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Applying expert knowledge to measure multidimensional rural poverty in Chittagong (Bangladesh)

Author: Melania Salazar-Ordóñez; Lorenzo Estepa; Rosa Cordón-Pedregosa

Institution: Universidad Loyola Andalucía / Fundación ETEA para el Desarrollo y la Cooperación

Address: Escritor Castilla Aguayo, 4 Córdoba – Spain

Email: msalazar@uloyola.es; lorenzo.estepa@fundacionetea.org;

Abstract

To understand poverty dynamics is needed to analyse not only the factors that are responsible for limiting the welfare of the poor but also the way to reflect this poverty in a reliable measure. There are a plenty of poverty (or deprivation) definition which results on different poverty (or deprivation) measures such as absolute or relative income poverty measure, measure of social deprivation or multidimensional poverty. Though, those which only take into account income/consumption are full of critics for being too narrow. In this regard, poverty is acknowledged as a complex and multidimensional issue so a measure has to try to portray this reality.

Multidimensional poverty index elaborated by United Nations Development Programme (UNPD) includes deprivation in three dimensions such as health, education and living standards in an attempt to capture the whole poverty dynamics, being the most widely used as it covers 109 countries. However, among the main limits of this index appears the non-incorporation of income dimension and the worth or weight given to each indicator, which form the three dimensions. The weights of each indicator are fixed and the same across the countries; they are assigned according to the number of indicators presented in the dimensions.

This paper aim is to contribute to overcome the above-mentioned second limit. To do so, in a first step, Multidimensional poverty index is estimated according to UNPD method, by means of 4,641 face-to-face surveys at household level taken in rural Bangladesh – Chittagong region – in 2012. Bangladesh has a per capita income of 848$ pretending to get 1,300$ in 2021. It is a rural based country (80% of population) and the decline in the national incidence of poverty stood at a mere 9% percent between 1991 and 2008, and about 63 million people still live below poverty line. Second, the multi-criteria technique Analytic Hierarchy Process (AHP) is used to identify the weights of each indicator which from UNPD dimensions according to expert opinion, by mean of 29 face-to-face surveys with researchers working in terms of rural poverty in Bangladesh. Third, significant differences are calculated between the results of the multidimensional poverty index estimating with, on the one hand, fix weights and, on the other hand, expert opinion weights. To increase the accuracy in classifying the households regarding to their poverty level results essential in order to plan and design efficiency policies which allow reducing poverty.

Keywords

Multidimensional poverty index; Analytic Hierarchy Process; Rural Bangladesh

1. Introduction

In recent years, there is a growing debate about the different approaches to measuring poverty. It seems that the emergence of multidimensional poverty measures have failed detract from other more traditional measures based on the price system (Alkire and Santos, 2010; Villar, 2010). In particular, the Multidimensional Index Poverty – MIP is one of the most popular measures used by the UNDP in its annual Human Development Report. It can get some idea of the joint distribution of the multiple dimensions of poverty which are included in the index — to what extent the different dimensions of poverty are shared by the same people.

The use of multidimensional measures of poverty have posed new technical and methodological problems (Ravallion, 2011) in the choice of the dimensions considered, availability of data, theoretical support, public support, empirical evidences, etc. The most accurate indicators have to be elected to build the dimensions considered and critical thresholds of these indicators are established to mark off poverty. In addition, the weighting of the indicators have to be decided (Ibid.)

Regarding the last issue, all the elements of the MIP are given (Alkire and Santos, 2010.). A key step in implementing any multidimensional measure, together with selecting a set of dimensions, is how they should be weighted to form the composite index (Ravnborg, 1999). Those with a stake in the outcomes will certainly be in a better position to do determine what weights to apply than the analyst calibrating a measure of poverty. The specific country and policy context should determine what tradeoff is considered appropriate (Ravallion, 2011.).

This paper aim is to contribute to overcome the above-mentioned second limit. To do so, in a first step, Multidimensional poverty index is estimated according to UNPD method, by means of 4,641 face-to-face surveys at household level taken in rural Bangladesh – Chittagong region – in 2012. Bangladesh has a per capita income of 848$ pretending to get 1,300$ in 2021. It is a rural based country (80% of population) and the decline in the national incidence of poverty stood at a mere 9% percent between 1991 and 2008, and about 63 million people still live below poverty line. Second, the multi-criteria technique Analytic Hierarchy Process (AHP) is used to identify the weights of each indicator which from UNPD dimensions according to expert opinion, by mean of 29 face-to-face surveys with researchers working in terms of rural poverty in Bangladesh. Third, significant differences are calculated between the results of the multidimensional poverty index estimating with, on the one hand, fix weights and, on the

other hand, expert opinion weights. To increase the accuracy in classifying the households regarding to their poverty level results essential in order to plan and design efficiency policies which allow reducing poverty.

