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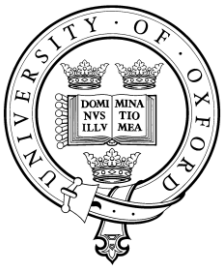

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Changes Over Time in Multidimensional Poverty: Methodology and Results for 34 Countries

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Abstract
This paper sets out a systemic account of changes over time in multidimensional poverty using the Alkire-Foster Adjusted Headcount Ratio and its consistent sub-indices. The techniques were then applied to the analysis of changes in the global Multidimensional Poverty Index (MPI) and related destitution measure. The analysis focused on 34 countries and 338 subnational regions, covering 2.5 billion people, for which there is a recent MPI estimation and comparable Demographic and Health Survey (DHS) dataset for analysis across time. First, it assesses overall changes in poverty and its incidence and intensity. Next, it examines changes in the MPI and its consistent sub-indices across urban-rural regions, subnational regions, and ethnic groups. Finally, the paper analyses the changes for a strict subset of the poor, who are identified as 'destitute' using a more extreme deprivation cutoff vector, and studies relative rates of reduction of destitution and poverty by country and region.

Keywords: Multidimensional Poverty, Poverty Analysis, Poverty Trends

JEL classification: I3, I32, D63, O1

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The Oxford Poverty and Human Development Initiative (OPHI) is a research centre within the Oxford Department of International Development, Queen Elizabeth House, at the University of Oxford. Led by Sabina Alkire, OPHI aspires to build and advance a more systematic methodological and economic framework for reducing multidimensional poverty, grounded in people's experiences and values.

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1 Introduction

The aim of poverty measurement is to aid, incentivize, and confirm the successful reduction of disadvantages that blight people's lives. Comparing poverty levels in different countries across time reveals how and in what dimensions poverty has been reduced. These accounts illustrate what is possible and point out where progress has been slow or nonexistent.

Methodologically, this paper sets out the core components of dynamic multidimensional poverty analysis then outlines how to analyze the pro-poorness of multidimensional poverty reduction patterns by considering changes in intensity as well as incidence of poverty, population subgroup decompositions, and changes in a destitute subset of the poor. Applying these techniques, it documents how multidimensional poverty and its incidence and intensity has changed in 34 countries representing 2.5 billion people, and further assesses the pro-poorness of those changes across 338 subnational regions, ethnic groups in three countries, and destitution in all 34 countries. In the course of this paper we rule out certain methodological options and illustrate others in some detail.

To measure multidimensional poverty, we use the global Multidimensional Poverty Index (MPI), which is an internationally comparable measure of acute poverty in over 100 developing countries. The MPI was developed by the Oxford Poverty and Human Development Initiative (OPHI) at the University of Oxford with the Human Development Report Office of the United Nations Development Programme (Alkire and Santos, 2014; UNDP, 2010a,b; Alkire *et al.*, 2011a). We also explore the changes over time in a destitution measure (Alkire, Conconi and Seth, 2014a), which identifies the subset of the MPI poor who are destitute according to more severe deprivation cutoffs (e.g. severe undernutrition instead of undernutrition).

The MPI follows a direct method by assessing the extent to which people satisfy minimum international standards in social rights or valuable ends. It is identically formulated across rural and urban areas. Thus it complements indirect methods that use income or consumption levels to identify a minimum living standard (Alkire and Santos, 2014), and in particular complements global monetary measures such as the $1.25/day figures (Chen and Ravallion, 2010). The MPI builds on the counting traditions used in Latin America and Europe (Atkinson, 2003) and seeks to advance the work of Amartya Sen (1979, 1992, 1997, 2009), who has persuasively argued for more comprehensive conceptualizations and measures of capability poverty. Drèze and Sen (2013) among others empirically motivate such analysis, observing that the level (and change) of income per capita or of income poverty does not necessarily predict the levels of achieved functionings in social indicators (c.f. Bourguignon et al., 2010).

The MPI, like any internationally comparable poverty measure, is data constrained and imperfect. Alkire and Santos (2014) applied robustness tests for several parameters in the MPI and found national comparisons to be robust to a wider range of deprivation cutoffs, poverty cutoff, and dimensional weights. They found comparisons using the DHS datasets this paper employs to be particularly robust. An important strength of the MPI is that the final measure reflects the joint distribution of deprivations and is sensitive to the intensity of deprivation among the poor. Also, because the measure is direct, comparisons do not require additional adjustments, such as for rural-urban prices, inflation, or PPPs (see Alkire, 2011; Alkire, Foster, and Santos 2011). We further explore MPI comparisons in this paper.

The contribution of this paper is three-fold. First, it is the first paper to set forth a systematic account of changes over time in multidimensional poverty using the Alkire-Foster Adjusted Headcount Ratio and its consistent sub-indices. Second, it scrutinizes three methodological approaches to assessing the pro-poorness of poverty reduction. Third, it applies these methodologies exhaustively using the global MPI and a linked destitution measure in 34 countries. The data are harmonized to enable definitive assessments across poverty and destitution for two or three points of time for each country. Although precise indicator definitions across countries vary, country experiences can also be compared in informative ways, as can income poverty trends for certain countries.

The paper is organized as follows. Section 2 presents the measurement methodology used to construct a multidimensional poverty and linked destitution index, the associated statistics used to analyze changes over time, subnational and ethnic decompositions and dimensional breakdown, and incidence and intensity analysis. Section 3 describes the DHS datasets used in this study and their harmonization, and delineates the levels of comparability that have been achieved over time and across countries. Section 4 presents key findings from the MPI estimates at the national level. Section 5 analyses changes over time by regional and ethnic groups, finding diverse country patterns. Section 6 explores the changes over time in destitution among the poor. Section 7 concludes.

2 Measurement Methodology

2.1 Alkire and Foster M_0 Measure[1]

The global MPI follows the functional form of the Adjusted Headcount Ratio (M_0), which is the simplest measure within the family of poverty measures developed by Alkire and Foster (2007, 2011a). The methodology begins at the level of the person or household, identifies the set of indicators in which

[1] The notation of this section follows Alkire and Foster (2011a).

they are deprived at the same time, and summarizes their poverty profile in a weighted deprivation score. If their deprivation score exceeds the poverty cutoff, they are identified as multidimensionally poor. The number of poor people and their deprivation score – which shows the 'intensity' of poverty they experience – becomes part of the final Adjusted Headcount Ratio.

Consider a society with n persons and d dimensions. From an n x d matrix of achievements y, and a vector of deprivation cutoffs $\boldsymbol{z}$ (boldface denotes a vector), construct the *matrix of deprivations* associated with y, $g^0=[g^0_{ij}]$, whose typical element g^0_{ij} is defined by $g^0_{ij}=w_j$ when $y_{ij}<z_j$, while $g^0_{ij}=0$ otherwise. The matrix g^0 is an $n\times d$ matrix whose ij^{th} entry is w_j when person i is deprived in the j^{th} dimension, and zero when the person is not. The weights on each dimension, denoted w_j, sum to one. The i^{th} row vector of g^0, denoted g^0_i, is person i*'s deprivation vector*. The j^{th} column vector of g^0, denoted $\boldsymbol{g}^0_j$ gives the distribution of dimension j across the population. From the matrix g^0 we construct a column vector c of *weighted deprivation scores*, whose i^{th} entry $c_i=|\, g^0_i \,|$ represents the sum of the weights for the dimensions in which i is deprived.

Identification: A second cutoff k is used to identify the poor. For $0<k\leq 1$, let ρ_k be the identification method defined by $\rho_k(y_i; z)=1$ whenever $c_i\geq k$, and $\rho_k(y_i;z)=0$ whenever $c_i<k$. In other words, ρ_k identifies person i as poor when the deprivation score c_i is at least k; if not, i is not poor. For $k\leq(\min w_j)$, we obtain the union identification case in which any deprivation identifies someone as poor, and for $k=1$, the intersection in which only persons experiencing deprivations in all dimensions are poor.

Censoring after Identification: Let $g^0(k)$ be the matrix obtained from g^0 by replacing its i^{th} row g^0_{ij} with a vector of zeros whenever $\rho_k(y_i;z)=0$, so that $g^0_{ij}(k) = g^0_{ij}\rho_k(y_i;z)$. Similarly, define the *censored vector of deprivation scores* $c(k)$ by $c_i(k)=\rho_k(y_i;z)c_i$ for $i=1,\ldots,n$.

Aggregation: The *Adjusted Headcount Ratio* is the mean of the censored deprivation matrix multiplied by d: $M_0=d[\mu(g^0(k))]$. M_0 can also be expressed as the product of two intuitive partial indices: the headcount ratio and the average deprivation share across the poor. The headcount ratio or *incidence* $H=H(y;z)$ is defined by $H=q/n$, where $q=q(y;z)=\Sigma^n_{i=1}\rho_k(y_i,z)$ is the number of poor persons. The average deprivation share across the poor, or *intensity*, is given by $A=|c(k)|/(q)$, and reflects the percentage of deprivations the average poor person experiences. We can equivalently express the Adjusted Headcount Ratio as $M_0=HA= d[\mu(g^0(k))]$.

Consistent Subindices: The M_0 can be broken down after identification into consistent dimensional subindices called 'censored headcount ratios' that depict the percentage of the population who are poor and are deprived in dimension j. These are the mean of the j^{th} column vector of the censored matrix and

are denoted $h_j(k) = \mu(\boldsymbol{g_j^0})$. The percentage contribution of the j^{th} dimension is $(w_j\ h_j(k))/M_0$ (Alkire et al., 2015, Ch 5).

The global MPI is an Adjusted Headcount Ratio M_0 implemented with specific parameters. The MPI is based on ten indicators, which are organized into three equally weighted dimensions: health, education, and living standards. Its ten indicators and deprivation cutoffs reflect deprivations within a household such as undernutrition or child mortality, being educated, or lacking access to safe water and adequate sanitation, and are equally weighted within each dimension (Table 1). A person is identified as poor if they are deprived in at least one-third of the weighted indicators.

This paper also analyses a related measure of destitution (Alkire, Conconi and Seth, 2014a). This measure has the same indicators, weights, and poverty cutoff as the MPI. However for eight of the ten indicators, destitution deprivation cutoffs are used: for example, severe malnutrition instead of malnutrition, losing at least two children, having all primary school-aged children out of school, not having anyone with at least a year of schooling in the household, practising open defecation, and so on. For electricity and flooring, the cutoffs do not change. A person is destitute if he or she is deprived in at least a third of the weighted destitution indicators (Alkire, Conconi and Seth, 2014a). By definition, a destitute person is always multidimensionally poor. The destitution Adjusted Headcount Ratio (and other consistent partial indices) is constructed using the same mathematical formulations as the MPI and is denoted by a superscript 'D' as in MPI^D. Table 1 presents the structure of both MPI and Destitution measures.

