

Composite indicators of well-being: the relative importance of weights

Tarantola Stefano
 Joint Research Centre of the European Commission
 Via E. Fermi, 2749
 21027 Ispra, ITALY
 E-mail: stefano.tarantola@jrc.ec.europa.eu

Giachin Ricca Elena
 University of Rome Tor Vergata
 Economic Theory and Institutions
 Via Columbia, 2
 00133 Rome, Italy
 E-mail: elenagiachin@hotmail.it

Composite indicators are becoming mainstream tools for benchmarking elements like individuals, countries, firms, cities, etc. in a variety of multi-dimensional contexts, such as well-being, market integration, competitiveness, urban quality of life, etc.

The standard approach used to build composite indicators consists in combining an underlying set of indicators X_i through a series of treatments and algebraic manipulations, such as scale transformations, imputations, normalizations, weightings, aggregations; the result of this process is a set of composite scores Y_j for the various elements (eg universities, regions, cities, etc.). Y_j can be considered as the output of a mathematical model that is applied to the underlying indicators X_i (OECD-JRC, 2008). Quite often, a weighted average of the X_i s – through a set of weights w_i , is used to obtain Y . We call these weights *subjective* as they are customarily assigned subjectively by the developers (eg from the developer or from a panel of experts in the area) as measures of importance, although Arrow's theorem states that, for the linear aggregation, weights represent 'trade-offs' rather than importance coefficients.

Another approach to obtain composite indicators, which we consider in this work, is to estimate micro econometric models from given empirical data; in this case the weights are obtained as regression coefficients. Let us examine the specific case of a composite indicator of well-being, considering the micro econometric function:

$$\text{Life Satisfaction}_{ijt} = \alpha + X'_{ijt}\beta + Z'_{jt}\gamma + \varepsilon_{ijt}$$

for each individual i , belonging to country j , at time t .

Here, empirical data for individual life satisfaction (taken from Eurobarometer surveys) are used as the dependent variable. Z_{jt} are explanatory variables at macro level, specifically the Eurostat headline indicators of the European Strategy of Sustainable Development (SDS); Z_{jt} are given for country j and point in time t . X_{ijt} are other explanatory variables at individual level, specifically socio-demographic and economic

characteristics (like gender, age, education level, employment status, marital status, household income). ε_{ijt}

is an error term and the coefficients α , β , and γ are estimated. The composite indicator of well-being for country j at time t , based on the SDS headline indicators Z_{jt} , is defined as

$$WB_{jt} = Z'_{jt}\gamma$$

i.e. a linear aggregation, where γ are the estimated weights. We call these weights *objective* because they are obtained using a statistical estimation procedure from given observations, although they derive from subjective evaluation of life satisfaction. The well-being composite indicator is calculated at country level for all European Member States and at a given point in time.

Assume now that we have also developed a composite indicator of well-being using the standard approach, considering the set of SDS indicators as underlying components. The weights will be chosen by a panel of experts (subjective choice based on values). The question is therefore “can we make a comparative assessment of the composite scores in the two cases?” It may happen that the scores obtained using the objective weights are different from those obtained by using the subjective weights. What does this mean in terms of policy inference? What happens to the country scores if we use a merged set of weights values? We should also consider the presence of other sources of uncertainty that can cause variability in the composite scores (uncertainties in data imputations, for instance). So it becomes important to assess which are the drivers of uncertainty in the composite scores: the weights or other sources? This is an answer that sensitivity analysis can provide and that can be useful to determine a pedigree of the composite indicator. In a composite indicator with high pedigree the scores would depend very little on the subjective choices (i.e. *values* of experts), and more on reducible uncertainties (i.e. *facts*, such as uncertainties in data).

In this paper we analyze all these questions by comparing the standard approach with that based on objective weights and testing the robustness of the country composite scores in terms of the various sources of uncertainty (weights plus others). The robustness analysis can have relevant policy implications as it helps us to know whether the two approaches provide similar policy conclusions.

REFERENCES

OECD-JRC European Commission, Joint Research Centre (2008) Handbook on Constructing Composite Indicators: Methodology and User Guide, by Nardo, M. M. Saisana, A. Saltelli and S. Tarantola (EC/JRC), A. Hoffman and E. Giovannini (OECD), OECD publication Code: 302008251E1

Saltelli, A., D'Hombres, B., Jesinghaus, J., Manca, A. R., Mascherini, M., Nardo, M. and Saisana, M. (2010), Indicators for European Union Policies. Business as Usual?, Social Indicators Research, Vol. 102, Number 2, 197-207.

Di Tella, R. and MacCulloch, R. (2006). Some Uses of Happiness Data in Economics. Journal of Economic Perspectives 20 (1): 25-46.

Deaton, A. (2008). Income, Health and Wellbeing around the World: Evidence from the Gallup World Poll, *Journal of Economic Perspectives* 22 (2), 53-72.

Helliwell, J. (2003), How's life? Combining individual and national variables to explain subjective well-being, *Economic Modelling* 20, 331-60.

Stevenson, B., and Wolfers, J. (2008), *Economic Growth and Subjective Well-Being: Reassessing the Easterlin Paradox*, *Brookings Papers on Economic Activity*, Spring.