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Research Report

A response to the weaknesses of the Multidimensional Poverty Index (MPI): the correlation Sensitive Poverty Index (CSPI)

Briefing Paper, No. 19/2011

Provided in Cooperation with:

German Institute of Development and Sustainability (IDOS), Bonn

Suggested Citation: Rippin, Nicole (2011) : A response to the weaknesses of the
Multidimensional Poverty Index (MPI): the correlation Sensitive Poverty Index (CSPI), Briefing
Paper, No. 19/2011, Deutsches Institut für Entwicklungspolitik (DIE), Bonn

This Version is available at:

<https://hdl.handle.net/10419/199681>

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A Response to the Weaknesses of the Multidimensional Poverty Index (MPI): The Correlation Sensitive Poverty Index (CSPI)

Summary

In 2010, the Human Development Report introduced the Multidimensional Poverty Index (MPI). The MPI complements traditional income-based poverty indices by measuring the multiple deprivations that households face at the same time. Besides other appealing properties, in particular its decomposability, the MPI has the advantage that it is very easy to calculate. At the same time, the simplicity of its approach causes a number of methodological weaknesses.

The calculation of the MPI is based on ten vital items that are weighted differently according to their importance. The MPI is a counting index, as it simply counts the number of weighted items that households lack. All households for which this number is at least 30% are considered poor. All other households are considered non-poor and therefore excluded from the calculations.

The appealing simplicity of the MPI, however, comes at a cost. The MPI has four main methodological weaknesses:

- Since the MPI simply counts the number of items lacked by households, it assumes that no correlation exists between them. This assumption is not realistic. It is rather safe to say that, for instance, proper sanitation and safe drinking water are related to health as well as education indicators.
- The MPI is unable to capture inequality. In other words, transferring items from a poor to a less poor household does not change the poverty index as long as both households remain poor according to the MPI.
- The cut-off level of 30% is an arbitrary choice; changing it would affect poverty rates and even country rankings.
- The specific structure of the MPI implies problematic distortions. It leads to an inflation in poverty rates that increases the poorer a country and thus the severer its budget constraints. This results in less attention paid to the neediest of the needy.

Rippin (2010) introduced the Correlation Sensitive Poverty Index, a new index that shares the appealing properties of the MPI but none of its weaknesses. The CSPI is a counting index like the MPI and therefore shares its decomposability as well as its simplicity. However, the CSPI does not require a cut-off. Instead of excluding households from the calculations, it weights each household according to the number of weighted items that it lacks. This unique structure leads to the following advantages compared to the MPI:

- The CSPI is able to capture the correlation between the poverty indicators.
- The CSPI captures inequality among the poor; it increases whenever items are transferred from a poor to a less poor household.
- The CSPI does not require the arbitrary cut-off but instead provides policy makers with the opportunity to deliberately choose the level of importance they want to attribute to inequality among the poor.
- Finally, the new index avoids the inflation of poverty rates for poorer countries and puts a greater emphasis on the neediest of the needy in those countries than the MPI.

Multidimensional poverty measurement

Whether poverty is perceived as a lack of basic needs or a lack of capabilities, it is beyond dispute that it is a multidimensional phenomenon. Insufficient income has for a long time been considered to be a good proxy for poverty in all its various facets. However, the lack of income is not a good proxy when some items are not offered, for example, schools or hospitals in remote areas of a country.

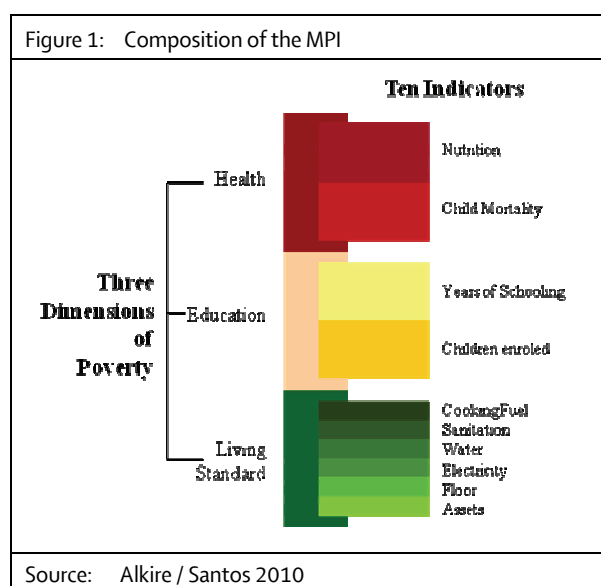
In response, multidimensional approaches have been developed that replace the single income indicator with a number of different poverty indicators. Empirical evidence plainly reveals that considerable population shares might be poor in a multidimensional way but not income poor, and vice versa. Indeed, the results diverge to such a great extent that the multidimensional measurement of poverty recently experienced a rush of attention from researchers as well as policy makers.