After this introduction, it is described the case study and the questionnaire design in part two. Methodology is described in part three and results are presented in part four. Conclusions are presented in part five.

2. Case study and questionnaire design

Bangladesh is located in the Bay of Bengal and has a population of almost 167 million people (72% in rural areas). Its development has been determined by one of the highest population density in the world (more than 1,064 people/ km^2). The economic growth has been around 4.5% in real terms since the mid-1970s of the last century (World Bank, 2013). However, the poverty is widely extended as 31% of the citizens lives below the poverty line (World Bank, 2013). Agricultural sector generates about one third of gross domestic product (GPD) and 60% of employment. Service sector represents around 52% of GPD and industry 17%. This country is divided in seven administrative divisions. Chittagong is one of these seven divisions with 28 million of inhabitants. It is the third contributor to the national GPD – 19% – and agriculture sector employs 48% of labour forces (Ibid). In this area, 26.2% of population lives below poverty line, 5 percentage points less than the average at national level (Ibid).
The data for this paper was compiled using 4,641 face-to-face surveys administered from August 2012 in South Kosbash which is a region of Chittagong with 25,446 inhabitants. The questioners were administered to the whole households inside this region (4,999) but only 92.7% of them was used because of household identification problems. The questioner was designed using Participatory Rural Appraisal[1], in combination with social and resource mapping[2] and implemented by the Bangladesh Academy for Rural Development – BARD. The questionnaire was structured into several sections to separate information of households' members; health; life conditions; agricultural and livestock activities; support, income and expense; and networking.

The responds' profile in average was 99.9% the household head and 92.3% married people. According to sex, 92.2% was men, working 46.8% of the respondents in agricultural sector, 13.3% in receiving remittances and 11.2% in own business. The schooling levels were

[1] Participatory Rural Appraisal is a qualitative approach where people analyse their own problems, set their aims and monitor their achievements.
[2] Social mapping allows showing the households' location, their relationships and those factors relevant to relative poverty; while resources mapping helps to locate geographically the accessible natural resources.

very low, 35.1% of the surveyors was illiterate and 17.9% only knows how to write name and surname. Regarding the households' profiles, the average number of members was 5.16 people (standard deviation = 2.18), with 2.72 men by household (standard deviation = 1.42). By age, 0.61 members are less than 5 years old (standard deviation = 0.76) and 1.25 between 6 and 15 years old (standard deviation = 1.11), being older than 57 years old, 0.38 (standard deviation = 0.62).

3. Methodology

First, in order to measure the multidimensional rural poverty in Southern Chittagong, the Multidimensional Poverty Index (MPI) developed by Alkire and Santos (2010) has been applied. This Index is the most widely performed as it is calculated by the UNDP since 2010[3], today for 104 countries. The MPI is constructed basing on a range of indicators, which are grouped in three dimensions, measured at individual level by means of a binary scale where the 1 means deprivation in the indicator and 0 no deprivation. So that each household is classified as poor or not according to the number of deprivations the family members suffer simultaneously. Each dimension is equally weighted and each indicator also has the same weight depending on the number of them which are included in the constructs (see Table 1).

Table 1. Dimensions, indicators and weights in the MPI

Dimension	Indicator	Weight (%)
Education	At least one household member has less than five years of schooling	16.6667
	At least one school-age child (up to grade 8) is not attending to school	16.6667
Health	At least one household member is malnourished	16.6667
	At least one child has died	16.6667
Standard of Living	Not having electricity	5.5556
	Not having access to clean drinking water	5.5556
	Not having access to adequate sanitation	5.5556
	Using polluted cooking fuel (dung, wood or charcoal)	5.5556
	Having a home with a dirt floor	5.5556
	Owning no car, truck or similar motorized vehicle while owning at most one of these assets: bicycle, motorcycle, radio, refrigerator, telephone or	5.5556

[3]The UNDP was the pioneer institution in the measurement of multidimensional poverty. The first proposal appeared in 1997 and was called the Human Poverty Index (HPI) which was substituted by the MPI.

	television

Source: Alkire et al. (2013)

The deprivation scores are calculated adding the weights where the household suffers deprivations so they can get values between 0 to 100%. When scores are above 33%, the household is classified as poor (Human Development Report, different dates). In addition, other two indexes are estimated (Human Development Report, different dates): the headcount ratio (H) and the intensity of poverty (A). The first one makes an approximation of the population proportion that is poor, dividing the number of multidimensionally poor people by the total population. The second reflects the average indicators in which multidimensional poor people are deprived. The MPI for a whole country is calculated as the population percentage that is multidimensionally poor adjusted by the intensity of the deprivations. Finally, it is also estimated the contribution of each dimension to multidimensional poverty, measuring the number of indicators in each dimension which present deprivation and the number of people who suffer this deprivation (Human Development Report, different dates). Starting from Southern Chittagong region data we have estimated, first, the deprivation score for each household using the above mentioned method and, second, the rest of indexes for the whole region.

