

How to integrate macro and micro perspectives: an example on Human Development and Multidimensional Poverty.

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Abstract When building indicators of quality of life attention is focused on aggregation across different dimensions. However two other aspects need consideration: distribution of each “dimension” across the population (*inequality*) and joint distribution of individual achievements or – viceversa - deprivations. Aim of this paper is to suggest a *correction* to the composite indicator, that takes into account some aspects concerning the joint micro distribution of achievements in each dimension. As an example we *correct* the Human Development Index (HDI) by means of the Multidimensional Poverty Index (MPI).

1 Introduction

Among the cross-cutting issues in the measurement of quality of life there is the challenge of aggregation across different dimensions.

Usually aggregation is obtained computing first of all a scalar measure of each dimension, and then aggregating the different dimensions (at macro-level).

However, among the recommendations of the commission on the measurement of Economic Performance and Social Progress (ref) we find:

- emphasise household perspective
- give more prominence to joint distribution of the dimensions of people's well being.

Thus, if we were to follow the commission's recommendations, we should first of all obtain an aggregate measure of QoL at individual or household level (micro-level) and then a scalar (mean) measure at regional or group level.

Aim of the present paper is to integrate the two different perspectives: horizontal or micro-level aggregation (households) and vertical or macro-level (regional) aggregation. In particular we want to carry on to a macro-level of analysis, some indicator of intensity of deprivation in quality of life.

The chosen indicator is a natural extension/application of the Alkire-Foster (2009) class of multidimensional poverty measure M_0 . Multidimensional poverty measure has been introduced to measure the intensity of multivariate poverty, its aim is to reflect the joint distribution of disadvantages and the composition of poverty among the multiply

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deprived. Indicators of this kind can be easily introduced to measure intensity of social exclusion or other multidimensional components of Quality of Life; all is required are data, threshold values and weights.

2 Multidimensional poverty measure M_0

Let us consider poverty in d dimensions across a population of n individuals. Let $\mathbf{Y} = [y_{ij}]$ denote the $n \times d$ matrix of achievements, $i=1, \dots, n$; $j=1, \dots, d$; $y_{ij} \geq 0$ represents individual i 's achievement in dimension j .

Let \mathbf{w} be a weighting vector whose j th element w_j ($j=1, \dots, d$) represents the weight that is applied to dimension j . We set $\sum w_j = d$, that is, the dimensional weights sum to the total number of dimensions. Let $z_j > 0$ be the deprivation cut-off in dimension j , and \mathbf{z} be the vector of deprivation cutoffs.

First of all from \mathbf{Y} define a deprivation matrix $G^0 = [g_{ij}^0]$, whose typical element is defined by $g_{ij}^0 = w_j$ when $y_{ij} < z_j$ and $g_{ij}^0 = 0$ when $y_{ij} \geq z_j$. Then, by adding up all the elements in each row of the matrix, define column vector \mathbf{c} of deprivation counts, whose i -th entry $c_i = \sum g_{ij}^0$ ($i=1, \dots, n$) represents the weighted deprivations suffered by person i . Finally select a poverty cutoff k , such that $0 < k \leq d$ and apply it across vector \mathbf{c} . A person is identified as poor whenever $c_i > k$.

To aggregate information about multidimensionally poor individuals we construct a second matrix $G^0(k)$, that contains the weighted deprivations **only** of exactly those persons who have been identified as poor, given k , and *excludes* deprivations of the non-poor. From this censored matrix we can construct the censored vector of deprivation counts $\mathbf{c}(k)$.

M_0 is defined as: $M_0 = \sum c_i(k)/nd$. It can also be expressed as the product of two measures: the (multidimensional) headcount ratio (H) and the average deprivation share among the poor (A). In other words: $M_0 = H \times A$, where: $H = q/n$, $A = \sum c_i(k)/dq$.

H is simply the proportion of people that are poor, or q/n where q is the number of poor people. A is the average of fraction of deprivation intensity among the poor. A represents the *intensity* of multidimensional poverty.