Two main ways exist to measure poverty in a multidimensional framework. The poverty indicators can either be analysed separately or merged into a composite index. Examples for the former approach are the Millennium Development Goals (MDGs). However, a recent UNDP report (2010) "What will it take to achieve the Millennium Development Goals?" questioned the goal system of the MDGs. It claims that close relationships exist between the single goals. Therefore, the process of achieving the MDGs might be accelerated if they were addressed simultaneously rather than separately. Such a simultaneous approach is provided by composite indices that merge the different poverty indicators into one single index. A prominent example for a composite index is the MPI.

The Multidimensional Poverty Index (MPI)

The MPI comprises three equally weighted poverty dimensions: health, education and living standards (Figure 1).

The health dimension is measured by the two equally weighted indicators nutrition and child mortality. Education is captured by the two equally weighted indicators



years of schooling and child enrolment. Living standards are measured by the six equally weighted indicators cooking fuel, sanitation, water, electricity, floor and assets (e.g. radio, tv, mobile phone etc.).

The MPI is a counting index; it counts the number of indicators that lack in a household. However, if a household lacking one or more items was included in the MPI, the index would yield poverty rates of more than 90% for a considerable number of developing countries. In order to avoid this problem, a 30% cut-off is utilised to exclude households from the calculations: All households that lack less than 30% of the weighted poverty indicators are considered non-poor and therefore not included in the MPI.

For example, a household that is deprived in nutrition and child enrolment is MPI poor since its weighted sum of indicators is $1/6 + 1/6 > 0.3$. A household that is deprived in, say, nutrition and sanitation is not MPI poor as the weighted sum of indicators is $1/6 + 1/18 = 2/9 < 0.3$.

Though the simplicity of the MPI is undoubtedly appealing, it also implies a couple of methodological weaknesses.

Weaknesses of the MPI

The MPI is a composite index. It identifies ten different poverty indicators that are weighted and merged into the final index. It therefore provides the possibility to estimate the effect that a policy has on all poverty indicators at once. However, the MPI has four methodological weaknesses:

1. The simple counting approach of the MPI makes it impossible to capture any kind of correlation between the indicators. However, as the aforementioned UNDP report stressed, poverty indicators are closely related. In the case of the MPI, safe drinking water, for instance, can be expected to be closely related to all health and education indicators. To account for these correlations would be essential to prevent distortions in the estimated poverty effect of policies.

2. Another weakness of the MPI is its approach to inequality. Already in 1976, Amartya Sen required good poverty indices to be decomposable in the three components of poverty:

- Poverty incidence: the number of the poor
- Poverty intensity: the mean number of deprivations suffered by the poor
- Poverty inequality: the distribution of deprivations among the poor.

The MPI, however, is not able to capture inequality among the poor; if items are taken from a poor household and transferred to a less poor household, as long as both households remain poor, the MPI will not change. This implies that the fastest reductions in poverty can be achieved if those lifted out of poverty are closest to the cut-off. As a result, policies based on such an index will give those with the farthest distance to the cut-off, i.e. the neediest, the least priority.

3. Another weakness of the MPI is its 30% cut-off. The cut-off is necessary in order to avoid poverty rates at such high

levels that they would actually be meaningless. Its choice, however, is problematic as it happens arbitrarily and does not only affect poverty rates, but also country rankings. In addition, minor changes in household conditions or, even worse, minor measurement errors may have significant impact on poverty rates. This is due to the fact that households suffering deprivations just below the cut-off are excluded from poverty calculations whereas households with deprivations at or above the cut-off enter the index with full weight.