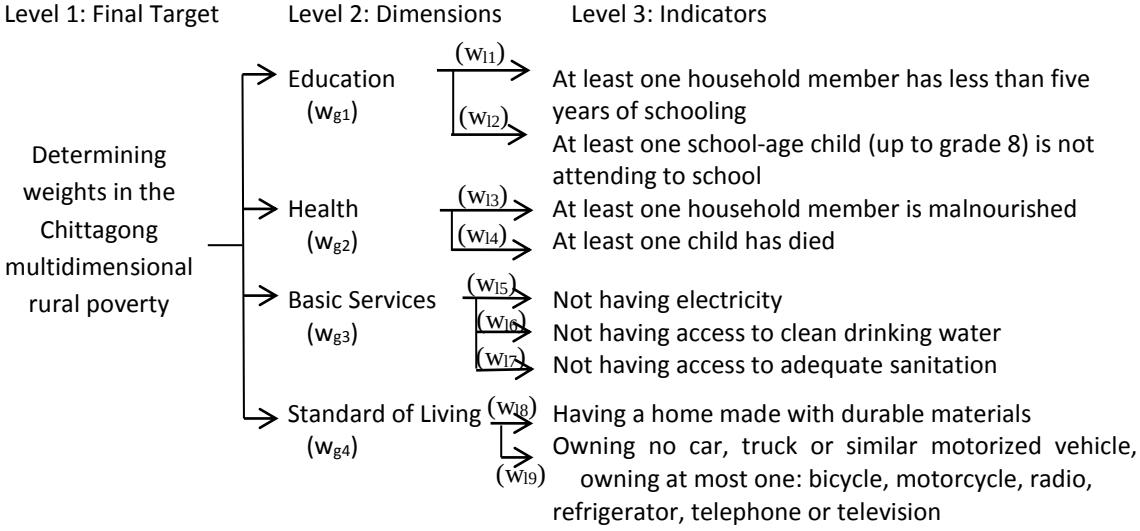
On the other hand, different methods exist to assign weights to composite indicators (OECD, 2008) such as those basic on statistical models – e.g. factor analysis or data envelopment analysis – or participatory methods – like Conjoint Analysis and Analytic Hierarchy Processes (AHP). The second ones have the advantage of incorporating stakeholders' opinions for example from experts, citizens or politicians. According to Forman and Dyer (1983), AHP enables to derive weights as opposed to arbitrarily assigning them. Indeed, the AHP is easily comprehended and allows judging the importance of concrete elements giving them priorities (Saaty and Vargas, 2012). Taking into account the aim of the research, the last approach was selected.

The Analytical Hierarchical Process (AHP) was created by Saaty (1980) as a structured and flexible technique that approaches complex decision problems by means of hierarchical structures and ratio-scale measures[4]. In this study, AHP was used as a weighting method to determine the weights of each MPI indicators incorporating expert knowledge.

[4] Criticisms of this technique (see, e.g. Belton 1986; Holder 1990; etc.) have been addressed by Saaty (1990, 1991) and Harker and Vargas (1990).

The hierarchical structure, besides the final target (determining weights in the Chittagong multidimensional rural poverty elements), has developed in 2 levels. The level 2 has been designed from the MPI dimensions; however the dimensions of Standard of living has been divided in two – Basic services and Standard of living – to reduce the number of pairwase comparisons and avoid cognitive stress in the experts. The level 3 has included the MPI indicators[5] (Figure 1).

Figure 1. Hierarchical structure of the AHP design



Source: Authors' elaboration

Pairwise comparisons between each dimension yielded the global weights (w_{gi}), and those between each indicator, inside the dimensions, produced the local ones (w_{lj}). The pairwise comparisons were measured with Saaty's scale (1980, 1994, 1997, etc.) from 1 to 9, where 1 represents similar importance between both elements and 9 represents the highest level of importance of the first over the second. Data were collected by 29 face-to-face interviewers with Bangladeshi rural experts[6], carried out in March 2013. Experts were asked about the relevance of these indicators to measure poverty in Bangladesh considering the today situation, i. e. which indicators had to be more taken into account to measure poverty. Those experts were scientific officers selected from different Rural Research Institutes.

