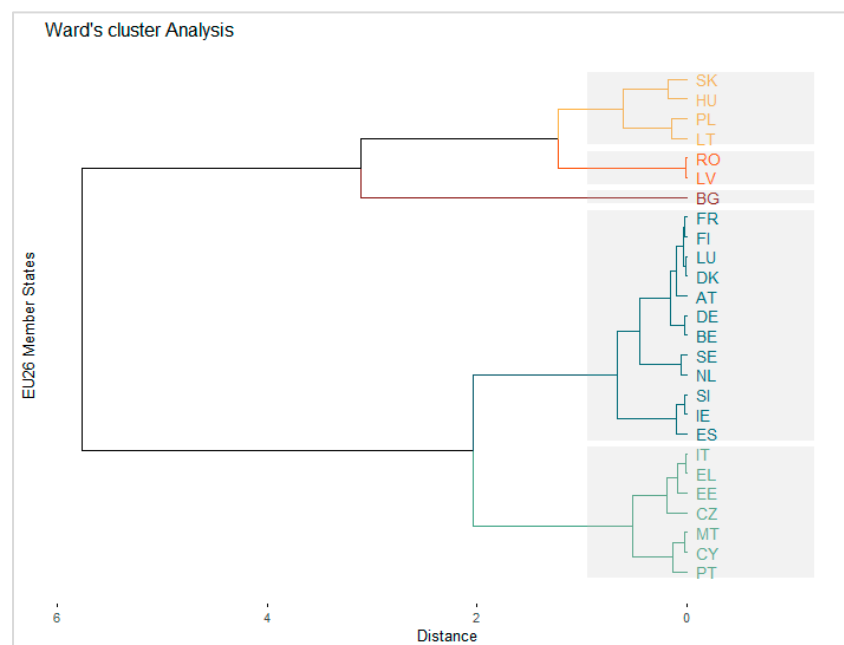


Figure 1. Hierarchical cluster analysis of 2005 AMPI⁺ score with Ward method.

Subsequently, the ranges of the five classes obtained in 2005 were calculated (Table 3) and then kept constant for the construction of the maps for the whole period under consideration, attributing high AMPI⁺ scores to higher levels of social exclusion.

Table 3. AMPI⁺ score ranges of material deprivation in EU26 countries in 2005.

Cluster	AMPI ⁺ Range	EU26 MS
1. High level of material deprivation	>213	BG
2.	>187: ≤213	LV; RO
3.	>140: ≤187	HU; LT; PL; SK
4.	>104: ≤140	CY; CZ; IT; EE; EL; MT; PT
5. Lower level of material deprivation	≤104	AT; BE; DE; DK; ES; FI; FR; IE; LV; NL; SE; SI

4. Discussion

Following the socio-economic imbalances caused by the economic and financial crisis of 2008 and the global pandemic of 2020, European institutions have put into place a series of measures aimed at countering the negative effects that have strongly weakened the social fabric of the European Union, undermining its competitiveness on the international scene.

By reconstructing how the distribution of the phenomenon has changed over time, it has been brought to light which areas over time have encountered the greatest difficulties in fighting social exclusion and which have adopted more effective measures.

For the development of the index, the method of the Adjusted Mazziotta and Pareto Index is implemented [33,35]. Exploiting the versatility of this aggregation technique and the extreme simplicity of calculation, the index was created by exploiting the data made available by the EU-SILC module of Eurostat dedicated to material deprivation. Thanks to the availability of the data and the nature of their collection, it was possible to select 10 deprivation items belonging to the dimensions of “economic stress” and “forced lack of durable goods” that met the availability and validity criteria for the period of 2005–2022. Based on the data availability, the area of application was limited to the EU-26 countries, excluding Croatia and Great Britain.

To provide a better interpretation of how the presence of social exclusion within the European context has changed, a cluster analysis was carried out starting from the AMPI⁺

scores awarded for the year 2005. In this way, the partition in classes maintained constant for all the periods allowed for understanding the different distributions of the phenomenon.

