Multidimensional Poverty Measures from an Information Theory Perspective *

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Abstract

This paper proposes to use an Information Theory approach to design multi-dimensional poverty indices. Traditional monetary approaches to poverty rely on the assumption that all relevant attributes of well-being are perfectly substitutable, which arguably, is too strong an assumption to impose. Based on the idea of essentiality of some attributes, scholars have recently suggested multidimensional poverty indices where the existence of trade-off between attributes is relevant only for individuals who are below a poverty threshold in all of them (Bourguignon & Chakravarty 2003, Tsui 2002). The present paper proposes a method which encompasses both approaches and, more interestingly, it opens the door to an intermediate position which allows, to a certain extent, for substitution of attributes even in the situation in which one or more (but not all) dimensions are above the set threshold. An application using individual well-being data from Indonesian households in 2000 is presented to compare the results under the different approaches.

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1   Extended Abstract

Evaluation of household or individual well being is now widely accepted as a multiattribute exercise. Far less agreement exists on such matters as which attributes to include, how such attributes are related and/or contribute to overall well being, and what criteria to employ for complete (i.e., index based) ranking of well-being situations. Some degree of robustness may be sought through weak uniform rankings of states, as by Stochastic Dominance and related criteria. A useful starting point, both for the believers and non-believers in the multidimensional approach, is to see the traditional univariate assessments in the multiattribute setting: it is as though a weight of one is attached to a single attribute, typically income or consumption, and zero weights given to all other real and potential factors. Univariate approaches do not avoid, rather, they imposes very strong a priori values.

The literature on multidimensional poverty recognizes four broad approaches to derive measures of poverty (Deutsch & Silber 2005): the fuzzy set theory, the information theory, the efficiency analysis, and the axiomatic derivation to poverty measures (Bourguignon & Chakravarty 2003, Tsui 2002). All four must produce aggregate measures of well-being, that is, an individual representation functions; and the poverty measure is derived from this aggregate function and the distribution of the constituent attributes. All measures classify certain members of the population as 'poor'. This paper adopts the information theory perspective to assess the different aggregation methods and examines who is classified as poor in the axiomatic and the information theory approaches.

A brief description of the Information Theory (IT) approach is as follows: the distance between two distribution functions can be efficiently measured using the relative entropy measure, as proposed by Shannon (1948). From the relative entropy measure one can derive an individual level aggregate function whose distribution is the least divergent from the distribution of the constituent welfare attributes. The second step is to define the set of poor and an appropriate aggregation method across individuals. All of the existing univariate poverty measures present as candidates. This paper presents two alternative family of measures depending on the underlying definition of poverty line. The resulting measures encompass the indices proposed by others (Bourguignon and Chakravarty 2003, Tsui 2002) while opening the way to more general measures of poverty, including more complex moments than the average functions ($\frac{1}{n}\sum_{i=1}^{n}$). Additionally, the measures presented in the paper allow for substitution from an attribute that exceeds its poverty level to another that falls short of it; a concept that we will refer to as weak poverty

focus property. An individual does not have to be poor in all dimensions to be either considered poor or non-poor in the multidimensional context. We think that weak focus is, indeed, a very attractive feature of multidimensional approach which deserves to be examined in many real life situations.

This paper is structured as follows: Section 2 introduces the notation that will be use throughout the article. Section 3 presents a succinct description of the Information Theory and its application to the area of inequality and multidimensional well-being indices. Section 4 uses the IT approach to derive two alternative families of multidimensional poverty indices. Measures presented elsewhere are shown to be included in the proposed set. Section 5 illustrates the use of these measures using household data from Indonesia in 2000 and presents some remarks concerning implementation and practical issues. One issue concerns the identification of truly distinct attributes, highlighting the statistical role played by any chosen index and its ability to utilize information in different dimensions.[1] Section 6 concludes.

References

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Deutsch, J. & Silber, J. (2005). Measuring multidimensional poverty: An empirical comparison of various approaches, *Review of Income and Wealth* **51**(1): 145–74. Bar-Ilan U; Bar-Ilan U.

Tsui, K. Y. (2002). Multidimensional poverty indices, *Social Choice and Welfare* **19**(1): 69–93. Chinese U Hong Kong.

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[1]Since we only consider three dimension – income, education and health – we do not deal with the clustering techniques that also use consistent IT method for dimension reduction based on the similarity of the attribute distributions. We merely report several robust measures of dependence between our chosen attributes to shed light on their relations.