4. Finally, the MPI leads to problematic distortions: the poorer a country, the more are poverty rates inflated, resulting in less attention paid to the poorest of the poor. However, in the poorest countries with the most severe budget constraints, targeting the neediest is of utmost importance. The explanation for the distortion is straightforward. In less poor countries, only the poorest fraction of the population is deprived in a sufficient number of indicators to reach the cut-off level. Thus, poverty rates are rather small and the poorest population groups are of highest importance. In poorer countries, the argument is just the opposite.

However, there is a way to overcome the weaknesses of the MPI.

The Correlation Sensitive Poverty Index (CSPI)

In 2010, Rippin introduced a new index called the Correlation Sensitive Poverty Index (CSPI). The CSPI is a counting index and as such shares the appealing characteristic of the MPI of being easy to calculate. However, it is able to overcome all of the aforementioned weaknesses of the MPI.

Counting indices are usually considered to be incapable to capture the relationships between poverty indicators. The CSPI, however, has a unique feature that bridges the gap between the counting approach and the correlation between poverty indicators. Like the MPI, the CSPI counts the number of items that lack in each household. However, each household also then receives an additional weight that depends on the number of items that are lacking in the specific household. This simple yet new approach allows the counting index CSPI to capture the relationships that undoubtedly exist between the poverty indicators.

The unique feature of the CSPI has several implications. By weighting the households, it is able to capture inequality among the poor; it increases whenever items are transferred from a poor to a less poor household. The poverty rates generated by the CSPI are not only reasonable so that no additional cut-off is required, they are also undistorted.

A numerical illustration

In order to illustrate the differences between the MPI and CSPI, consider the following example of five Indian households selected from the 2005 Indian Demographic and Health Survey that are presented in table 1 below.

The term “yes” indicates the lack of an item in a household. Thus, household 1 suffers a lack in 7 out of 10 indicators, household 2 in 5 out of 10, etc. The disadvantage of the cut-off is obvious. Though households 3, 4 and 5 suffer deprivations in a different number of indicators they are not considered poor according to the MPI. The treatment of household 3 is especially problematic. Household 3 lacks the same poverty indicators as household 2 with only one exception: it is deprived in sanitation whereas household 2 is deprived in years of education. However, the education and health indicators have a weight of 1/6 whereas the living standard indicators have a weight of 1/18. Thus, household 3 does not reach the cut-off of 30%, as $5 \times 1/18 < 0.3$, but household 2 does, as $1 \times 1/6 + 4 \times 1/18 = 0.389 > 0.3$.

The CSPI does not require the 30% cut-off. As a result, all households that lack any poverty item are considered poor, yet to different degrees. This procedure provides a continuous ranking of households. It also avoids the extreme values of the MPI that are a result of the distortions caused by the cut-off.

Empirical evidence

Applying MPI and CSPI to the real world reveals how big the differences between the two indices really are. The empirical evidence for this comparison is based on national and sub-national poverty calculations for a sample of 28 countries (Rippin 2011).

The first main result is that the poverty rates generated by the MPI are indeed deflated in less poor and inflated in poorer countries. For instance, Yerevan, the capital of Armenia with its more than one million inhabitants, has a MPI poverty rate of 0. The CSPI poverty rate is with 0.4% still very low but it acknowledges that poverty does exist in the region. Niger, on the other hand, has a MPI poverty rate of 64.2%; the corresponding CSPI poverty rate is 47.5%.

As argued above, the distortions caused by the MPI are rather problematic. Those countries that actually do possess the budget to address poverty face reduced poverty rates, whereas those countries with the severest budget constraints face inflated poverty rates that dilute the focus on the poorest of the poor where it is needed the most. It is a great advantage of the CSPI that it avoids these distortions.

The second main result is that the MPI's inability to capture inequality among the poor yields incomplete and distorted

Table 1: A comparison of five Indian households

HH	Education		Health		Living Standard						MPI	CSPI
	Years	Attendance	Mortality	Nutrition	Electricity	Water	Sanitation	Flooring	Cooking	Assets		
1	yes	yes	yes	no	yes	yes	no	yes	no	yes	0.722	0.522
2	yes	no	no	no	yes	yes	no	yes	yes	no	0.389	0.151
3	no	no	no	no	yes	yes	yes	yes	yes	no	0.000	0.077
4	no	yes	no	no	no	no	yes	no	no	no	0.000	0.049
5	no	yes	no	no	no	no	no	no	no	no	0.000	0.028