Studying the average trend of the phenomenon over the 18-year period, five reference years were identified in relation to the major macroeconomic events that affected the EU26 countries in the 2000s: 2005, 2008, 2013, 2018, and 2022. As reconstructed with the support of cartograms (Figure 2), in 2005, there was a clear vertical divide between countries experiencing greater degrees of material deprivation (clusters 1 and 2) and member countries facing higher levels of inclusiveness. The greater concentration of medium–high levels of social exclusion between the Balkan and eastern European countries, with the particular case of Bulgaria (144 AMPI+ scores), seems consistent with what is reported in the literature and by supranational bodies with respect to the greater sensitivity to socio-economic phenomena of the so-called new member states (EU-10). In fact, the population of the EU-10 countries tends to show a greater vulnerability to the phenomena of social inequality in the early phase of accession, particularly as a result of the transition from a communist to a capitalist-type market system [18,47]. This transition is an exacerbating factor of inequality among social groups, consequently leading to rifts not only within the country but also at the community level, as confirmed by Figure 2. Moreover, it is interesting to note that there is, with respect to the dimensions of deprivation investigated, a different sensitivity between the EU-10 MSs and western Europe MSs [10,13]. On the other hand, ref. [48] underlined a discontinuity in some Mediterranean countries against the main trend of the old member states (EU15), that, on average, experience lower levels of deprivation. Examples are Greece, Spain, and Portugal, which tend towards a level of social exclusion more similar to that suffered by the EU10 countries. In addition to being detected by the application of the AMPI index, these exceptions are consistent with the trends of other phenomena that can be linked to material deprivation, as in the case of poverty, making it even more important to understand how the phenomenon is distributed among the European population, avoiding the risk of approximations that would lead to a misallocation of resources [48].

Looking at the most deprived countries—Bulgaria, Latvia, Lithuania, Romania, and Poland—analysis of the original data reports that, on average, there were more critical issues among the population than the dimension of “enforced lack of durable goods”, with high percentages of the population for indicators expressing the inability to own a private car and a washing machine. As for the economic stress dimension, the variables that, in 2005, reported higher values than the population at risk are the inability to take a holiday, the inability to face unexpected expenses, and, for the Bulgarian population (69.5% of the population), the inability to adequately heat one’s home.

At this early stage, it is interesting to note that cluster 1—which expresses a higher level of MD—is composed solely of the country Bulgaria, with an AMPI+ score of 144, which is extremely high considering that, in the second rank, is Latvia with an AMPI+ score of 121.

Shifting the focus to 2008, despite an initial improvement in the northernmost countries of eastern Europe—Poland (AMPI+08, 103), Czech Republic (AMPI+08, 93), and Slovakia (AMPI+08, 102)—some countries began to show the first effects of the financial economic crisis of 2007–2009. Examples are Romania (AMPI+08, 125—second rank) and Portugal (AMPI+08, 107—third rank), which, due to increases in inequality, were placed in a worsening cluster, gaining positions in the rankings due to increases in their AMPI+ scores.

After the economic crisis, the Mediterranean MSs reported a greater weakness to economic shocks, with an increase in the percentage of the population—mostly compared to the variables included in the dimension “economic stress”—such as the positioning of Italy, Malta, and Greece (107 average AMPI+13), in the top ten most deprived countries compared to the EU26. In the case of Greece (113.4 AMPI+13) and Italy (104.8 AMPI+13), for example, there was a general increase in the rates of deprivation for all variables expressing economic difficulties, with an increase from 57.3% to 74.9% of the Italian population being

unable to sustain sudden expenditure compared to 2005, a higher percentage than Bulgaria (64.1%), despite it representing the most deprived EU26 country in 2013.