Table 1: Multidimensional Poverty Index (MPI) and Multidimensional Destitution (MPI^D): Dimensions, Indicators, and Deprivation Cutoffs

Dimensions of poverty	Indicator	Deprived if…
Education	Years of Schooling	MPI: No household member has completed five years of schooling
		Dest: No household member has completed more than one year of schooling
	Child School Attendance	MPI: Any school-aged child is not attending school up to the age at which they would complete class 8.
		Dest: No child is attending school up to the age at which they would complete class 6
Health	Child Mortality	MPI: Any child has died in the family
		Dest: Two or more children have died in the family
	Nutrition	MPI: Any adult or child for whom there is nutritional information is malnourished
		Dest: Any adult or child for whom there is nutritional information is *severely*

		malnourished.
Living Standard	Electricity	MPI & Dest: The household has no electricity
	Improved Sanitation	MPI: The household's sanitation facility is not improved (according to MDG guidelines) or it is improved but shared with other households
		Dest: The household has no facility.
	Improved Drinking Water	MPI: The household does not have access to improved drinking water (according to MDG guidelines) or safe drinking water is more than a 30-minute walk from home, roundtrip
		Dest: The household does not have access to safe drinking water or safe water is more than a 45-minute walk (round trip).
	Flooring	MPI & Dest: The household has a dirt, sand, or dung floor
	Cooking Fuel	MPI: The household cooks with dung, wood, or charcoal
		Dest: The household cooks with dung or wood.
	Assets ownership	MPI: The household does not own more than one radio, TV, telephone, bike, motorbike, or refrigerator and does not own a car or truck
		Dest: The household has no assets listed above (radio, telephone etc.) and no car.

2.2 Changes in M_0, H, and A across Two Time Periods

This section describes how to compare M_0 and its associated partial indices over time using repeated cross-sectional data. Such comparisons may also be importantly affected by migration and demographic shifts, which require separate treatment.[2]

The basic component of poverty comparisons is the absolute pace of change across periods. The **absolute rate of change** is the simple difference in poverty levels between two periods. Changes (increases or decreases) in poverty across two time periods can also be reported as a relative rate. The **relative rate of change** is the difference in levels across two periods as a percentage of the initial period. The analysis of absolute and relative changes together provides an elementary sense of overall progress.

For any two periods we denote the initial period by t^1 and the final period by t^2. The achievement matrices for periods t^1 and t^2 are denoted by X_{t^1} and X_{t^2}, respectively. The same set of parameters – deprivation cutoff vector $\boldsymbol{z}$, weight vector $\boldsymbol{w}$, and poverty cutoff k – are used in each period.

2 Here we present the number as well as the levels of poverty, but do not analyse demographic shifts due to space constraints.

The **absolute rate of change** (Δ) is simply the difference in Adjusted Headcount Ratios between two periods and is computed as

$$\Delta M_0 = M_0(X_{t^2}) - M_0(X_{t^1}). \quad \textbf{(1)}$$

Similarly, for H and A.

The **relative rate of change** (δ) is the difference in poverty as a percentage of the initial poverty level and is computed for M_0 as

$$\delta M_0 = \frac{M_0(X_{t^2}) - M_0(X_{t^1})}{M_0(X_{t^1})} \times 100. \quad \textbf{(2)}$$

To compare the rates of poverty reduction across countries that have different periods of reference, annualized changes are used. The **annualized absolute rate of change** ($\bar{\Delta}$) is the difference in Adjusted Headcount Ratios between two periods divided by the difference in the two time periods ($t^2 - t^1$) and is computed for M_0 as

$$\bar{\Delta} M_0 = \frac{M_0(X_{t^2}) - M_0(X_{t^1})}{t^2 - t^1}. \quad \textbf{(3)}$$

The **annualized relative rate of change** ($\bar{\delta}$) is the compound rate of reduction in M_0 per year between the initial and the final periods, and is computed for M_0 as

$$\bar{\delta} M_0 = \left[\left(\frac{M_0(X_{t^2})}{M_0(X_{t^1})} \right)^{\frac{1}{t^2 - t^1}} - 1 \right] \times 100. \quad \textbf{(4)}$$

The same formula can be used to compute and report annualized changes in the other partial indices, namely, H, A, censored headcount ratios, or percent contributions.

2.2.1 Dimensional Changes (Uncensored and Censored Headcount Ratios)

The reductions in M_0, H, or A can be broken down by dimensions. The analysis of dimensional changes considers both the raw or uncensored headcount ratios (h_j) and the censored headcount ratios ($h_j(k)$) presented above. These are the means of the j^{th} column of the uncensored or censored deprivation matrix, divided by n. By definition, the uncensored headcount ratio of an indicator is equal to or higher than the censored headcount ratio of that indicator, and the changes in censored headcount ratios depict changes in deprivations among the poor. When deprivations are reduced among the poor, or when a poor person becomes non-poor, the censored deprivations change.

2.2.2 Decomposition by Population Subgroup

One important property that the Alkire-Foster family of measures satisfy is population subgroup decomposability. The overall M_0 can be expressed as $M_0 = \sum_{\ell=1}^{m} \nu^{\ell} M_0(X^{\ell})$, where $M_0(X^{\ell})$ denotes the Adjusted Headcount Ratio and $\nu^{\ell} = n^{\ell}/n$ the population share of subgroup ℓ. It is especially useful to analyze poverty changes by population subgroups, to see if the poorest subgroups reduced poverty faster than less poor subgroups, and to compare the dimensional composition of reduction across subgroups (Alkire and Seth, 2015). Population-shares for each time period must be analyzed alongside subgroup trends.

To supplement the above analysis it is useful to explore the contribution of population subgroups to overall poverty reduction, which not only depends on the changes in subgroups' poverty but also on changes in the population composition. This can be seen by presenting the overall change in M_0 between two periods (t^1, t^2) as

$$\Delta M_0 = \sum_{\ell=1}^{m} \left(\nu^{\ell,t^2} M_0(X_{t^2}^{\ell}) - \nu^{\ell,t^1} M_0(X_{t^1}^{\ell})\right). \quad \textbf{(5)}$$

Note that the overall change depends both on the changes in subgroup M_0's and the changes in population shares of the subgroups.

2.2.3 Theoretical Decompositions

This section seeks to establish whether it is possible to go beyond the cross-sectional analysis presented above and make some assessment of poverty transitions. We explain the motivation using panel data and then introduce two interesting theoretical approaches for M_0 decompositions that have been proposed for use with cross-sectional data. But when we assess the assumptions they entail empirically, we find they cannot be justified in our datasets, thus limit this analysis to previously mentioned components.

2.2.3.1 Panel Data Analysis

Consider a fixed set of population of size n across two periods, $t^1$and t^2. The population can be categorized into four mutually exclusive and collectively exhaustive groups that we refer to as the following dynamic subgroups:

Subgroup N: Contains n^N people who are *non-poor* in *both* periods t^1 and t^2,

Subgroup O: Contains n^O people who are *poor* in *both* periods t^1 and t^2 (*ongoing poor*),

Subgroup E^- Contains n^{E^-} people who are poor in period t^1 but *exit poverty* in period t^2,

Subgroup E^+ Contains n^{E^+} people who are poor in period t^1 but *enter poverty* in

period t^2.

We denote the achievement matrices of these four subgroups in period t by X_t^N, X_t^O, $X_t^{E^-}$, and $X_t^{E^+}$ for all $t = t^1, t^2$. The proportion of the multidimensionally poor population in period t^1 is $H(X_{t^1}) = (n^O + n^{E^-})/n$ and that in period t^2 is $H(X_{t^2}) = (n^O + n^{E^+})/n$. The change in the proportion of poor people between these two periods is $\Delta H = H(X_{t^2}) - H(X_{t^1}) = (n^{E^+} - n^{E^-})/n = H(X_{t^2}^{E^+}) - H(X_{t^1}^{E^-})$. In other words, the change in the overall multidimensional headcount ratio is the difference between the proportion of poor entering and the proportion of poor exiting poverty. Note that, by construction, no person is poor in $X_{t^1}^N$, $X_{t^2}^N$, $X_{t^2}^{E^-}$, and $X_{t^1}^{E^+}$ and thus $H(X_{t^1}^N) = H(X_{t^2}^N) = H(X_{t^2}^{E^-}) = H\left(X_{t^1}^{E^+}\right) = 0$. Thus also $M_0(X_{t^1}^N) = M_0(X_{t^2}^N) = M_0(X_{t^2}^{E^-}) = M_0\left(X_{t^1}^{E^+}\right) = 0$. In contrast, all persons in $X_{t^1}^{E^-}$, $X_{t^2}^{E^+}$, $X_{t^1}^O$, and $X_{t^2}^O$ are poor and thus $H(X_{t^1}^O) = H(X_{t^2}^O) = H(X_{t^1}^{E^-}) = H\left(X_{t^2}^{E^+}\right) = 1$. Therefore the M_0 of each of these four subgroups is equal to its intensity of poverty.

In a fixed population, the overall population and the population share of each dynamic subgroup remains unchanged across two time periods.[3] The change in the overall M_0 can be decomposed by these population subgroups using Equation (5) as

$$\Delta M_0 = \frac{n^O}{n}\left(M_0(X_{t^2}^O) - M_0(X_{t^1}^O)\right) - \frac{n^{E^-}}{n} M_0(X_{t^1}^{E^-}) + \frac{n^{E^+}}{n} M_0\left(X_{t^2}^{E^+}\right). \quad \textbf{(6)}$$

Thus, the right-hand side of Equation (6) has three additive components. The first component $\Delta M_0^O = \frac{n^O}{n}\left(M_0(X_{t^2}^O) - M_0(X_{t^1}^O)\right)$ is due to the change in the intensity of those who remain poor in both periods – the ongoing poor – weighted by the size of this dynamic subgroup. The second component $\Delta M_0^{E^-} = \frac{n^{E^-}}{n} M_0(X_{t^1}^{E^-})$reflects the change in the intensity of those who exit poverty (weighted by the size of this subgroup) and the third component $\Delta M_0^{E^+} = \frac{n^{E^+}}{n} M_0\left(X_{t^2}^{E^+}\right)$ reflects the population-weighted change in the intensity of those who enter poverty. In sum, $\Delta M_0 = \Delta M_0^O - \Delta M_0^{E^-} + \Delta M_0^{E^+}$.

These indicators can be estimated using panel data with a fixed population to monitor how the change in M_0 was produced by changes in different parts of the distribution of the poor. The analysis is pro-poor because we can ascertain whether the poorest exited poverty or only the barely poor, and see whose deprivation scores declined – those with the highest deprivation scores or not.

[3] Suitable adjustments can be made for demographic shifts when the population is not fixed across two periods.

2.2.3.2 Approximations Using Cross-Sectional Data

Cross-sectional data cannot distinguish between these dynamic subgroups. As a rough approximation, consider two observable groups, roughly defined as *movers* and *stayers.* We define movers as the ΔH people who reflect the net change in poverty levels across the two periods. Stayers are ongoing poor plus the proportion of previously poor people who were replaced by 'new poor' and totals those who are poor in period two $H(X_{t^2})$. In considering only the 'net' change in headcount, one effectively permits the larger of $E^- \; or \; E^+$ to dominate: if poverty rose nationally, the group who entered poverty dominate; otherwise, it is the group who exited poverty. The subordinate third group is allocated among the ongoing poor and the dominant group. For the remainder of this section we presume that both M_0 and H decreased and that $E^- > E^+$. So we presume $\Delta H = (H^{E^-} - H^{E^+})$ and $H(X_{t^2}) = (H^O + H^{E^+})$. Evidently, ΔH and $H(X_{t^2})$ may be estimated using cross-sectional data.