When the pairwise comparisons were conducted, weights were estimated from Saaty's matrices ($A = a_{ijk}$), formed by the reciprocal of the paired comparisons of each element. Various methods have been proposed to estimate the weights. Saaty proposed the

[5] Polluted cooking fuel variable was eliminated because of problems with the data. This implied the reassignment of the indicators' weights inside the Standard of living dimension (arising 6.667) to estimate MPI with the NUPD method.

[6] We counted on four Directors, five Joint Directors and twenty Senior Scientific Officers.

eigenvector method as the best estimator; however, the literature does not provide any evidence for the superiority of any method (Fichtner 1986; Zahedi 1986). We opted for the row geometric mean. Then the arithmetic mean was applied to aggregate the individual pairwise comparisons. At last, to apply the weight in the estimation of deprivation scores normalized weights (w_{nj}) were estimated by multiplying each local weight (local ones (w_{lj})) by the upper global weight (global weights (w_{gi})).

Finally, we checked if statistical significant differences existed between the deprivation scores across household estimating with equal and experts' knowledge weights by means of the Student's t-test on two means' comparison.

4. Results

When the MPI for rural households in Southern Chittagong was calculated using equal weights, we obtained nearly 47% of the households lived in a poverty situation because the deprivation score accounted for was above 33.3% threshold. The general mean, considering the whole households, resulted in 31.6% (standard deviation of 19.4), and taking into account only the poor ones in 49.9% (standard deviation of 12.2). The rate of the households living in severe poverty, i.e. presenting deprivation scores over 50%, stood at 29.8%.

The share of people who live in multidimensionally poor (H) households reached 48%, a figure under that obtained for the whole country which was 58% according to data from 2007 year (Human development report, 2013). The intensity of deprivation (A) in this region was 48.7% so a poor person presented some kind of deprivation in, approximately, half of the indicators. As a result, the MPI had a 0.233 value, close to the MPI for the whole country in 2007 (0.292). In the contribution of each dimension to poverty, the highest shortage for citizens was derived from the assets represented in the Standard of living dimension (50.6%), while the Education only contributed to multidimensional poverty with 18.13%.

Regarding the weights assigned by the Bangladesh rural experts using the AHP method, the results are displayed in Table 2, where w_{gi} and w_{lj} represent the weights within each group and w_{nj} are the normalized weights. The consulted experts had an average experience in territorial development of 10 years, with four of them working in rural development in Bangladesh more than 20 years.

Table 2. Weight assigned by experts

Dimensions Indicators	w_{gi}	w_{lj}	w_{nj}
Education	0.263		
At least one household member has less than five years of schooling		0.652	0.172
At least one school-age child (up to grade 8) is not attending to school		0.348	0.092
Health	0.277		
At least one household member is malnourished		0.609	0.169
At least one child has died		0.391	0.108
Basic Services	0.245		
Not having electricity		0.111	0.027
Not having access to clean drinking water		0.539	0.132
Not having access to adequate sanitation		0.350	0.086
Standard of Living	0.215		
Having a home made with durable materials		0.519	0.111
Owning no car, truck or similar motorized vehicle, owning at most one: bicycle, motorcycle, radio, refrigerator, telephone or television		0.480	0.103

Source: Authors' elaboration

The dimensions' weights given by experts were not equal but similar. For the experts, Health and Education had the highest relevance to measure poverty in Bangladesh considering the today situation. In addition, we can observe that inside Health dimension the most important variable is the household members' malnourished and inside Education the level of education in adults. Considering the indicators' normalized weights, respondents assigned the highest value to have less than five years of schooling by adults, malnourish in the household members and access to clean drinking water. These indicators contained 47.3% of the total weight to measure poverty. The least relevant variables to measure poverty, according to experts' opinion, overlapped to have electricity, adequate sanitation and at least one school-age child not attending to school. The previous results are coherent if we reflect on 59% of Southern Chittagong houses can access to electricity, 62% have access to adequate sanitation and only 12.7% have some children not attending to school. However, in the 88% of the households at least one member has less than five years of schooling, 30% states to be in food deficit and 42.6% in breakeven (with a very few situations of some deficit), and a very few 24% has access to clean water –i.e. 76% ignores or knows that they are drinking water polluted with arsenic.