3 Aggregation at macro level

Aggregation at macro-level can be obtained as an average/mean (for example geometrical mean) or linear combination of achievements in each dimension. For instance human development index is a summary measure of human development; it measures average achievements in a country in three basic dimensions: health, education, income and it is defined as the geometric mean of the three dimension indexes.

The problem is that this index does not take into account the distribution across the three dimensions. In particular it does not take into account the deprivation intensity. Severe concentration of deprivations among few households leads to worst quality of life (or human development level) than equidistribution of deprivations. Of course if

we had the data we could compute a summary measure of the three dimensions for each household or individual unit; and then an overall index. We could even compute as 0 the achievements index of a multidimensionally poor household, thus penalizing the overall average value of the macro-indicator.

Alternatively we can try to “correct” the macro-level index by taking into account the multidimensional deprivation measure M_0 .

4 How can we correct the macro-level indicator?

First of all define a penalization coefficient P ($0 \leq P \leq 1$) obtained from the multidimensional deprivation measure M_0 . Then define the “corrected” or “micro-level integrated” Quality of Life indicator (QoL_c) as: $QoL_c = QoL (1-P)$.

Our suggestion is to use a multidimensional deprivation measure (either M_0 or the head count H) to penalize the aggregate measure of well being.

Just as an example we have tried to correct HDI by means of Multidimensional Poverty Index (MPI). The results – in terms of rank differences - are shown in table A in appendix. The greatest losses (≥ 10) in HD ranking due to the concentration of disadvantages in a small part of the population are reported in table 1. We make use of three different penalization coefficients: MPI (which gives rise to the corrected HDI we have called $HDIc_1$) the head count ratio H (which gives rise to $HDIc_2$) and the % of population in severe poverty (leads to $HDIc_3$).

Of course the best correction would be the one that leads us to the same $HDIc$ we would have if HDI could be calculated computing first of all household achievements – setting an achievement to zero whenever it coexists with severe deprivations in other dimensions - and then an overall measure. Being unable to do so (because of the lack of data) we can only hope the different corrections to converge to similar results (i.e. lead to similar rankings). For this reason we compare the rank losses due to intense deprivation in some households with the rank losses – in those same countries – due to inequality, i.e. disparities in the distribution of the three dimensions of HDI across the population, as measured by the Inequality Adjusted HDI (IHDI). We can easily see there is greater agreement between $HDIc$ rankings than between any of these and IHDI.

References

1. Alkire, S. , Foster J.E. : Counting and Multidimensional Poverty Measurement . Oxford Poverty & Human Development Initiative OPHI Working Paper 32. (2009)

Table 1:

Country	MPI	H (%)	%severe poverty	Ranks							
				HDI	HDIc 1	HDIc 2	HDIc 3	HDI-HDIc1	HDI-HDIc2	HDI-HDIc3	HDI-IHDI
Peru	0.086	19.9	6.0	23	35	44	34	-12	-21	-11	-5
Gabon	0.161	35.4	13.2	38	52	56	52	-14	-18	-14	8
Namibia	0.187	39.6	14.7	50	60	62	59	-10	-12	-9	-14
India	0.283	53.7	28.6	62	69	73	71	-7	-11	-9	1
Timor-Leste	0.360	68.1	38.7	73	79	87	82	-6	-14	-9	-1
Angola	0.452	77.4	54.8	74	91	96	95	-17	-22	-21	...
Tanzania	0.367	65.2	43.7	78	85	84	89	-7	-6	-11	1
Senegal	0.384	66.9	44.4	80	89	90	90	-9	-10	-10	0
Ethiopia	0.562	88.6	7.3	97	103	107	107	-6	-10	-10	1