If poverty has reduced and there has not been a large influx of new poor, that is, if $H^{E^+} = n^{E^+}/n$ is negligible, this strategy could also approximate the relative intensity levels of those who moved out of poverty, $H^{E^-} = n^{E^-}/n$, and the changes in intensity among those who remained poor, $H^O = n^O/n$. If H^{E^+} is expected (from other sources of information) to be large, or if the intensity of the new poor is expected to differ greatly from the average, this assumption is not warranted.[4]

Consider the intensity of the net population who exited poverty – under these simplifying assumptions reflected by the net change in headcount, denoted $A^{\hat{E}}$ – and the intensity change of the net ongoing poor, whom we will presume to be $H(X_{t^2})$, denoted $\Delta A^{\hat{O}}$. The ΔM_0 can be decomposed according to these two groups. These decompositions can be interpreted (given the foregoing assumptions) as showing the percentage of the change in M_0 that can be attributed to those who moved out of poverty – versus the percentage of change that was mainly caused by a decrease in intensity among those who stayed poor.

$$\Delta M_0 = \underbrace{\Delta H \times A^{\hat{E}}}_{\text{Movers}} + \underbrace{H(X_{t^2}) \times \Delta A^{\hat{O}}}_{\text{Stayers}} \qquad \textbf{(7)}$$

Cross-sectional data does not provide the intensity of those who stayed poor or of those who moved out of poverty. One empirical strategy is to estimate upper and lower bounds for these using each dataset. First, identify the $\Delta H \times n$ poor persons having the lowest deprivation scores in the dataset (sampling weights applied) and use the average of these scores for $A^{\hat{E}}$, then solve for $A^{\hat{O}}$. Subsequently, identify the $\Delta H \times n$ poor persons having the highest deprivation scores in that dataset and repeat the procedure.

4 The corresponding considerations apply if poverty has increased and H^{E^-} is expected to be small.

This will generate upper and lower estimates for $A^{\hat{E}}$ and $A^{\hat{O}}$ in a given dataset, which will illuminate the degree of uncertainty that different assumptions introduce. To estimate maximum upper and lower bounds it could be assumed that all those moved out of poverty had an intensity score of the value of k (the minimum), and subsequently assume that their intensity was 100% (the maximum).

2.2.3.3 Theoretical Incidence-Intensity Decompositions

Two theory-based approaches to decomposing changes in repeated cross-sectional data according to 'incidence' and 'intensity' have recently been proposed. In each approach assumptions are made regarding the intensity of those who exit or remain poor.

For simplicity of notation, we here denote the M_0, H, and A for period t^1 by $M_0^{t^1}$, H^{t^1}, and A^{t^1} that for period t^2 by $M_0^{t^2}$, H^{t^2}, and A^{t^2}. Apablaza and Yalonetzky (2013) propose an additive decomposition. Since $M_0 = H \times A$, they propose to decompose the change in M_0 by changes in its partial indices as follows:

$$\Delta M_0 = \underbrace{A^{t^1}\left(H^{t^2} - H^{t^1}\right)}_{\text{Poverty effect from entry and exit}} + \underbrace{H^{t^1}\left(A^{t^2} - A^{t^1}\right)}_{\text{Poverty effect}} + \underbrace{\left(\left(H^{t^2} - H^{t^1}\right)\left(A^{t^2} - A^{t^1}\right)\right)}_{\text{Interaction effect}}. \quad \textbf{(8)}$$

Their approach entails two assumptions. First, the intensity among those who left poverty is assumed to be the same as the average intensity in period t^2. Second, the intensity change among the ongoing poor is assumed to equal the simple difference in intensities of the poor across the two periods. The decomposition is completed using an interaction term. Apablaza and Yalonetzky interpret this decomposition of changes in the Adjusted Headcount Ratio $(M_0)(\mathrm{M_0})$. as reflecting: 1) changes in poverty incidence (H), 2) changes in intensity (A), and 3) a joint effect reflecting the interaction between incidence and intensity $(\Delta H \times \Delta A)$.

Building on Apablaza and Yalonetzky (2013), Roche (2013) proposes a Shapley value decomposition following Shorrocks (1999).[5] It provides the marginal effect of changes in incidence and intensity as follows:

5 Shorrocks (1999) showed that the Shapley value decomposition can be applied to any function under certain assumptions.

$$\Delta M_0 = \underbrace{\frac{A^{t^2}+A^{t^1}}{2}\left(H^{t^2}-H^{t^1}\right)}_{\text{Incidence of Poverty effect}} + \underbrace{\frac{H^{t^2}+H^{t^1}}{2}\left(A^{t^2}-A^{t^1}\right)}_{\text{Intensity of Poverty effect}} \quad \textbf{(9)}$$

Formula 9 assumes that the intensity of those who exited poverty is the average intensity of the two periods $\frac{A^{t^2}+A^{t^1}}{2}\left(H^{t^2}-H^{t^1}\right)$ and calls this the 'incidence effect'. It also assumes the other group has the average headcount ratio between the two periods and their change in intensity is the simple difference in intensities across the periods, $\frac{H^{t^2}+H^{t^1}}{2}\left(A^{t^2}-A^{t^1}\right)$, and describes this as the 'intensity effect'.

As Roche demonstrates, Shapley decompositions could be applied to each step of dynamic analysis using the Alkire-Foster (AF) method. For example, if the underlying assumptions are transparently stated and accepted, the theoretically derived marginal contribution of changes in incidence and marginal contribution of changes in intensity can be expressed as a percentage of the overall change in M_0 so they both add to 100%:

$$\Phi_H^0 = \frac{\left(\frac{A^{t^2}+A^{t^1}}{2}\left(H^{t^2}-H^{t^1}\right)\right)\times 100}{\Delta M_0} \quad \textbf{(10)}$$

$$\Phi_A^0 = \frac{\left(\frac{H^{t^2}+H^{t^1}}{2}\left(A^{t^2}-A^{t^1}\right)\right)\times 100}{\Delta M_0}. \quad \textbf{(11)}$$

To address demographic shifts, Roche follows a similar decomposition of change as that used in FGT unidimensional poverty measures (Ravallion and Huppi, 1991) and Shapely decompositions (Duclos and Araar 2006; Shorrocks 1999).

Shall we apply such theoretical decompositions in our investigation of the pro-poorness of multidimensional poverty reduction? Table 2 presents the empirical estimations for the upper and lower bounds for the 'movers' (incidence) and 'stayers' (intensity) effects. At the upper bound, where we assume the poorest of the poor moved out of poverty, those who moved out of poverty could have had average intensities ranging from 37% in Armenia (the least poor country in the analysis) to 100% in

Ethiopia and Niger[6]. In most countries, at the upper bound, over 100% of the poverty reduction is due to movers; the exceptions are Ethiopia, Malawi, Mozambique, and Niger. At the lower bound, where we assume the least (barely) poor people moved out of poverty, those who moved out of poverty could have intensities between 33% and 38%. At the lower bound, movers' contribution to poverty reduction would range from 16.6% in Niger[7] to 93.6% in Armenia.

The last columns of Table 2 (p. 13) provide the Shapley decompositions. In all cases the Shapley decompositions lie between the upper and lower bounds. But the empirical upper and lower bounds are wide and vary greatly across countries. Thus in the absence of further evidence from panel data, we cannot justify the assumptions required to precisely decompose changes in MPI by incidence and intensity.[8] While this can seem disappointing, for policy purposes, as Sen stresses, it may be better to be 'vaguely right than precisely wrong'. It remains informative to explore the absolute changes in each partial index across time as our empirical analysis will demonstrate.

3 Data

The analysis of changes in MPI over time in this paper focuses on 34 countries: Armenia, Bangladesh, Benin, Bolivia, Cambodia, Cameroon, Colombia, Dominican Republic, Egypt, Ethiopia, Gabon, Ghana, Guyana, Haiti, India, Indonesia, Jordan, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Nepal, Niger, Nigeria, Pakistan, Peru, Rwanda, Senegal, Tanzania, Uganda, Zambia, and Zimbabwe. These are the countries for which there is a recent MPI estimation and comparable Demographic and Health Survey (DHS) datasets for analysis across time. The 34 countries come from every geographic region in the developing world. They contain more than 2.5 billion people,[9] which is around 37% of the world's population as per population estimates for 2010.[10] They are Low, Lower Middle, and Upper Middle Income Countries with a GNI per capita in 2012 from $320 in Malawi to $10,040 in Gabon.[11]

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6 The upper bound estimate of the movers' effect in Senegal is 20.7%, also below 100%. We do not refer to this country because it did not register significant poverty reduction.

7 The lowest lower bound estimate for the movers' effect is of 6.9% in Senegal. We do not refer to it because it did not register a significant poverty reduction.

8 A necessary topic for future research is to replicate this analysis using panel datasets, to compare actual information on poverty transitions with the upper and lower bounds and with the theoretical and Shapley point estimates; if, across a large set of panel datasets reflecting a large population of countries and subnational regions, a clear pattern emerges, this could justify the assumptions required for theoretical decompositions.

9 In this case, that is true using either population data from the 'closing' year of the survey or from 2010 for all countries.

10 India alone corresponds to 1.2 billion people or 17.4% the world population. Other large countries in the analysis are Indonesia –3.5%, Pakistan – 2.5%, Bangladesh – 2.2%, Nigeria – 2.3%, and Ethiopia – 1.3%.

11 The income categories correspond to World Bank (2012). *World Development Indicators*. Washington DC: World Bank, accessed February 2013.

Poverty levels range from low to high: the proportion of MPI poor[12] in the starting period ranged from 1% to 94% across these countries.