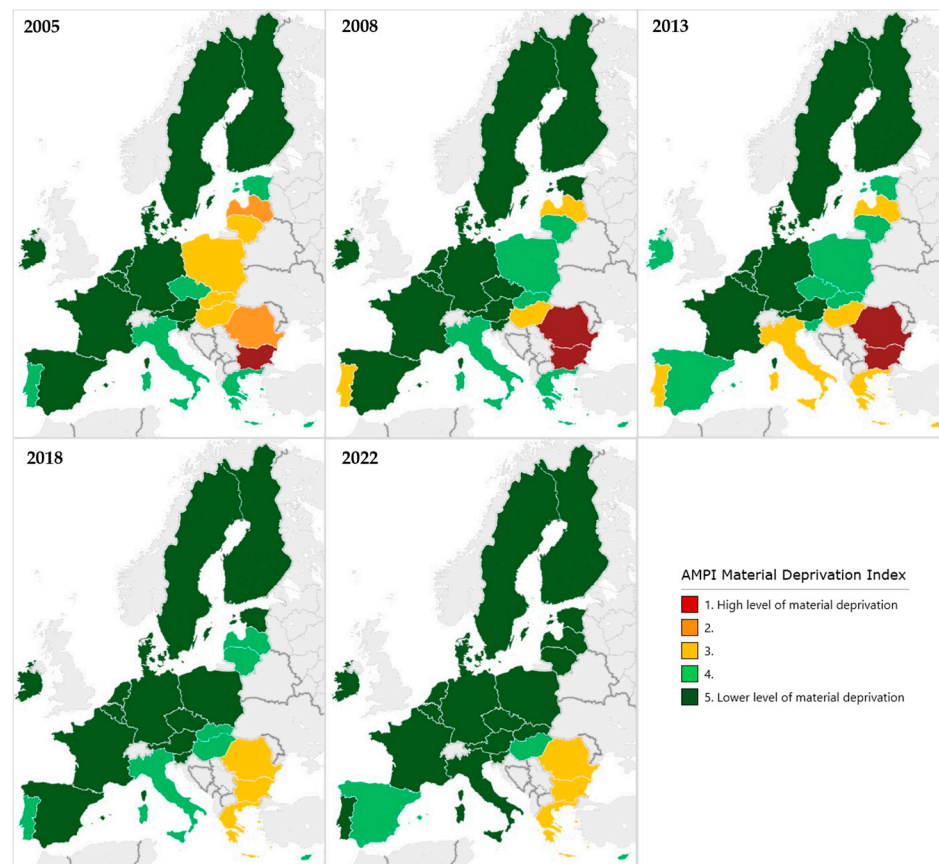


Figure 2. Spatial distribution of material deprivation among EU26 countries in the 2000s.

It is in this post-crisis period that, as shown in Figure 2, a change from 2005 can be observed, with a division no longer vertical but horizontal, underlining the greater difficulty in coping with socio-economic effects for southern countries compared to Scandinavian and central European ones, for which, despite some small fluctuations, a worsening that would lead to a different classification from the fourth and fifth clusters was never observed.

However, as shown in the chart below (Figure 3), thanks to the adoption of social policies at the national and European levels (e.g., Europe 2020 Agenda), the overall trend over the 18 years examined reports a positive evolution with a progressive improvement in social inclusion at the European level.

Indeed, in 2018, an emptying of the first and second clusters of deprivation can be observed, with the populating of the third cluster solely by Bulgaria, Romania, and Greece, with AMPI⁺¹⁸ scores of 110.6 (−15.3 vs. AMPI⁺¹³), 113.5 (−8.4 vs. AMPI⁺¹³), and 105.5 (−8.3 vs. AMPI⁺¹³), respectively.

At the end of the period, although some countries experienced a non-linear curve, the scenario of the European Union appeared recovered. After 18 years, despite the difficulties caused by COVID-19 in 2020, the first and second classes of deprivation disappeared, giving way to widespread levels of low-to-medium social exclusion across the European scenario.

Based on the 2022 rankings drawn up for the EU26 member countries, the top ten positions for deprivation are still occupied by eastern European countries, with the only exceptions of Greece, Portugal, and Spain, respectively, in the first, sixth, and ninth ranks. Some problems still persist within countries located in the Balkan peninsula, such as Bulgaria, Romania, and Greece, which occupy the third cluster.

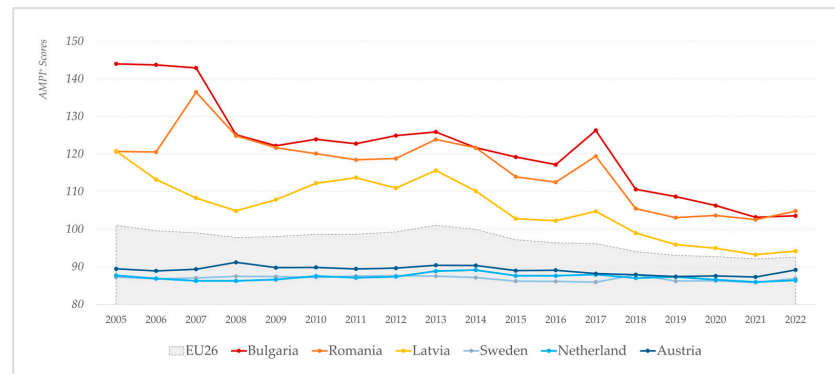


Figure 3. AMPI⁺ trends in top 3 and bottom 3 MSs in 2005 compared with EU26 average for 2005–2022.

Considering the evolution of Bulgaria, although the state has, on average, always ranked between first and second (except for 2020, where it occupies the third rank), the evolution of MD among the population shows a decreasing trend (Figure 2). Focusing on its variation in the AMPI⁺ score in 2022 compared to 2005, it is precisely Bulgaria that scored one of the best improvements compared to the EU26 countries, with the transition from a 144 to 103.6 AMPI⁺ score.