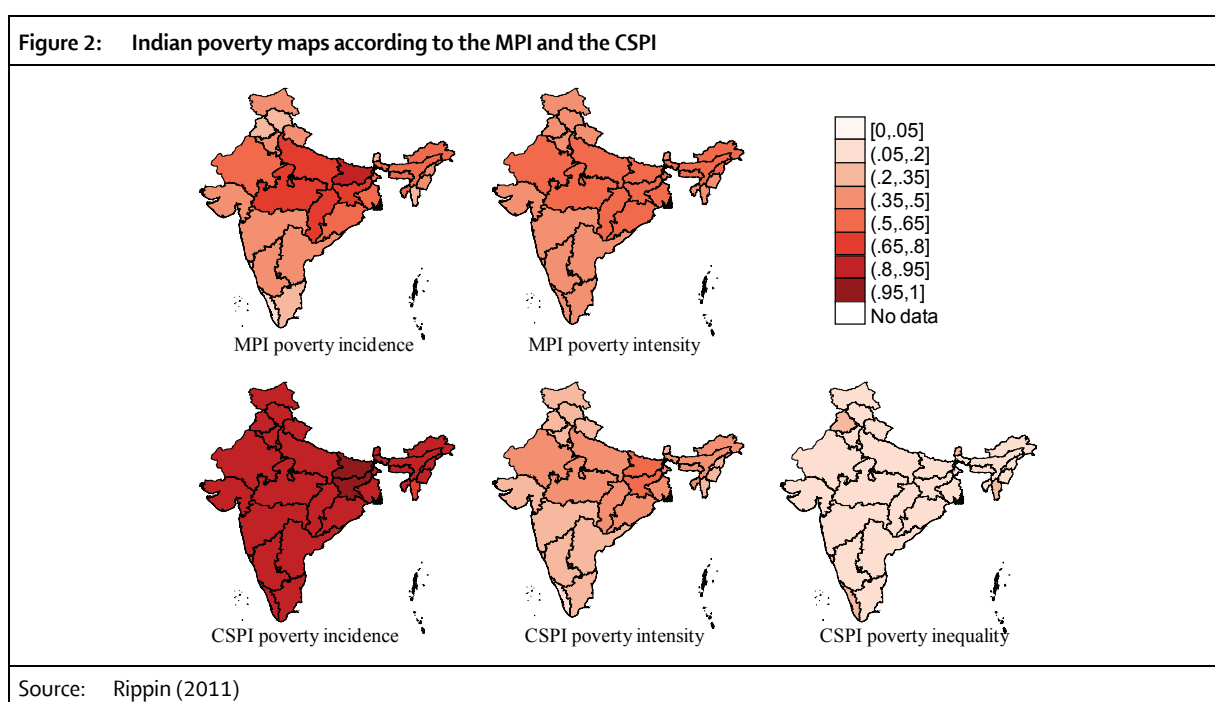
pictures of poverty. Figure 2 illustrates Indian poverty maps according to the MPI and the CSPI. The MPI is only able to provide poverty maps for poverty incidence and intensity whose explanatory power is in addition diluted as a result of the 30% cut-off. Poverty intensity is calculated as the number of deprivations suffered by those households that already lack at least 30% of the weighted indicators. Consequently, differences in poverty intensity are underestimated. Poverty incidence counts the number of households that cross the 30% cut-off. The discontinuity of this approach overstates the differences in poverty incidence.

The CSPI is able to provide much more detailed and distinct pictures of poverty. Without over- or underestimating regional differences, it is able to clearly identify the regions with the highest levels of poverty incidence, intensity and inequality.

The way ahead

Exact measures of poverty are essential to adopt the right policies. Though the MPI has been a major step forward, it still suffers from methodological weaknesses. The CSPI provides a way to overcome these weaknesses and therefore allows more informed policy making.

Other weaknesses related to data issues, however, continue to persist. These weaknesses comprise the different frequencies with which household surveys are conducted in different countries, lacking data, missing values etc. All these data issues reduce the credibility of poverty results not only for the MPI and the CSPI, but for any international poverty index. In order to enhance informed policy making, improvements of the statistical data base are urgently required.

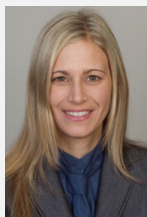


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