Table 2: Decomposing the Change in MPI by Dynamic Subgroup

	Upper Bound				Lower Bound				Shapley Decomposition	
	A Movers	ΔA Stayers	Movers Effect (%)	Stayers Effect (%)	A Movers	ΔA Stayers	Movers Effect (%)	Stayers Effect (%)	Incidence Effect H (%)	Intensity Effect A (%)
Armenia 2005–2010	0.37	0.02	**103.3**	**-3.3**	0.33	-0.04	**93.6**	**6.4**	**99.2**	**0.8**
Bangladesh 2004–2007	0.83	0.01	**114.2**	**-14.2**	0.35	-0.05	**48.2**	**51.8**	**73.2**	**26.8**
Bangladesh 2007–2011	0.78	0.03	**120.6**	**-20.6**	0.35	-0.06	**54.3**	**45.7**	**78.2**	**21.8**
Benin 2001–2006	0.93	0.01	**107.7**	**-7.7**	0.34	-0.05	**39.5**	**60.5**	**68.2**	**31.8**
Bolivia 2003–2008	0.60	0.04	**110.7**	**-10.7**	0.38	-0.13	**69.5**	**30.5**	**84.8**	**15.2**
Cambodia 2005–2010	0.74	0.02	**112.9**	**-12.9**	0.34	-0.09	**52.3**	**47.7**	**73.5**	**26.5**
Cameroon 2004–2011	0.87	0.04	**135.4**	**-35.4**	0.33	-0.05	**51.9**	**48.1**	**85.0**	**15.0**
Colombia 2005–2010	0.55	0.05	**118.3**	**-18.3**	0.34	-0.08	**72.5**	**27.5**	**90.8**	**9.2**
Dom. Rep. 2002–2007	0.52	0.04	**109.7**	**-9.7**	0.35	-0.11	**73.3**	**26.7**	**86.7**	**13.3**
Egypt 2005–2008	0.54	0.04	**125.7**	**-25.7**	0.33	-0.04	**77.3**	**22.7**	**95.1**	**4.9**
Ethiopia 2000–2005	1.00	-0.04	**51.0**	**49.0**	0.34	-0.07	**17.2**	**82.8**	**35.6**	**64.4**
Ethiopia 2005–2011	1.00	-0.04	**60.0**	**40.0**	0.35	-0.07	**21.1**	**78.9**	**38.7**	**61.3**
Gabon 2000–2012	0.54	0.06	**112.8**	**-12.8**	0.37	-0.11	**78.2**	**21.8**	**93.2**	**6.8**
Ghana 2003–2008	0.73	0.04	**115.5**	**-15.5**	0.36	-0.11	**56.7**	**43.3**	**79.3**	**20.7**
Guyana 2005–2009	0.54	0.03	**134.2**	**-34.2**	0.33	-0.01	**83.2**	**16.8**	**97.7**	**2.3**
Haiti 2005/6–2012	0.83	0.01	**107.3**	**-7.3**	0.35	-0.10	**45.8**	**54.2**	**68.2**	**31.8**
India 1998/9–2005/6	0.82	0.04	**136.0**	**-36.0**	0.34	-0.05	**55.7**	**44.3**	**87.0**	**13.0**
Indonesia 2007–2012	0.63	0.03	**115.1**	**-15.1**	0.34	-0.07	**61.5**	**38.5**	**81.4**	**18.6**
Jordan 2007–2009	0.44	0.01	**108.9**	**-8.9**	0.33	-0.01	**82.4**	**17.6**	**86.5**	**13.5**
Kenya 2003–2008/9	0.76	0.03	**129.9**	**-29.9**	0.33	-0.04	**56.7**	**43.3**	**82.5**	**17.5**
Lesotho 2004–2009	0.68	0.02	**121.9**	**-21.9**	0.33	-0.05	**59.9**	**40.1**	**82.6**	**17.4**
Madagascar 2004–2008/9	0.87	-0.02	**136.1**	**-36.1**	0.34	0.03	**53.9**	**46.1**	**87.7**	**12.3**
Malawi 2004–2010	0.86	0.00	**99.7**	**0.3**	0.33	-0.04	**38.8**	**61.2**	**59.8**	**40.2**
Mozambique 2003–2011	0.89	-0.01	**95.3**	**4.7**	0.37	-0.09	**40.1**	**59.9**	**62.8**	**37.2**
Namibia 2000–2007	0.68	0.04	**129.8**	**-29.8**	0.33	-0.04	**63.3**	**36.7**	**88.2**	**11.8**
Nepal 2006–2011	0.74	0.04	**113.4**	**-13.4**	0.38	-0.13	**58.2**	**41.8**	**79.5**	**20.5**
Niger 2006–2012	1.00	-0.04	**46.7**	**53.3**	0.35	-0.07	**16.6**	**83.4**	**33.5**	**66.5**
Nigeria 2003–2008	0.91	0.05	**148.4**	**-48.4**	0.34	-0.04	**55.0**	**45.0**	**93.9**	**6.1**
Pakistan 2006/7–2012/13	0.90	0.02	**126.7**	**-26.7**	0.33	-0.03	**47.0**	**53.0**	**74.3**	**25.7**
Peru 2005–2008	0.59	0.02	**119.5**	**-19.5**	0.33	-0.04	**67.1**	**32.9**	**86.4**	**13.6**
Peru 2008–2012	0.52	0.04	**117.9**	**-17.9**	0.33	-0.06	**74.9**	**25.1**	**93.5**	**6.5**
Rwanda 2005–2010	0.79	0.00	**101.1**	**-1.1**	0.36	-0.10	**46.9**	**53.1**	**67.8**	**32.2**
Senegal 2005–2010/11	1.00	-0.02	**20.7**	**79.3**	0.33	-0.02	**6.9**	**93.1**	**12.6**	**87.4**
Tanzania 2008–2010	0.89	0.01	**109.8**	**-9.8**	0.33	-0.04	**41.1**	**58.9**	**68.7**	**31.3**
Uganda 2006–2011	0.81	0.02	**116.6**	**-16.6**	0.34	-0.06	**49.0**	**51.0**	**76.3**	**23.7**
Zambia 2001/2–2007	0.87	0.00	**95.8**	**4.2**	0.33	-0.06	**36.9**	**63.1**	**58.8**	**41.2**
Zimbabwe 2006–2010/11	0.66	0.02	**117.7**	**-17.7**	0.33	-0.04	**59.2**	**40.8**	**78.6**	**21.4**

The most recent estimate in 20 out of the 37 comparisons is for 2010, 2011, or 2012; 12 countries' most recent estimates are between 2007 and 2009; and five countries' most recent estimates are between 2005 and 2006.[13] The first data point ranges between 1998/9–2008. The time period ranges between 2 and 12 years depending on the frequency of data collection in each context; 30 of the periods last 4 to 7 years, for 5 countries the range is less than 4 years, for Mozambique it is 8 years, and for Gabon the

12 The term 'MPI poor' refers to people who are in acute poverty because they are deprived in at least one-third (33%) of the weighted indicators (Alkire and Santos 2014).

13 Benin and India.

comparison covers 12 years. We have two periods of comparison for Ethiopia, 2000–05 and 2005–10; for Bangladesh, 2004–07 and 2007–11; and for Peru, 2005–08 and 2008–12. Hence, we have a total of 37 comparisons. Given the diversity in the length of period we undertake analysis based on the annualized change.[14]

To describe this sample of countries, we present some of the population aggregates for them. If we aggregate the global MPI estimates published in 2014 using 2010 population weights, this group of countries as a whole would be roughly as poor as Haiti.[15]

OPHI's global MPI estimations for each country, reported in Alkire, Conconi and Seth (2014b) and in the UNDP's Human Development Reports, use the maximum information available in the survey on which the estimation is based. As a result, improvements in the questionnaire or survey design imply improvements in the MPI estimation. This methodological strategy produces the most accurate estimation for a given year, but estimates are not designed for comparison over time. In order to allow accurate assessment of trends in MPI over time, this paper rigorously standardizes the MPI indicator sets and parameters for those countries for which changes in the questionnaire design may affect comparability across time.[16] Comparable MPI values are denoted by $\mathbf{MPI_T}$ as their values may differ from published MPI values. We have information on the 10 MPI indicators for 29 countries; Guyana, Indonesia, Pakistan, and Tanzania lack information on nutrition, and Egypt lacks information on cooking fuel. Details on the MPI adjustment for comparability and differences with the published figures are provided in Annex 2.

4 National Results

4.1 Overview of Poverty Reduction

Table 3 presents the level, change, and statistical significance of changes in the MPI_T.[17] The first insight from the analysis is that of the 34 countries, 30 – covering 98% of the poor people across all 34 – had statistically significant reductions in multidimensional poverty at the α=0.05 significance level and 29 countries at α=0.01. Guyana and Peru (2005–2008) had reductions that were only significant at α=0.10. Yet, the pace of progress varied considerably across countries.

14 Note that statistical significance refers to the full period of comparison, not to the annualized change. Naturally longer periods of comparison are more likely to generate significant results.

15 In such a case, the illustrative aggregate MPI would be 0.249 and 47.1% of people would be poor. The MPI indicator set and parameters are not yet adjusted for comparability in these calculations.

16 Note we assume the rest of the survey design allows comparability.

17 In Annex 1, Tables A.1 and A.2 presents these figures for H_T and A_T.

Nepal, Rwanda, Ghana, and Tanzania had the largest absolute reductions in MPI poverty, greater than 0.018 per annum. Bangladesh, Cambodia, and Bolivia also proved to be strong performers, with reductions above 0.015 per year. In relative terms, Armenia, the Dominican Republic, and Bolivia had the fastest decrease in MPI_T, reducing their starting poverty levels by more than 12% per year. Each of the top-performing countries – Nepal, Rwanda, Ghana, Tanzania, Cambodia, and Bangladesh – decreased their original level of MPI_T by 5% to 9% per year – making them successes in both relative and absolute terms.

On the other hand, Jordan and Senegal had no significant reduction, and Madagascar had a statistically significant (at α=0.01) increase in multidimensional poverty.

The level of success in translating the gains of growth into poverty reduction apparently varies across countries and also sometimes across periods (see Table A.3 in Annex 1).[18] For instance, in the periods under analysis, Bangladesh and India registered similar rates of growth in GNI per capita, but Bangladesh reduced MPI_T more than twice as fast as India. On the other hand, although India has grown six times faster than Cameroon, the latter reduced MPI_T as fast as India. Finally, although the average growth rate in Ethiopia more than doubled between the period 2000–2005 and 2005–2008, the annualized relative change in the MPI_T remained practically the same.[19]

The MPI uses a poverty cutoff of 33.33%, but the findings discussed above are robust to a range of different poverty cutoffs (see Annex 3 for more details).

4.2 Comparing the Evolution of Headcount Ratios for MPI and Income Poverty

The previous section focused on the rate of poverty reduction in MPI_T. Now we focus on changes in the headcount ratio. The multidimensional headcount ratio (H_T) and its annualized rates of change are presented in the first columns of Table 4.[20] The same 30 countries had significant changes in the headcount ratio, and those that were most successful in reducing the MPI – Nepal, Ghana, Bolivia, Cambodia, Rwanda, Tanzania, and Bangladesh – also strongly reduced the incidence of multidimensional poverty, both in absolute and relative terms. Nepal reduced incidence from 65% to 44% in a five year period (2006–2011), a yearly decrease of 4.1 percentage points. The other top performing countries registered annualized reductions between 2.3 and 3.4 percentage points.

18 This topic merits a separate study of its own.

19 The relationship between growth and multidimensional poverty reduction in the set of countries considered here is analyzed in Alkire, Foster, Roche and Vaz (2015).