The deprivation scores for each household estimating with the weights given in a proportional way or by the experts showed statistically significant differences (t-Student = 97.56, p= 0.000). Applying the expert knowledge, Southern Bangladesh region accounted for

55.3% of household living in multidimensional poverty conditions. It increased the poor households estimating using equal weights in more than 8%. Average value was placed in 38.9% (standard deviation was 21.1) and 55.2% (standard deviation was 14.2) by approaching whole sample and poor homes, respectively. These mean an increase in seven and five percentage points compared to the previous estimations. Severe multidimensional poverty affected 36.4% of households –seven percentage points over estimations with equal weights. The percentage of population suffering from multidimensional poverty and the intensity of deprivation were also increased from 48% to 50.6%, in the first case, and 48.7% to 53.7%, in the second. Starting from the above-mentioned data, the MPI resulted 0.271, 18% higher to that calculated in advance. In addition, changes happened in the dimensions' contributions to MPI. Considering normalized weights, the Standard of living dimensions increase until 56% and Education decrease at 17%.

5. Conclusions

Well informed local experts paint a picture of multidimensional poverty in Chittagong substantially different from that stated by the MPI methodology.

The standard of living, dimension is revealed as the most important for the measurement of local poverty, resulting in more than 12% higher than the weights assigned by the MPI methodology.

Furthermore, the relative weights of education and health are reduced by almost 7% and 5.6%, respectively, by local experts compared with the methodology MPI.

This is reflected in a similar increase in the contribution of the dimension of Living Standard in multidimensional poverty in the area, which goes from 50.6% to be 56%.

The fact that for example, access to potable water, has had a weight assigned by local experts 6.5% higher than the MPI methodology may result in an increase in the index of multidimensional poverty.

An assignment of weights to the dimensions and indicators of poverty, by local experts in specific contexts can put particular emphasis on policies to combat poverty.

In environments where resources are scarce, it is necessary to prioritize the most adequated policies for each situation. It is in this context, that this expert knowledge can be used by methods to attack more directly the problem of poverty.

In the case of attending school indicator, local experts have diminished its weight in 7,4%, (from the MPI 16,67% established). Apart from the change in the configuration of poverty of households is derived, it can doubt the effectiveness of certain policies, that are working well (amplifying a problem that may actually be in a process of solution).

If local expert knowledge is combined with local informants members of the community, the endogenous perception of poverty may also be taken into account.

Bibliography

Alkire, S. y Santos, M.E. (2010) "Acute Multidimensional Poverty: A New Index for Developing Countries" Oxford Poverty & Human Development Initiative –OPHI- Working Papers Nº 38.

Alkire, S., Conconi, A. y Roche, J.M. (2013) "Multidimensional Poverty Index 2013: Brief Methodological Note and Results" Disponible en: www.ophi.org.uk/multidimensional-poverty-index/

Forman, Ernest H. with Dyer, Robert F. (1983) "Group Decision Support with the Analytic Hierarchy Process", Decision Support Systems, Vol 8, pp 99-124, 1992.

Ravnborg, H.M. (1999) "Desarrollando perfiles de pobreza regionales basados en las percepciones locales" Cali. Colombia. CIAT.

Ravallion, M (2011). "On Multidimensional Indices of Poverty" Policy Research Working Paper 5580. The World Bank Development Research. Group Director's office. February 2011

Saaty, T. & Vargas L. (2012) "Models, Methods, Concepts & Applications of the Analytic Hierarchy Process" Second Edition. International Series in Operations Research & Management Sience. Springer New York

Summer, A. (2007) "Measuring versus measurement: why do "economic" indicators of poverty still predominate?" Development in Practice, 17: 4-13.

Tezanos, S., Quiñones, A., Gutiérrez, D. y Madrueño, R. (2013) "Desarrollo humano, pobreza y desigualdades" Manuales de cooperación y desarrollo, Universidad de Cantabria.

UNDP (1997) “Informe sobre Desarrollo Humano 1997” Madrid: Mundi Prensa.

UNDP (2008) “Informe sobre Desarrollo Humano 2008. La lucha contra el cambio climático: Solidaridad frente a un mundo dividido” Nueva York: Oxford University Press.

Villar, A. (2010) “A new approach to Multidimensional Poverty Measurement” Working paper series 10.07. Dept. of Economics. Universidad Pablo Olavide de Sevilla.

World Bank (1990) “World Development Report 1990: poverty” Washington DC: Banco Mundial.

World Bank (2001) “Informe sobre el desarrollo Mundial 2000/2001. Lucha contra la pobreza” Madrid: Mundi Prensa.

World Bank (2013) “Indicadores del Banco Mundial” Disponible en: http://datos.bancomundial.org/indice/ios-indicadores-del-desarrollo-mundial