Table A

Country	Ranks				Country	Ranks			
	HDI	MPI	HDIC	HDI-HDIc		HDI	MPI	HDIC	HDI-HDIc
Slovenia	1	1	1	0	Kyrgyzstan	55	32	47	8
Czech Republic	2	23	2	0	Tajikistan	56	51	51	5
United Arab Emirates	3	4	3	0	Viet Nam	57	52	55	2
Estonia	4	40	5	-1	Nicaragua	58	58	59	-1
Slovakia	5	2	4	1	Morocco	59	43	54	5
Hungary	6	28	6	0	Guatemala	60	57	61	-1
Latvia	7	13	7	0	Iraq	61	47	56	5
Argentina	8	25	8	0	India	62	75	69	-7
Croatia	9	29	9	0	Ghana	63	61	62	1
Uruguay	10	14	10	0	Congo	64	70	66	-2
Montenegro	11	15	11	0	Lao Republic	65	74	71	-6
Mexico	12	27	13	-1	Cambodia	66	72	70	-4
Serbia	13	6	12	1	Swaziland	67	68	65	2
Trinidad- Tobago	14	33	16	-2	Bhutan	68	56	63	5
Belarus	15	3	14	1	Kenya	69	71	68	1
Russian Federation	16	10	15	1	Sao Tome and Principe	70	62	64	6
Kazakhstan	17	5	17	0	Pakistan	71	73	73	-2
Albania	18	11	18	0	Bangladesh	72	79	75	-3
Bosnia and Herzegovina	19	7	19	0	Timor-Leste	73	89	79	-6
Georgia	20	8	20	0	Angola	74	99	91	-17
Ukraine	21	18	21	0	Myanmar	75	63	67	8
Macedonia	22	19	22	0	Cameroon	76	78	76	0
Peru	23	53	35	-12	Madagascar	77	88	82	-5
Ecuador	24	22	23	1	Tanzania	78	90	85	-7
Brazil	25	26	25	0	Yemen	79	76	77	2
Armenia	26	9	24	2	Senegal	80	93	89	-9
Colombia	27	37	26	1	Nigeria	81	81	80	1
Azerbaijan	28	34	29	-1	Nepal	82	85	84	-2
Turkey	29	41	31	-2	Haiti	83	80	78	5
Belize	30	38	30	0	Mauritania	84	86	86	-2
Tunisia	31	24	28	3	Lesotho	85	64	72	13
Jordan	32	20	27	5	Uganda	86	91	90	-4
Sri Lanka	33	35	34	-1	Togo	87	77	81	6
Dominican Republic	34	30	33	1	Comoros	88	95	93	-5
China	35	45	38	-3	Zambia	89	83	87	2
Thailand	36	16	32	4	Djibouti	90	60	74	16
Suriname	37	42	36	1	Rwanda	91	97	96	-5
Gabon	38	66	52	-14	Benin	92	96	94	-2
Paraguay	39	48	43	-4	Gambia	93	82	88	5
Bolivia	40	54	46	-6	Côte d'Ivoire	94	87	92	2
Maldives	41	31	37	4	Malawi	95	92	95	0
Mongolia	42	50	45	-3	Zimbabwe	96	67	83	13
Moldova	43	17	39	4	Ethiopia	97	107	103	-6
Philippines	44	49	48	-4	Mali	98	106	104	-6
Egypt	45	39	42	3	Guinea	99	101	100	-1
Occ. Palestinian Territory	46	12	40	6	Central African Republic	100	102	102	-2
Uzbekistan	47	21	41	6	Sierra Leone	101	98	98	3
Guyana	48	44	49	-1	Burkina Faso	102	105	106	-4
Syrian Arab Republic	49	36	44	5	Liberia	103	100	101	2
Namibia	50	69	60	-10	Chad	104	84	97	7
Honduras	51	65	58	-7	Mozambique	105	103	105	0
South Africa	52	46	50	2	Burundi	106	104	107	-1
Indonesia	53	55	53	0	Niger	107	108	108	-1
Vanuatu	54	59	57	-3	Congo	108	94	99	9