20 Table A.3 in Annex 1 shows the statistical significance of changes in H_T.

Table 3: Level, Change, and Statistical Significance of Changes in MPI_T

	Multidimensional Poverty Index (MPI_T)				Annualized Change		t-statistics for difference	
	Year 1		Year 2		Absolute	% Relative		
Armenia 2005–2010	.003	(.001)	.001	(.000)	.000	-17.7%	2.22	**
Bangladesh 2004–2007	.364	(.007)	.306	(.007)	-.020	-5.7%	5.60	***
Bangladesh 2007–2011	.306	(.007)	.245	(.006)	-.015	-5.4%	6.92	***
Benin 2001–2006	.474	(.008)	.414	(.006)	-.012	-2.7%	5.70	***
Bolivia 2003–2008	.175	(.005)	.089	(.003)	-.017	-12.6%	13.68	***
Cambodia 2005–2010	.299	(.006)	.212	(.006)	-.017	-6.7%	10.11	***
Cameroon 2004–2011	.298	(.009)	.248	(.007)	-.007	-2.6%	4.39	***
Colombia 2005–2010	.039	(.002)	.023	(.001)	-.003	-9.8%	8.04	***
Dom. Rep. 2002–2007	.040	(.002)	.020	(.001)	-.004	-13.0%	9.27	***
Egypt 2005–2008	.034	(.002)	.024	(.001)	-.003	-10.7%	4.69	***
Ethiopia 2000–2005	.677	(.004)	.604	(.006)	-.014	-2.2%	6.56	***
Ethiopia 2005–2011	.604	(.006)	.526	(.007)	-.013	-2.3%	7.83	***
Gabon 2000–2012	.161	(.006)	.075	(.004)	-.007	-6.1%	10.74	***
Ghana 2003–2008	.309	(.007)	.202	(.007)	-.021	-8.1%	10.39	***
Guyana 2005–2009	.050	(.004)	.041	(.002)	-.002	-4.5%	1.71	*
Haiti 2005/6–2012	.335	(.010)	.248	(.008)	-.013	-4.5%	6.43	***
India 1998/9–2005/6	.304	(.002)	.254	(.003)	-.007	-2.5%	12.81	***
Indonesia 2007–2012	.095	(.003)	.066	(.002)	-.006	-7.0%	8.93	***
Jordan 2007–2009	.013	(.002)	.011	(.001)	-.001	-8.9%	0.89	
Kenya 2003–2008/9	.296	(.008)	.244	(.010)	-.009	-3.5%	4.10	***
Lesotho 2004–2009	.238	(.005)	.190	(.007)	-.010	-4.4%	5.09	***
Madagascar 2004–2008/9	.374	(.015)	.414	(.007)	.009	2.3%	2.64	***
Malawi 2004–2010	.381	(.006)	.334	(.005)	-.008	-2.2%	6.06	***
Mozambique 2003–2011	.505	(.007)	.393	(.007)	-.014	-3.1%	11.86	***
Namibia 2000–2007	.194	(.008)	.154	(.005)	-.006	-3.2%	3.17	***
Nepal 2006–2011	.350	(.013)	.217	(.012)	-.027	-9.1%	7.61	***
Niger 2006–2012	.696	(.007)	.621	(.007)	-.012	-1.9%	7.80	***
Nigeria 2003–2008	.368	(.011)	.313	(.006)	-.011	-3.2%	4.04	***
Pakistan 2006/7–2012/13	.264	(.005)	.235	(.009)	-.005	-2.0%	2.86	***
Peru 2005–2008	.085	(.007)	.066	(.003)	-.006	-8.0%	1.83	*
Peru 2008–2012	.066	(.003)	.043	(.002)	-.006	-10.3%	5.47	***
Rwanda 2005–2010	.461	(.005)	.330	(.006)	-.026	-6.4%	15.65	***
Senegal 2005–2010/11	.440	(.019)	.423	(.010)	-.003	-0.7%	1.03	
Tanzania 2008–2010	.371	(.008)	.335	(.007)	-.018	-5.0%	3.48	***
Uganda 2006–2011	.420	(.007)	.343	(.009)	-.015	-3.9%	5.83	***
Zambia 2001/2–2007	.397	(.008)	.332	(.007)	-.012	-3.2%	4.59	***
Zimbabwe 2006–2010/11	.180	(.006)	.145	(.005)	-.008	-4.7%	4.61	***

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10
Standard errors reported between brackets.

The multidimensional headcount ratio (H_T) can be seen as the multidimensional equivalent to the $1.25 a day poverty headcount. Thus, we proceed in comparing the evolution of these two poverty measures. The $1.25 a day poverty headcounts and their annualized rate of change are presented in the last columns of Table 4.

This comparison is not straightforward so some caveats are necessary. The key limitation in comparing these two measures is the lack of frequently updated poverty data. For example, matching year comparisons in both the first and last period are only available for seven of the countries under analysis: Armenia, Colombia, Dominican Republic, Egypt, Ethiopia, and Malawi. In the case of eight countries, the $1.25 data is older than the comparable MPI (Bangladesh,[21] Cambodia, Cameroon, Ghana, Indonesia, Mozambique, Nepal, Niger, Pakistan, Peru, and Uganda); while in nine countries there is not enough income poverty data to compute a comparable rate of income poverty reduction[22] (Benin, Gabon, Guyana, Haiti, Kenya, Lesotho, Namibia, Tanzania, and Zimbabwe). Hence, we have matched data when possible. When income poverty data was not available from the same year of a survey, we used a linear interpolation between the two closest data points to estimate the level of income poverty at the year of the survey. Interpolation was employed for Bangladesh, Bolivia, Cambodia, Jordan, Madagascar, Nigeria, Rwanda, and Zambia. When interpolation was not possible (for instance, when the last year with income data was prior to the last year of the MPI-comparison period), we computed the rate of change in income poverty with reference to the periods closer to the MPI-comparison period for which we had data. We used this procedure for Cameroon, Ghana, India, Indonesia, Mozambique, Nepal, Niger, Pakistan, Peru, Senegal, and Uganda. The final comparison covers 25 countries for which very roughly comparable income poverty data is available from PovCalNet (World Bank 2012a, accessed in June 2014), but the conclusions may be affected by the lack of matching data points.

Multidimensional poverty incidence was larger than income poverty at the beginning of the comparison period in 19 of the 25 countries. The gap between the two figures varied between 0.3 percentage points for Nigeria in 2003 (with an MPI headcount of 63.5% and income poverty of 63.8%)[23] and 43 percentage points for Cameroon 2004 (with an MPI and income incidence of 53.8 and 10.8, respectively).

21 The most recent income poverty figure available for Bangladesh is for 2010, while the most recent MPI figure is for 2011. This affects the comparison 2007–2011.

22 In most countries there is either one data point or no income data after the start of the MPI-comparison period. There is no information at all for Zimbabwe.

23 In Nigeria, the income poverty figure actually lies within the 95% confidence interval of the MPI headcount, which is between 60.4% and 66.7%.

Table 4: Comparison between Change in Annualized Incidence of MPI and $1.25/day

Country & Period	MPI Headcount Ratio (H_T)						$1.25 Headcount Ratio				Years of income information used to compute change rates	
	Level				Annualized change		Level		Annualized change			
	Year 1		Year 2		Absolute	Relative	Year 1	Year 2	Absolute	Relative	Year 1	Year 2
Armenia 2005–2010	.8	(.2)	.3	(.1)	-.1	-12.4%	4.0	2.5	-.3	-9.1%	2005	2010
Bangladesh 2004–2011 [1]	67.1	(.9)	49.6	(.9)	-2.5	-4.2%	52.1	43.3	-1.5	-3.1%	2000, 2005	2010
Bangladesh 2004–2007	67.1	(.9)	59.0	(1.1)	-2.7	-4.2%	52.1	36.1	-1.5	-3.0%	2000, 2005	2005, 2010
Bangladesh 2007–2011	59.0	(1.1)	49.6	(.9)	-2.4	-4.2%	50.5	43.3	-1.4	-3.0%	2005	2010
Benin 2001–2006 [2]	79.1	(.9)	72.1	(.8)	-1.4	-1.8%	-	-	-	-	-	-
Bolivia 2003–2008	36.3	(.8)	20.5	(.7)	-3.2	-10.8%	20.7	15.6	-1.0	-5.5%	2002, 2005	2008
Cambodia 2005–2010	59.2	(1.1)	45.9	(1.1)	-2.7	-5.0%	35.9	18.6	-4.3	-15.1%	2004, 2007	2009
Cameroon 2004–2011	53.8	(1.3)	46.0	(1.1)	-1.1	-2.2%	10.8	9.6	-.2	-2.0%	2001	2007
Colombia 2005–2010	9.0	(.3)	5.7	(.2)	-.7	-8.9%	12.7	8.2	-.9	-8.5%	2005	2010
Dominican Rep. 2002–2007	9.3	(.4)	5.1	(.3)	-.8	-11.5%	5.7	3.8	-.4	-7.6%	2002	2007
Egypt 2005–2008	8.2	(.4)	6.0	(.3)	-.8	-10.2%	2.0	1.7	-.1	-5.3%	2005	2008
Ethiopia 2000–2011 [1]	93.6	(.4)	85.2	(.9)	-.8	-0.8%	55.6	30.7	-2.3	-5.3%	2000	2011
Ethiopia 2000–2005	93.6	(.4)	89.9	(.6)	-.7	-0.8%	55.6	39.0	-3.3	-6.9%	2000	2005
Ethiopia 2005–2011	89.9	(.6)	85.2	(.9)	-.8	-0.9%	39.0	30.7	-1.4	-3.9%	2005	2011
Gabon 2000–2012 [3]	35.4	(1.2)	17.4	(1.0)	-1.5	-5.7%	-	-	-	-	-	-
Ghana 2003–2008	58.7	(1.1)	41.9	(1.2)	-3.4	-6.5%	39.1	28.6	-1.3	-3.8%	1998	2006
Guyana 2005–2009 [4]	12.7	(1.0)	10.6	(.6)	-.5	-4.4%	-	-	-	-	-	-
Haiti 2005/6–2012 [5]	60.6	(1.5)	49.4	(1.3)	-1.7	-3.1%	-	-	-	-	-	-
India 1998/9–2005/6	57.3	(.4)	49.0	(.4)	-1.18	-2.2%	49.4	41.6	-.7	-1.5%	1994	2005
Indonesia 2007–2012	20.8	(.5)	15.5	(.4)	-1.1	-5.7%	24.2	16.2	-2.0	-9.5%	2007	2011
Jordan 2007–2009	3.6	(.6)	3.0	(.4)	-.3	-7.8%	0.2	0.1	-.1	-35.0%	2006, 2008	2008, 2010
Kenya 2003–2008/9 [6]	60.1	(1.2)	51.2	(1.6)	-1.6	-2.9%	-	-	-	-	-	-
Lesotho 2004–2009 [7]	50.8	(1.0)	42.2	(1.4)	-1.7	-3.7%	-	-	-	-	-	-
Madagascar 2004–2008/9	67.0	(2.1)	73.3	(1.1)	1.4	2.0%	70.0	77.3	1.6	2.2%	2001, 2005	2005, 2010
Malawi 2004–2010	72.1	(1.0)	66.7	(.8)	-.9	-1.3%	73.9	61.6	-2.0	-3.0%	2004	2010
Mozambique 2003–2011	82.3	(.7)	70.3	(1.0)	-1.5	-1.9%	74.7	59.6	-3.0	-4.4%	2003	2008
Namibia 2000–2007 [8]	41.3	(1.6)	33.7	(1.0)	-1.1	-2.9%	-	-	-	-	-	-
Nepal 2006–2011	64.7	(2.0)	44.2	(2.0)	-4.1	-7.4%	53.1	24.8	-4.0	-10.3%	2003	2010
Niger 2006–2012	93.5	(.5)	89.99	(.6)	-.6	-0.6%	65.9	43.6	-7.4	-12.8%	2005	2008
Nigeria 2003–2008	63.5	(1.6)	54.7	(.9)	-1.8	-3.0%	63.8	66.3	.5	0.8%	1996, 2004	2004, 2010
Pakistan 2006/7–2012/13	49.4	(.8)	45.2	(1.3)	-.7	-1.5%	22.6	21.0	-.8	-3.5%	2006	2008
Peru 2005–2012 [1]	19.5	(1.4)	10.5	(.4)	-1.3	-8.5%	8.6	4.9	-.7	-10.5%	2005	2010
Peru 2005–2008	19.5	(1.4)	15.7	(.7)	-1.3	-6.9%	8.6	6.2	-.8	-10.2%	2005	2008
Peru 2008–2012	15.7	(.7)	10.5	(.4)	-1.3	-9.6%	6.2	4.9	-.6	-11.0%	2008	2010
Rwanda 2005–2010	82.9	(.8)	66.1	(1.0)	-3.4	-4.4%	72.5	65.0	-1.5	-2.2%	2000, 2006	2006, 2011
Senegal 2005–2010/11	71.2	(2.4)	70.8	(1.5)	-.1	-0.1%	33.5	29.6	-.6	-2.0%	2005	2011
Tanzania 2008–2010 [9]	65.6	(1.2)	61.1	(1.1)	-2.3	-3.5%	-	-	-	-	-	-
Uganda 2006–2011	77.9	(1.1)	66.8	(1.5)	-2.2	-3.0%	51.5	38.0	-4.5	-9.6%	2006	2009
Zambia 2001/2–2007	72.0	(1.3)	64.8	(1.2)	-1.3	-1.9%	61.9	70.0	1.5	2.3%	1998, 2006	2006, 2010
Zimbabwe 2006–2010/11 [10]	39.7	(1.1)	33.5	(1.1)	-1.4	-3.7%	-	-	-	-	-	-

Source: Data on MPI authors' estimation. Data on $1.25/day incidence downloaded in June 2014 from PovCalNet (World Bank 2012a).

