Editorial

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Biographical notes: Ana García-Bernabeu is an Associate Professor of Applied Economics in the Department of Economics and Social Sciences at Universitat Politècnica de Valencia. She is member of the International Economics and Development Group. She is author or co-author of 35 papers and more than 20 conference papers. Her research has focused on the design and applications of different multicriteria decision making tools for the resolutions of problems associated with socially responsible investments and composite indicators. She is member of the Spanish Group of Multicriteria Decision Making and the International Society on Multiple Criteria Decision Making.

Javier Reig-Mullor is an Associate Professor of Finance in the Department of Economic and Financial Studies at Universitas Miguel Hernandez, Elche, Spain. He holds a degree in Business Administration from the University of Alicante, in 1992 and PhD in Economic and Business Sciences from University of Murcia, in 1997. He has been an author of more than 50 peer-reviewed journals, books and conference papers. He has participated in developing more than 30 funded research projects, both by public and private entities. His research has focused on the development of multicriteria decision making methods and their applications, the elaboration of models based in fuzzy sets, and the assessment of economic, finance and environmental problems.

The multidimensional nature of the main challenges facing today's society, such as sustainable development, competitiveness and innovation, circular economy, quality of life, and so on, require appropriate measurement approaches that monitor them at both macro (country, regions, cities) and micro levels (consumers and firms). From this perspective, composite indicators are tools that make it possible to summarise the behaviour of complex phenomena described in terms of individual or elementary indicators in an overall score. The main advantage of using composite indicators is that in the first instance, they summarise different dimensions of an issue by providing a 'context picture' that is easy to interpret and facilitates comparability across units of

analysis. However, they also have limitations as they can give confusing and non-robust messages if the indicators are poorly constructed.

A composite indicator should be based on a theoretical framework that allows individual indicators to be combined and weighted to reflect the dimensions or structure of the phenomena being measured. Thus, the way these indicators are constructed and applied seems to be a critical research issue from both theoretical and practical points of view. In building a composite indicator, the starting assumptions must be carefully evaluated to avoid results that lack analytical rigour (Nardo et al., 2005). Anyone interested in developing composite indicators should refer to the *Handbook on Constructing Composite Indicators* published jointly by OECD and JRC (OECD, 2008). It aims to understand better the complexity of current techniques used to build them by providing an 'ideal sequence of ten steps'. Despite this effort, the current situation is that no internationally agreed standards exist for the construction or dissemination of composite indices. Nevertheless, by looking at their application, the adoption of composite indicators by international institutions as a tool for analysis and policymaking has led to its expansion in several domains, e.g., economy, society, environment, tourism, health, or technology.

While discussion about the best methodology to design a composite indicator continues, we are interested in deepening the use of multicriteria decision making (MCDM) methodologies to address normalisation, weighting and aggregation issues. The most commonly used MCDM approaches to construct composite indicators include, to name but a few: analytical hierarchy process (AHP), data envelopment analysis (DEA), multi-attribute utility theory (MAUT), multi-attribute value theory (MAVT), ELECTRE, TOPSIS, VIKOR, PROMETHEE, MRP-WSCI and MACBETH. A composite indicator shares common objectives with MCDM techniques when it is used to classify or sort a set of alternatives. A benchmark study to understand the use of multicriteria methods for ranking and classifying is presented in Zopounidis and Doumpos (2002). However, the concept of composite indicator is not referred to in this paper. In Greco et al. (2018), a review of weighting, aggregation techniques, and robustness issues in constructing composite indicators is made. These authors consider some multicriteria methods as the AHP in the analysis of subjective weighting methods and DEA in the group of data-driven weights. Regarding the non-compensatory aggregation techniques, ELECTRE and PROMETHEE methods are highlighted. They also refer to robustness concerns through the new stochastic multi-attribute acceptability analysis (SMAA) method for dealing with the issue of uncertainty in the data or preferences required by the decision-maker during the evaluation process. The most recent work that addresses and reviews MCDM methods to build composite indicators is El Gibari et al. (2019). In it, the authors point out the increase of research in this field since 2014.

