A non-compensatory time analysis of material deprivation in the EU

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The challenges posed by the economic and financial crisis of 2008 prompted the European Union to adopt a series of long-term measures aimed at restoring the balance before the economic shocks. In particular, the interest of the European Union was focused on the study and development of statistical tools and common practices for researching the impact of material deprivation among the European population (Fusco *et al*., 2013; Whelan & Maître, 2013). Although it is difficult to define, common literature agrees that material deprivation is the state of disadvantage suffered by an individual due to the inability to access - or full utilize - common goods and services (Townsend 1979; Mack and Lansley, 1985). Although traditional indices do not consider the temporal dimension, material deprivation is a phenomenon resulting from a condition of long-term disadvantage (Calandrino, 2003). For this reason, the study proposes the construction of a statistical tool for the analysis of the evolution of material deprivation within the European Union in the period 2005-2019. In this way, using Eurostat EU-SILC data we underline what trends have emerged during the decade, in a period that includes the economic and financial crisis. This practice makes it possible not only to identify more or less deprived countries but also to identify benchmarks and extrapolate ideas based on which European countries could share good practices in the future. It is also possible to observe which countries, following the implementation of certain policies in the economic-social field, have emerged stronger and which, instead, have not benefited.

Because of the complex and multidimensional nature of material deprivation, it is necessary to adopt the construction of composite indices in order to understand their real shades and impact on the life of the individual (Guio, 2009; Sen, 2001). Data were drawn from the set of ten elementary indicators provided by Eurostat EU-SILC, a series of subjective data collected annually, which guarantees the homogeneity of collection, comparability, and completeness of European Union Member States. Despite some criticalities, the use of subjective information has been in recent decades a well-established practice in the literature, making it

a valid alternative to objective indicators for the representation of complex phenomena (Maggino, 2017 a, b). In particular, the index was applied to the period 2005-2019 to represent the conditions of the European population before and after the outbreak of the economic crisis. The analysis was conducted on 27 European member states (EU27), due to the incompleteness of the dataset relating to Croatia for the period 2005-2009.

For the construction of the index was adopted the method known as Adjusted Mazziotta-Pareto Index - AMPI (Mazziotta & Pareto, 2018; Ivaldi *et al.,* 2020 a), an evolution of the MPI method (Mazziotta & Pareto, 2017; Ivaldi & Ciacci, 2020), to favor the analysis of historical series and the comparison and classification of countries according to their level of deprivation. The AMPI method is an aggregative method of analysis, partially non-compensatory, as it prevents - at least partially - the occurrence of compensation between indicators with very uneven values.

The paper also uses cluster analysis based on the Ward Method, a clustering technique based on an aggregative algorithm, adopted to achieve a grouping into classes for the 2019 year (Ward, 1963). This technique allows building a series of clusters with low internal variance and high external variance. In this way, a greater homogeneity of the elements within the individual hierarchical partitions is guaranteed (Murtagh, 2014).

The robustness of the index was evaluated by using the Influence Analysis. By measuring the absolute average deviation of the ranks in the new rankings with respect to the one initially obtained, is possible to evaluate the importance of the single indicators with respect to the output (Mazziotta & Pareto, 2017). In our case, the average deviation is extremely small. This means that the index is robust from the point of view of its composition.

Through the construction of the historical series on the AMPI+ scores obtained, it has been possible to detect a worsening of the living conditions of the population in most EU27 states in the triennium 2010-2012. Compared to 2005, where medium-high levels of deprivation mainly affected the countries of Eastern Europe, there is an intensification of the phenomenon also among the countries of the Mediterranean area, that mitigating the sharp division between Western and Eastern European countries present pre-crisis. However, since 2015 AMPI+ scores have shown a progressive improvement in European living conditions which may be interpreted as the result of the recovery process started after the proclamation of the Europe 2020 Strategy in 2010. Thanks to the joint intervention of European governments and institutions, the problems produced by the crisis have been contained within State boundaries and the scenario in 2019 highlights a widespread betterment in social living conditions although, in a benchmark perspective, disparities between member States are still present.

The results reported by the cluster analysis on the AMPI+ index for 2019 confirm also a not fully homogeneous improvement on the territory, with the persistence of a higher level of deprivation in the countries of south-eastern Europe compared to the other EU27 member States, with a particular reference to the Balkan Peninsula, which occupies the first class of social exclusion. This result 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 New Member States (EU10) and some Mediterranean countries (e.g., Greece), which shown a weaker social fabric compared to the countries of Western Europe (Fura *et al*., 2017; Matković *et al*., 2007; OECD, 2004; Whelan & Maître, 2012).

In conclusion, the main results that emerged from the application of our index highlighted a great response capability of the European Union to deal with problems related to material deprivation and social exclusion, with the achievement of a greater level of social inclusion than in pre-crisis years, years before the end of Europe2020 Strategy. Just a country on 27 presents a worsening in AMPI+ score in 2019 compared to 2005. Despite this, the difference between the countries of the North-West and the Mediterranean and Eastern Europe is still too marked, a symptom of the need for an intervention of the European Union in order to reduce disparities between member States. In summary, AMPI is purposive for our scopes since it is both effective and suitable. Therefore, the originality of our contribution lies in the fact that we measure the evolutionary deprivation trend by applying a robust and well-established quantitative method of analysis.

237