1 Bangladesh, Ethiopia, and Peru have an additional a row showing the overall change between the first and third periods.

2 The most recent income poverty figure available for Benin is for 2003, making it impossible to compute the rate of reduction between 2001 and 2006.

3 In Gabon, since 1990, there is only income poverty data for 2005. Thus, it is not possible to accurately compute the poverty reduction rate 2000–2012.

4 The most recent income poverty measure available for Guyana is for 1998 making it impossible to know the rate of reduction 2005–2009.

5 The most recent income poverty measure available for Haiti is for 2001, making it impossible to know the rate of reduction 2006–2012.

6 The most recent income poverty measures available for Kenya are for 2005 and 1997, making difficult an accurate comparison with MPI changes.

7 The most recent income poverty measure available for Lesotho is for 2003, making it impossible to know the rate of reduction 2004–2009.

8 The most recent income poverty measures available for Namibia are 1993 and 2004, making difficult an accurate comparison with MPI changes.

9 The most recent income poverty measure available for Tanzania is for 2007. Thus, it is impossible to know the rate of reduction 2008–2010.

10 Income poverty data is not available for Zimbabwe.

Figure 1: Absolute Reduction of MPI and $1.25/day Headcount Ratios (annualized)

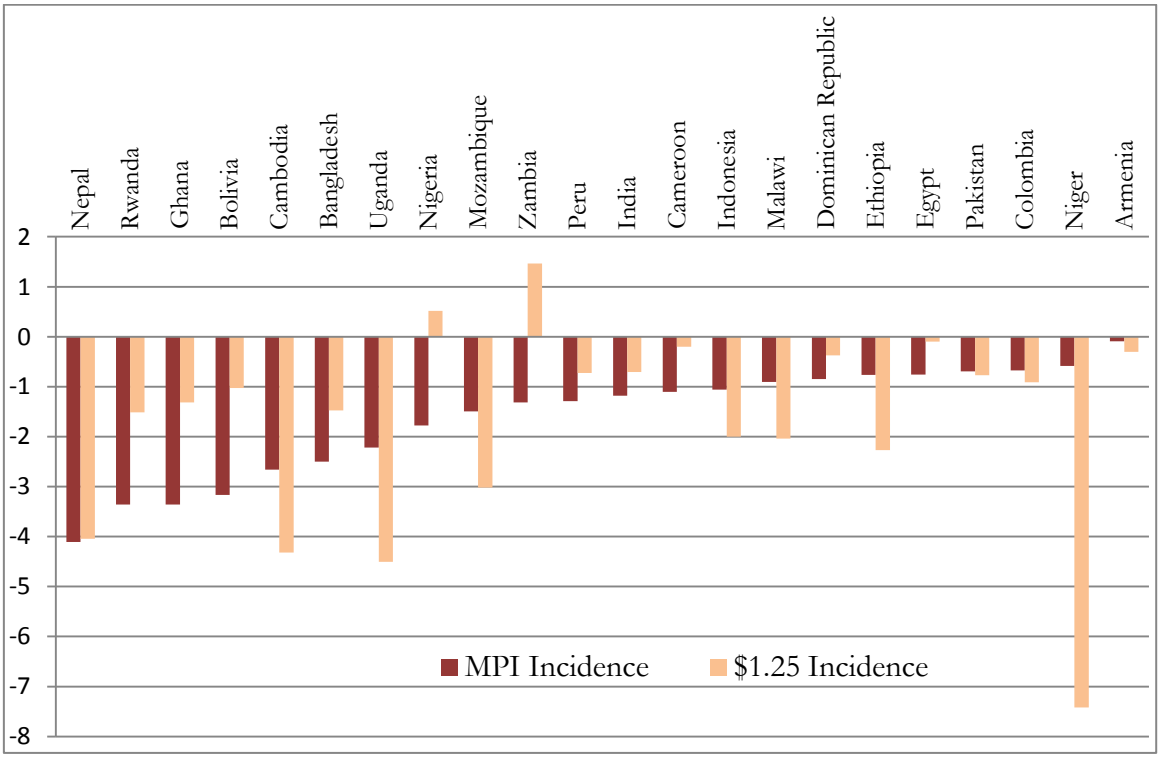


Figure 1 depicts the annualized absolute rates of change in MPI and $1.25/day incidence for the 22 countries that reduced the multidimensional headcount significantly and for which we have income data.[24] There is no uniform pattern. In some countries, such as Cambodia, Niger, Ethiopia, Uganda, and Mozambique, income poverty reductions exceeded H_T reductions. In other countries the reverse happened. Bolivia, Ghana, and Rwanda cut MPI incidence two to three times faster than income poverty in absolute terms, and closed the gap to eradication faster in relative terms, too. In Nigeria and Zambia, the two kinds of poverty changed in different directions: MPI incidence reduced, but income poverty increased.[25]

24 Relative to the data presented in Table 4, the graph excludes Jordan and Senegal, where the reduction in the multidimensional headcount was not significant, and Madagascar, where MPI incidence increased.

25 As we cannot estimate the standard errors for the changes in income poverty, we cannot infer if the differences between MPI and $1.25/day incidences are statistically significant or not.

If progress was only measured by reducing income poverty, Niger, Uganda, Cambodia, Nepal, Mozambique, and Ethiopia would be considered the leaders in poverty reduction, in that order. The tremendous gains of Rwanda, Ghana, and Bolivia would have been invisible.

If income and multidimensional poverty measures moved together, and if they both identified the same people as poor, there would be no need for two separate measures. While the issue of identification lies beyond the scope of this paper, we do observe significant variations between both the rates and, at times, the direction of change of these two poverty measures. This shows that MPI trends may diverge from $1.25 trends, and thus merit separate analysis.

In order to eradicate poverty, the rate of reduction in the multidimensional headcount ratio (H) must exceed the rate of population growth (see Table A.4 in Annex 1). Of the 30 countries that reduced H_T significantly, when population growth (using the 'medium' hypothesis) is taken into account, only 20 countries reduced the absolute number of poor people. In ten countries – Benin, Cameroon, Ethiopia, Kenya, Malawi, Mozambique, Niger, Pakistan, Uganda, and Zambia – the number of poor people increased.

5 Decomposition of Changes over Time: Different Paths to Poverty Reduction

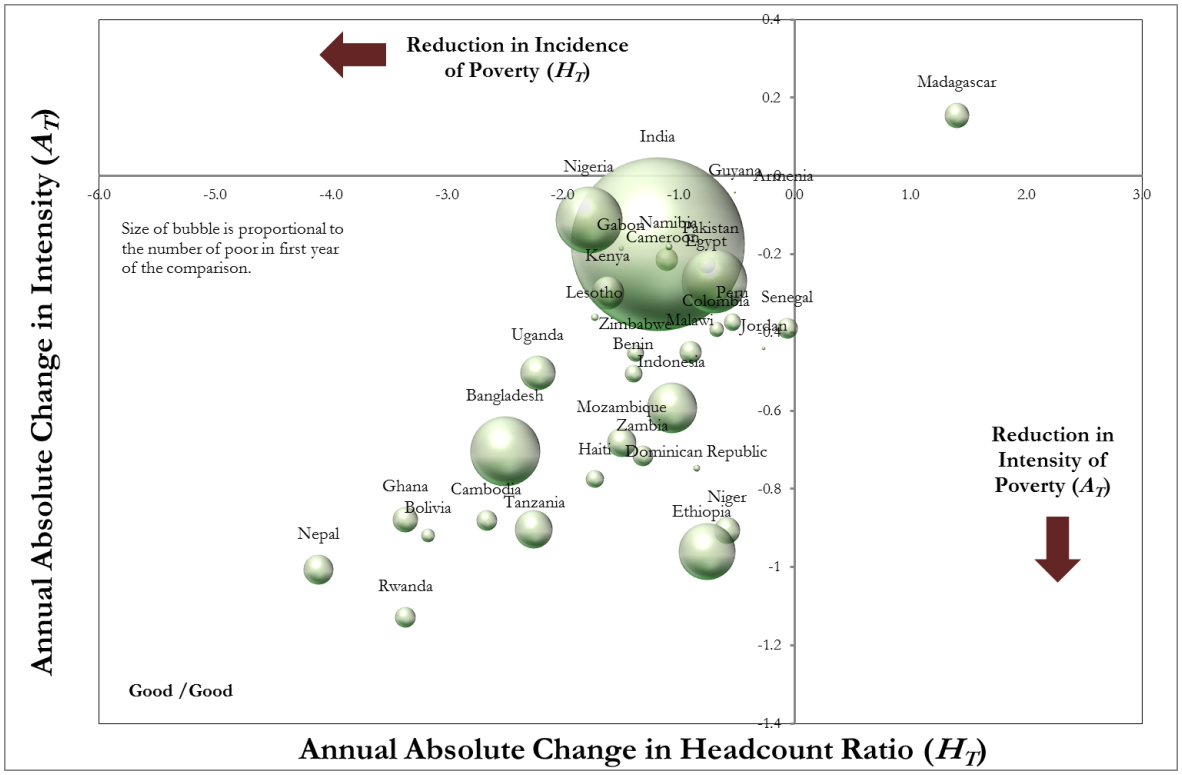
5.1 Incidence and Intensity

A reduction in MPI occurs because a country has succeeded in reducing H_T, the incidence of poverty, or in reducing A_T, the intensity of poverty among poor people, or doing both in some proportion.

Figure 2 depicts the annualized absolute change in incidence and intensity (in percentage points) in each of the 34 countries. An overview of these figures suggests they have followed a wide range of reduction pathways. Nearly all countries reduced incidence (H_T) more than intensity. The exceptions were Ethiopia, where incidence fell by around 0.8 percentage points per year while intensity fell by 1.0, and Niger, where incidence dropped 0.6 percentage points and intensity dropped 0.9.[26] Interestingly, the 'top performing' countries reduced both the incidence (H_T) and the intensity (A_T) of MPI poverty. Absolute reductions in intensity (A_T) were strongest in Rwanda, Nepal, Ethiopia, Bolivia, Niger, Tanzania, Cambodia, and Ghana, showing the important progress made in the poorest countries to reduce the share of hardships experienced by those who are poor.