We are aware that there are still many issues under discussion without a definitive consensus, such as the objective-subjective approaches in weighting, the use of dichotomous variables, the interaction between indicators, or the compensability in the aggregation stage (Terzi et al., 2021). To contribute to the debate and understanding of some unsolved issues concerning composite indicators, this special issue of the *International Journal of Multicriteria Decision Making* aims to take a step in the direction of linking the conceptualisation and measurement of multidimensional phenomena with the MCDM theory and practice. After a thorough blind review process, five papers were finally accepted.

Thus, we present a collection of five papers dealing with recent theoretical and applied issues of composite indicators within the MCDM framework. We have ordered the papers according to the methodological contribution in the stages of constructing a composite indicator starting from the data normalisation, the weighting choice and the aggregation methodology. The areas of application of the proposed methods in this special issue include such relevance in the current context as economic development, decision making in healthcare contexts, sustainability and circular economy.

The first one by Casacci and Pareto deals with problems related with the normalisation stage when constructing a composite indicator for measuring and analysing socio-economic development. The authors proposed a nonlinear multivariate method for normalising a set of individual indicators in order to aggregate them into a composite index and construct profiles of country performance. The nonlinear multivariate method proposed by the authors allows to jointly normalise a set of individual indicators in order to construct a composite index without involving any assumptions about normality, linearity and causality or dependency. An application of the methodology to the measurement and analysis of socio-economic development of 153 countries is shown.

The second paper by Jangi et al. deals with the weighting assignment to handle group decision making. With this aim, the authors proposed a new MCDM software tool called 'expository-posthaste-effective-resembling-tool (ExPERT)' to be applied in health decision making. The authors address the problem of eliciting weights from experts' opinions and provide a more intuitive way of transforming qualitative and subjective information into quantitative data. Moreover, this tool displays a visual presentation that reduces the time required to assign the criteria weights compared to the traditional AHP technique, which is the most widely used method in health decision making.

The third paper by Regaieg and Frikha also deals with the issue of inferring criteria weights. The authors develop a mathematical programming model for eliciting objective weight parameters in the newest combinative distance-based assessment (CODAS) method. An illustrative example including a sensitivity analysis is included to test the applicability of the method.

The fourth paper by Ordaz et al. develops a proposal to establish a synthetic indicator for evaluating sustainability using a non-compensatory procedure in the aggregation stage. Thus, the authors resort to a non-compensatory approach computed by a mixed-integer linear programming model to assess the environmental sustainability performance of Cuban provinces.

Finally, Garcia-Bernabeu et al. deals with a new approach that consists in computing a multicriteria composite performance interval (MCPI) based on different aggregation rules. The suggested approach provides an additional layer of information as the lower bound corresponds to a non-compensability aggregation rule, whereas the upper bound is constructed allowing for full compensation. The authors apply the proposal to evaluate the circular economy performance of European member states.

At any rate, we hope that this material will encourage academic and practitioners to orientate their future research towards the improvement and application of MCDM methods in the construction of composite indicators. Finally, we would like to thank all the authors for their patience and friendly cooperation throughout the review process. Special gratitude is due to all the referees for their invaluable help.

References

El Gibari, S., Gómez, T. and Ruiz, F. (2019) 'Building composite indicators using multicriteria methods: a review', *Journal of Business Economics*, Vol. 89, No. 1, pp.1–24.

Greco, S., Ishizaka, A., Tasiou, M. and Torrisi, G. (2018) 'On the methodological framework of composite indices: a review of the issues of weighting, aggregation, and robustness', *Social Indicators Research*, Vol. 141, No. 1, pp.1–34.

Nardo, M., Saisana, M., Saltelli, A. and Tarantola, S. (2005) *Tools for Composite Indicators Building*, European Commission, Brussels.

OECD (2008) *Handbook on Constructing Composite Indicators: Methodology and User Guide*, OECD Publishing, Paris.

Terzi, S., Otoiu, A., Brimaccia, E., Mazziotta, M. and Pareto, A. (2021) *Open Issues in Composite Indicators a Starting Point and Reference on Some State-of-the-art-issues*, Roma TrE-Press, Roma.

Zopounidis, C. and Doumpos, M. (2002) 'Multicriteria classification and sorting methods: a literature review', *European Journal of Operational Research*, Vol. 138, No. 2, pp.229–246.