As shown in Figure 2, the trend of the AMPI⁺ index in Bulgaria shows a steady decrease in levels of social exclusion until 2009, when there is a reversal of the tendency in the curve and it reaches a peak of deprivation in 2017 (126.3 AMPI⁺17 scores), although distant from the initial AMPI⁺ value. All indicators show more than half of the population suffering from deprivation after 18 years compared to 2005. The gap between other member countries and the European average, however, still appears to be very pronounced, partly due to in-country disparities that impact the performance of inclusiveness at the national level, partly due to the ineffectiveness of fiscal social protection systems in terms of population coverage and targeting. According to World Bank estimates, in fact, in 2018, close to 30% of the 20% of poorest households did not receive any form of social assistance benefits [49].

Worth highlighting is the case of Greece (Figure 4). According to the application of the index, the Greek population will be the only one to end the period with a higher level of social exclusion than that in 2005 (112.5 AMPI⁺22 scores, +13.6 points). It is observed that its levels of deprivation have increased steadily, with only the exception of 2015 (112 AMPI⁺ scores, +13.2 points compared to 2005), since 2016, with a peak of 117.32 in AMPI⁺ score.

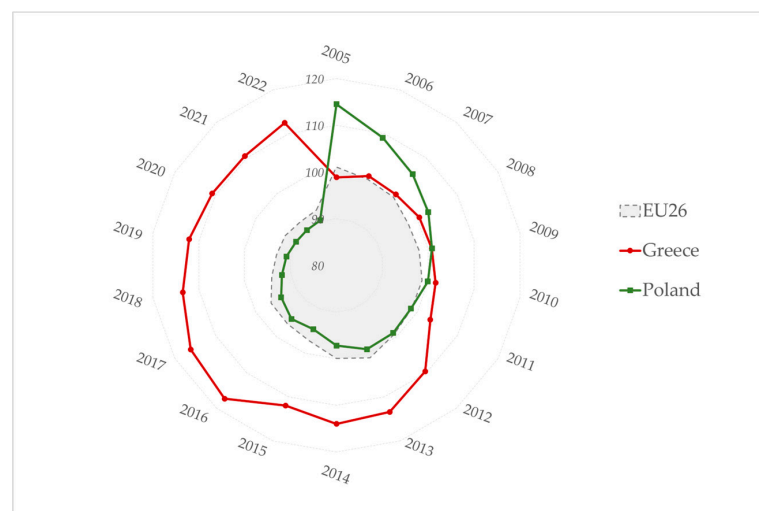


Figure 4. Comparison between Greece, Poland, and EU26 AMPI⁺ scores in 2000s.

This 2016 tightening follows the Greek Sovereign Debt crisis, which reached its peak in 2015 following the failure of the two financial economic rescue plans promoted by European institutions to avert default. The socio-economic repercussions that it generated are captured by the AMPI index, especially in terms of the dimension of economic stress. The peak reached by the index in 2016 coincides with a rapid increase in the indicator expressing “Inability to cope with unexpected expenses” from 30.4% of the population in 2015 to 53.6%.

This expresses a particular sensitivity of the Greek population to socio-economic phenomena and the inefficiency of the measures put in place in the country to contain the negative effects produced by the crisis and promote the recovery of the social fabric. Comparing the percentages of the deprived population for each component of the index, major criticalities emerge within the “economic stress” dimension. In particular, the variable expressing the inability to indulge in a vacation shows a fluctuation in the percentages of the deprived population over the period, always at around 50% of the population, with a low of 46.3% reached only in 2009–2010.

Also, a sharp deterioration can be observed after the economic crisis of 2008 and in 2014 for the variable expressing the “Inability to heat adequately one’s own home”, for which the peak is reached in 2014 with 33.9% of the deprived population, +59% compared to 2006.

On the other hand, a significant example in positive terms is given by Poland (Figure 4). Although the country falls within the EU-10 classification, Poland exhibits a development of the MD phenomenon that runs counter to the macro-area to which it belongs.

Taking 2005 as the base year, in which Poland occupied the fourth rank in the overall ranking with an AMPI⁺ score in 2005 of 114.5, in 2022 the country ranked 16th, with a reduction in the index score of 24.3 points (AMPI⁺ of 2022 90.2).