26 The estimate of the reduction in intensity was larger than the estimate of the reduction in incidence also in Senegal and Jordan. We did not list these countries because they did not register a significant poverty reduction.

Figure 2: Annual Absolute Change in Incidence and Intensity



Some countries have the same levels of poverty reduction, but different levels of reduction in terms of incidence and intensity. For example, Nigeria and Zambia had similar initial MPI_T levels (0.368 and 0.397, respectively) and have similar annualized poverty reduction rates (0.011 and 0.012 points, respectively), but reduced MPI_T in different ways. In Nigeria the reduction seems to be almost exclusively driven by a cut in incidence: the headcount ratio declined 1.8 percentage points per year while intensity did not change significantly. Zambia significantly reduced both incidence (1.3 percentage points per year) and intensity (0.7 percentage points).

We can complement this analysis using Table 2 presented earlier. According to those upper and lower bounds we confirm that in 22 of the 34 countries, the reduction in poverty was achieved mostly through moving people out of poverty (in these countries the lowest estimate of the movers' effect is above 50%). This is the case, for example, of Armenia where movers contributed between 93.6% and 103.3% to poverty reduction, and Cambodia where this contribution was between 52.3% and 112.9%. In Niger, in contrast, poverty reduction was mostly due to decreases in the deprivation scores of the ongoing poor: the stayers' effect explained between 53.3% and 83.4% of the poverty reduction. In 11 countries the results are ambiguous: Bangladesh (2004–2007), Benin, Ethiopia, Haiti, Malawi, Mozambique, Pakistan, Rwanda, Tanzania, Uganda, and Zambia.

5.2 How MPI Changes: Reductions in Each Indicator

To analyze dimensional changes, we first review population-wide changes, and subsequently those among the poor. Table A.5 presents the annualized absolute change of the uncensored headcount ratios of all indicators. The progress in each dimension varies greatly across countries. Bolivia, India, Indonesia, and Nepal statistically reduced deprivations in all indicators.[27] Nepal made remarkable improvements in assets and electricity coverage, the respective raw headcount ratios reduced 6.2 and 5.3 percentage points per year. Bolivia registered its highest advance in school attendance and sanitation, with reductions of 5.2 and 3.9 percentage points per year, respectively. The reductions in India and Indonesia were overall more modest. In India the biggest improvements were in sanitation and flooring (1.6 percentage points).

To focus on the poor, we examine changes in the censored headcount ratios. Note that any real reduction in any deprivation among the poor always directly reduces poverty, by either reducing the intensity of an ongoing poor person or enabling their exit from multidimensional poverty. The censored headcount of an indicator may also decline if poor people who were deprived in this indicator became non-poor due to decreases only in *other* indicators (but *retain* this deprivation in their non-poor status). Table A.6 displays the annualized absolute change of the censored headcount ratios of all indicators. When focusing exclusively on the poor, we find that all the countries listed above plus Cambodia, Colombia, the Dominican Republic, Gabon, Mozambique, and Rwanda significantly reduce the censored headcount ratios in all indicators. Rwanda made exceptional progress in sanitation and drinking water. The percentage of people who were poor and deprived in sanitation reduced on average 7.6 percentage points per year, between 2005 and 2010; with respect to drinking water, the reduction was 5.6 percentage points. Gabon made the highest advancements in sanitation and cooking fuel (1.4 percentage points); Colombia had the biggest improvements in cooking fuel and assets (0.5 percentage points); and the Dominican Republic made the highest reductions in school attendance and years of school.

A change in MPI is accelerated more by improvements in indicators that bear higher weights, such as education and health (one-sixth rather than one-eighteenth).[28] Considering the rate of change and indicator weights together, we see that Bolivia's changes were strongly driven by improvements in child school attendance and child mortality; India's were slightly more influenced by nutrition and child

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27 All these reductions were significant at α=0.01 or α=0.05, with the exception of the reduction in deprivation in drinking water in Nepal that was significant only at α=0.1.

28 This means that, for instance, a one percentage point reduction in the censored headcount ratio of malnutrition has a three times greater impact on changes in MPI than a one percentage point reduction in the censored headcount ratio of the use of cooking fuel, everything else remaining unchanged. The weights rebalance policy incentives, so that each dimension has roughly equivalent prominence.

mortality; Indonesia's gains in child school attendance and child mortality were more visible; and Nepal's progress was strongly supported by improvements in all four health and education indicators plus electricity (Table A.7).

It is interesting to see and track the changes in all the relevant indicators and notice that not one of the ten MPI indicators remained unchanged in these analyses over time.

Table 5 presents the average annualized rates of absolute change in raw and censored headcount ratios by world region.[29] Overall, the deprivation which registered the highest reduction on average was access to sanitation. It is the indicator whose raw and censored headcounts have the highest average rate of annualized absolute change across all countries. In Sub-Saharan Africa, Latin America, and the Caribbean, nutrition was among the indicators that improved more slowly; while in South Asia the education indicators changed more slowly on average.

5.3 Subnational MPI Changes

When assessing poverty reduction patterns, it is important to ensure that no population sub-group is left behind. A useful trait of the MPI measure is its ability to go beyond the national level and be applied to population subgroups. This feature allows us to compare the progress of different groups and potentially identify those at risk of falling behind. This section examines whether progress was evenly achieved across subnational regions and different ethnic groups.

5.3.1 Rural-Urban Disaggregation

Table A.8 presents the levels and changes in MPI_T, H_T, and A_T by rural and urban areas for each of the 34 countries studied. Poverty was higher in rural than urban areas in all of the countries in both of the periods. Twenty-six countries had significant reductions in urban poverty and 30 in rural areas.

Rural areas as a whole reduced multidimensional poverty faster than urban areas. On average, rural areas reduced the headcount ratio by 1.3 percentage points per year as compared to 1 percentage point per year for urban areas. The annualized average rural MPI_T reduction was 0.009, whereas the urban MPI_T reduction was 0.005.[30] Naturally starting levels of poverty and rural-urban migration will also have affected these rates. Rural areas had faster rates of reduction in most indicators.

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29 These findings are based on the average uncensored and censored headcount ratios across countries (including those in which the change in the headcount ratio was not significant) and use as weights the countries' population in the second period of the comparison. Note that low starting levels of deprivation usually have lower absolute rates of change.

30 These figures are weighted using the population in period 2.

Table 5: Average Annual Absolute Change in Raw and Censored Headcount Ratios by World Region

Indicators		All countries			Sub-Saharan African countries			Latin America and Caribbean countries			South Asia countries		
		Raw	Censored	No. countries	Raw	Censored	No. countries	Raw	Censored	No. countries	Raw	Censored	No. countries
Years of schooling	**Initial headcount (%)**	22.3	21.4	34	34.1	33.9	19	10.1	7.5	6	22.4	21.7	4
	Annual change (p.p.)	-0.6	-0.6		-0.9	-0.9		-0.4	-0.4		-0.6	-0.6	
Child school attendance	**Initial headcount (%)**	22.7	20.8	34	34.8	33.9	19	9.4	6.6	6	22.3	20.5	4
	Annual change (p.p.)	-0.6	-0.6		-1.1	-1.1		-1.1	-0.8		-0.4	-0.4	
Child mortality	**Initial headcount (%)**	28.8	26.0	34	41.5	39.1	19	14.2	9.1	6	28.1	25.5	4
	Annual change (p.p.)	-0.7	-0.8		-1.0	-1.2		-0.5	-0.5		-0.6	-0.7	
Nutrition	**Initial headcount (%)**	36.0	32.0	30	32.5	30.7	18	9.8	5.2	5	41.4	36.5	3
	Annual change (p.p.)	-0.6	-0.7		-0.5	-0.5		-0.4	-0.3		-0.7	-0.9	
Electricity	**Initial headcount (%)**	40.8	33.8	34	72.9	61.5	19	18.4	12.6	6	37.8	31.7	4
	Annual change (p.p.)	-0.9	-1.0		-0.5	-1.1		-1.0	-0.8		-1.1	-1.1	
Improved sanitation	**Initial headcount (%)**	72.1	49.0	34	91.1	68.9	19	37.3	16.4	6	76.3	52.5	4
	Annual change (p.p.)	-2.1	-1.8		-2.6	-2.8		-1.4	-1.1		-2.0	-1.7	
Drinking water	**Initial headcount (%)**	29.7	22.3	34	62.8	53.8	19	17.1	10.0	6	19.5	14.8	4
	Annual change (p.p.)	-1.2	-1.0		-2.0	-2.1		-0.2	-0.5		-0.8	-0.7	
Flooring	**Initial headcount (%)**	51.9	40.0	34	58.0	52.0	19	21.8	12.3	6	61.1	45.9	4
	Annual change (p.p.)	-1.1	-1.1		-0.3	-0.8		-0.4	-0.7		-1.5	-1.4	
Cooking fuel	**Initial headcount (%)**	75.3	51.8	33	88.3	69.4	19	34.2	16.9	6	77.1	54.1	4
	Annual change (p.p.)	-0.6	-1.2		0.1	-1.3		-0.6	-1.0		-0.4	-1.2	
Asset ownership	**Initial headcount (%)**	49.8	38.2	34	59.2	51.0	19	25.0	13.8	6	54.6	42.1	4
	Annual change (p.p.)	-1.2	-1.2		-1.4	-1.5		-1.6	-1.1		-0.9	-1.2	

Note: The averages were computed considering all countries (including those in which the change in the headcount was not significant), and using as weights the countries' population in the second period of the comparison.

5.3.2 Disaggregation by Subnational Regions

In this section we compare the MPI_T reduction across subnational regions. Data representative at the regional level are available for 31 countries (omitting Armenia, Guyana, and Peru), covering 338 regions. Table A.9 presents the percentage of regions in each country that have reduced poverty significantly at a significance level of at least α=0.05, as well as the percentage of poor people who lived in those regions at the initial year of the comparison period.

Eight cases – Bangladesh, between 2007 and 2011; Bolivia; Gabon; Ghana; Malawi; Mozambique; Niger; and Rwanda – showed statistically significant reductions in each of their subnational regions. In Bangladesh (2004–07) and Benin only one of the regions did not reduce poverty. In total, 208 regions containing 78% of the poor population in our sample showed statistically significant reductions in MPI_T.

In nine countries, Bangladesh (2007–2011), Bolivia, Colombia, Egypt, Kenya, Malawi, Mozambique, Namibia, and Niger, the fastest MPI_T reduction occurred in the poorest subnational area, which is a positive finding (Annex 4).[31]

Subnational decompositions are vital in order to display regional disparities. The country with the largest range of subnational MPI_T values at the initial year was Kenya. In 2003, Nairobi, the capital, had an MPI_T of 0.048, while the North Eastern region, which borders Somalia, had an MPI_T of 0.681. In Zimbabwe the ratio between regions was largest. In 2006, the province Matabeleland North had an MPI_T of 0.301, almost 30 times higher than the MPI_T of the least poor province Bulawayo. Other regions have greater equity. For instance, at the initial year, the three regions of Jordan had an MPI_T between 0.01 and 0.018. In 2005, the gap in Egypt was 0.071 and it actually decreased to 0.054 in 2008. In Bangladesh, Malawi, Rwanda, Tanzania, and Jordan, the MPI_T of the poorest region was less than twice the MPI_T of the richest region in the initial year.[32] Any study of subnational poverty requires simultaneous consideration of the number and population share of the regions over time.