There was a general improvement in the conditions of the population in both dimensions of deprivation considered, with all dimensions of deprivation falling at under 7% of the population, with the only exceptions of “Inability to afford paying for one-week annual holiday away from home” (27.6% of deprived population) and “Inability to face unexpected financial expenses” (27.1% of deprived population).

According to a World Bank report “Lessons from Poland, Insights for Poland: A Sustainable and Inclusive Transition to High Income Status” [50], in the case of Poland, great importance in improving the levels of social inclusion can be attributed, in part, to the process of transition from a communist-style economy to a capitalist system and, in part, to social reforms with the promotion of family-supporting welfare policies like the “Family + 500” program. This strategic combination of policies adopted by Poland made it possible in 2008 not only to stem the distorting effects of the economic crisis, but also to reduce poverty within the country by 40% in 2015–2018, with consequent improvements in the living conditions of the population (Eurostat sources).

At the European level, it was possible to detect a worsening of the living conditions of the population in most EU26 states in the years immediately following the economic crisis. Compared to 2005, where medium–high levels of deprivation mainly affected the countries of eastern Europe, in 2013, there was an intensification of the phenomenon also among the countries of southern Europe, mitigating the sharp division between western and eastern European countries in the present and pre-crisis.

After an analysis carried out on the original items of deprivation trends, a significant decline was found in the economic stress dimension, which showed a percentage increase in deprived citizens for several variables after the 2008 crisis. However, since 2015, the AMPI⁺ scores have shown a progressive improvement in European living conditions, which may be interpreted as the result of the recovery process that started after the proclamation of the Europe 2020 Strategy in 2010. The results reported by the AMPI⁺ index for 2018 show a clear improvement compared to the years following the crisis. It is possible to observe the total disappearance of the first and second deprivation clusters, with almost all the countries placed in the fifth class, expressing a higher level of social inclusion.

The results obtained by the AMPI⁺ index appear to be consistent with those of the latest report published by the European Commission for Employment, Social Affairs, and Inclusion in November 2019 and literature contributions [13]. Although only 1/5 of the target set by the fifth pillar of the European agenda, amounting to 4.2 million in 2017, has been confirmed, an improvement in levels of social exclusion compared to 2008 can be observed. The results presented by the European Union also confirm a not fully homogeneous improvement in the territory, with the persistence of some difficulties mainly occurring in the countries of southeastern Europe, with a particular reference to Greece, in which the process of improvement appears to have only begun in recent years. Material deprivation has been more positively influenced by welfare interventions in support of the population compared to the other dimensions of the AROPE index, with high levels of inclusion in some EU10 countries; therefore, the AMPI⁺ index also improved.

However, despite investigating the effects produced by the pandemic outbreak in 2020, it is still too early to be able to determine its actual impact. Although the AMPI⁺ index noted an increase from 2019 in nine countries, the drop in the curve does not appear to be as pronounced as it was in the case of the 2008 crisis. It will, therefore, be interesting to continue updating the index data to understand the distortions produced by the energy and inflation crises due to the wars in Ukraine and the Middle East, as well as to assess the effectiveness of the socioeconomic recovery policies defined at the EU level in the RecoverEU Agenda.

In this way, the index represents a possible integrative tool to support policy makers at the European level in designating European funds for social cohesion, directing more support to those countries that present more critical issues and may experience a decline in post-crisis recovery at the national and European scales.

5. Conclusions

In conclusion, the construction of the European Material Deprivation Index spanning from 2005 to 2022 represents a significant innovation in our approach to understanding and addressing material deprivation across Europe. One key aspect of innovation lies in its unique feature of allowing for the continuous monitoring of deprivation trends relative to a baseline year (2005). This longitudinal perspective enables policymakers to track changes over time and assess the effectiveness of interventions aimed at mitigating deprivation. Moreover, by emphasizing the importance of sustainable and resilient recovery policies, this index serves as a crucial tool in guiding efforts towards fostering social convergence across Europe, also with the possibility to support the allocation of green investment. Its ability to capture nuanced variations in material deprivation and provide actionable insights underscores its potential to inform targeted policy interventions that promote inclusive growth and equitable development throughout the region. However, the study is not free of limitations, like not including Croatia among the countries considered, despite its placement among newly annexed countries, which may show a greater sensitivity to the phenomenon, as in the case of the other EU10 member states. In addition, through further studies, the possibility of including additional variables of material deprivation, considering those goods and services that, over the 18 years monitored, have become more central to the daily lives of individuals, should be explored, e.g., personal computers or internet connection, which, during the period of the pandemic crisis, due to lockdown measures, took a central role in maintaining social relations.

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