Most countries are moving towards convergence; hence, the gap between the poorest and richest subnational regions is closing in absolute terms.[33] But the subnational disparities increased in Ethiopia (2000–2005), Indonesia, Jordan, Mozambique, Niger, Nigeria, Pakistan, Tanzania, and Zambia.

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31 Annex 4 includes graphics with the annualized absolute change in MPI_T against the initial MPI_T for all regions for a select group of countries. The levels and changes in MPI_T for all subnational regions in or sample can be found at http://www.ophi.org.uk/multidimensional-poverty-index/mpi-2014-2015/mpi-data/.

32 Bangladesh, Malawi, Rwanda, and Tanzania have relatively high levels of poverty. Therefore, some may argue that is the reason why the relative differences between regions are smaller. However, there are countries with similar poverty levels where that was not the case.

33 The same does not hold for relative rates, as might be anticipated; the only countries where poverty reduction in relative terms was faster in the poorest than the richest region were Egypt, Haiti, Malawi, Namibia, Nepal, Senegal, and Zimbabwe.

In 15 countries more than half of the subnational regions (with any starting level of poverty) were reducing poverty at an absolute rate smaller than the country's average.[34] The cases of Uganda and Nigeria are especially extreme. In Uganda only two of the nine regions reduced poverty more than the national average: Western and East Central, at 0.029 and 0.020 points per year, respectively, versus the average of 0.015 points. In Nigeria only one of the six regions, South South (which had 17.1% of Nigeria's population in the initial period of comparison, 2003) significantly reduced poverty.

Most of the top performers in reducing poverty, also decreased disparities across regions relatively well. Ghana, Cambodia, and Bolivia have reduced the differences between regions in absolute terms. Rwanda has reduced the dispersion of the distribution and the gap between the bottom and top regions. In Tanzania only the gap between the MPI_T of the bottom and the national average was reduced. These findings suggest that is important to analyze MPI_T reduction by subnational regions, as they may have very different paths.

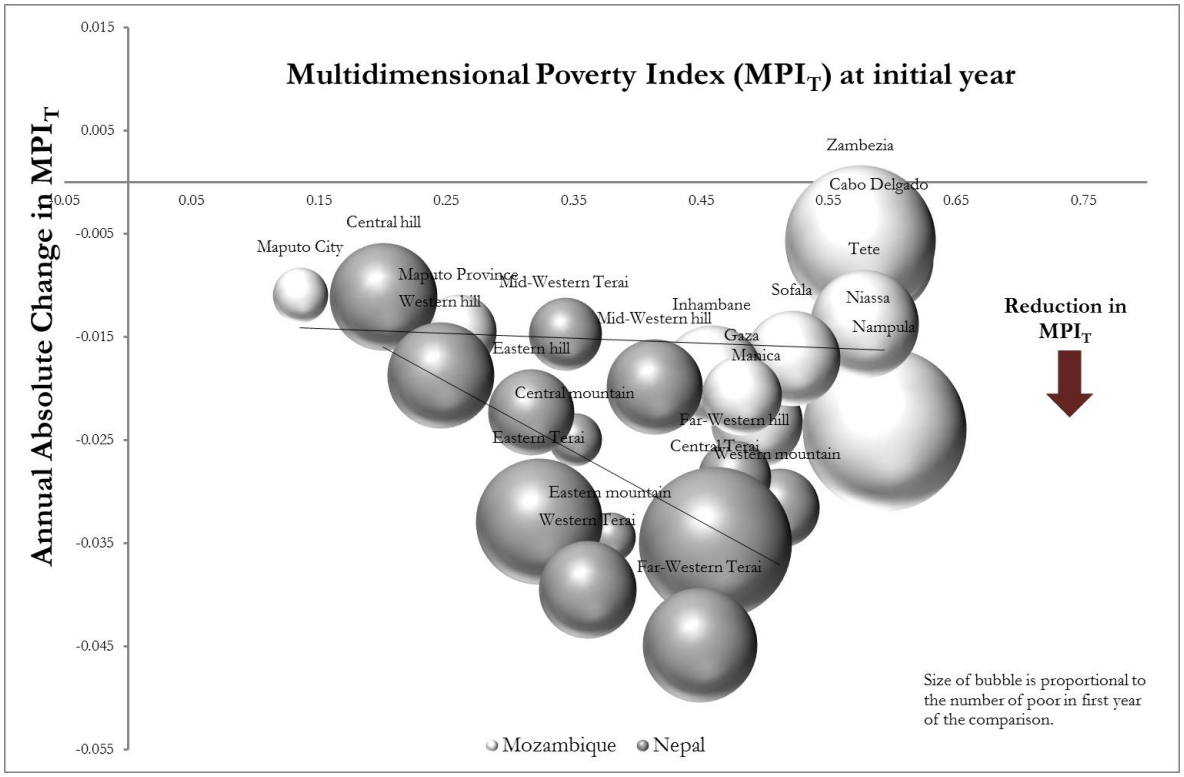
A useful graphic for this purpose plots the annualized absolute change in MPI on the vertical axis against the initial MPI for all regions. Figure 3 depicts all regions of Mozambique (light) and Nepal (dark). The size of the bubbles is proportional to the number of poor people living in the region in the initial year. In Nepal, we see a strong negative trend between the initial level of the MPI and the annualized absolute change in the MPI. This means that in Nepal poorer regions have tended to reduce poverty more than less poor regions, hence they are converging in absolute terms. In Mozambique the trend line is almost flat. Although the poorest region, Nampula, has the highest reduction (0.021 points), Zambezia and Cabo Delgado, the other two poorest regions, have slower progress. Overall, this graph shows that Nepal's poverty reduction was more equitable, favoring the poorest regions while Mozambique's did not.

5.3.2 Disaggregation by Ethnic Groups

It is also interesting to assess poverty reduction trends across ethnic groups. In Benin, Ghana, and Kenya, we decomposed the population by the main ethnic groups; a group 'other' – small ethnic groups (each generally representing less than 3% of the population); and 'missing', which includes all individuals missing information on ethnicity. The population-weighted average MPI_T of these groups corresponds to the national MPI_T.

34 In Ethiopia, 73% of regions had reduced poverty more slowly than the national average in 2000–2005, but only 46% in 2005–2011.

Figure 3: Poverty Reduction in Regions of Mozambique and Nepal



Annex 4 presents this graphic for additional countries.

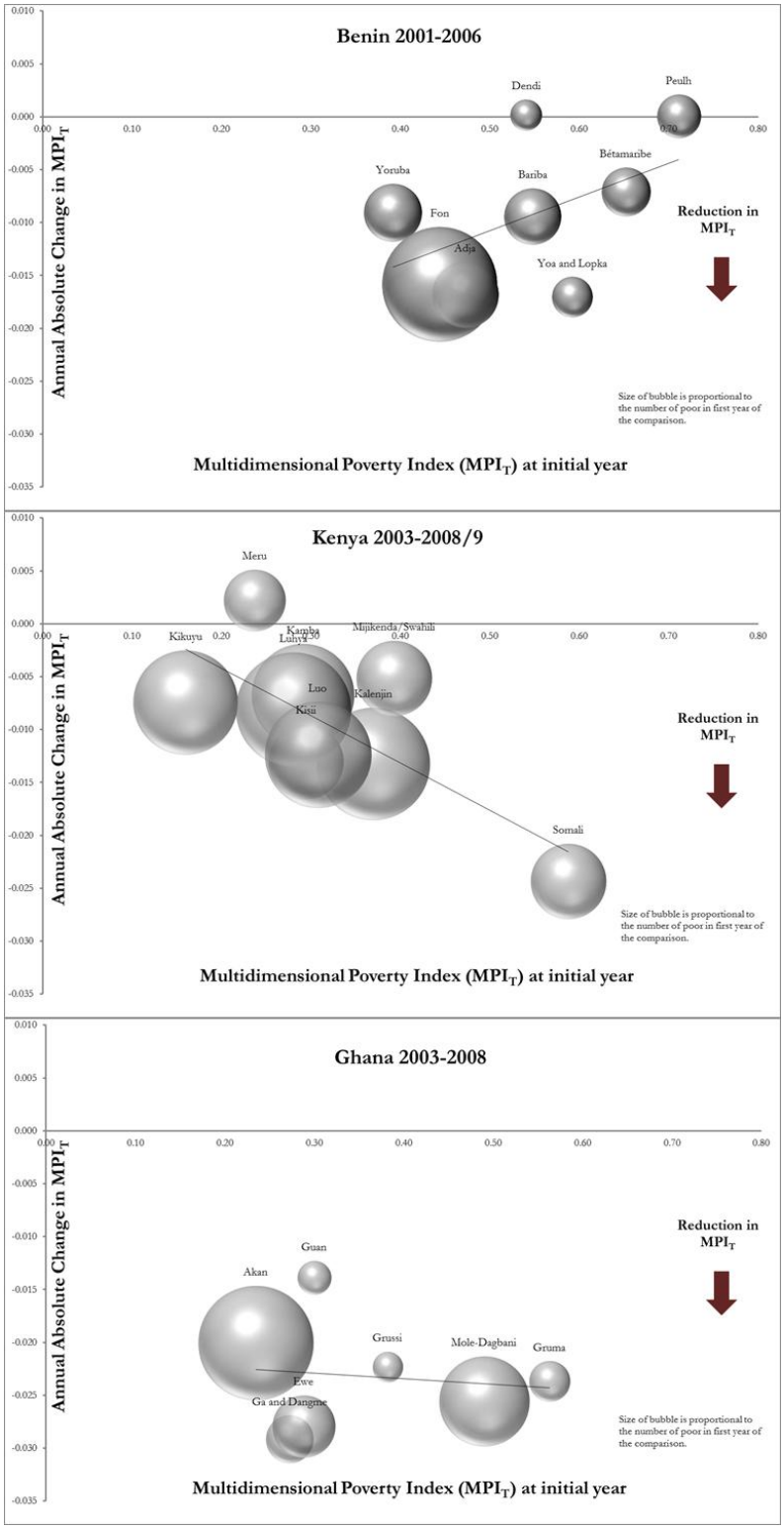
The MPI_T levels and change by ethnic group for Benin, Ghana, and Kenya are presented in Table A.10 in Annex 1. All three countries had statistically significant reductions in MPI_T. But these gains were distributed very differently across ethnic groups. Figure 4 replicates Figure 3 for the disaggregation by ethnic groups for the three countries.

Benin reduced MPI_T significantly for only two out of the eight main ethnic groups, representing 52% of the population at the initial year. Poverty reduction was insignificant among the poorest ethnic group, the Peulh. The figure for Benin shows a clear upward trend. The poorer ethnic groups tend to reduce poverty less. This increase in disparity across ethnic groups reflects an increase in horizontal inequality among the poor (Stewart 2010).

Ghana cut poverty among all ethnic groups at similar rate, although the reduction was not statistically significant among the Guan.

Kenya shows a clear pro-poorest reduction across ethnic groups. Poverty was significantly reduced at α=0.05 for only three groups: Somali, Kikuyu, and Luo. The poorest group, the Somali, had the biggest (absolute) reduction in poverty, reducing poverty at an annualized rate of 4.6%, well above the national rate of 3.5%.

Figure 4: Poverty Reduction among Ethnic Groups in Benin, Kenya, and Ghana



6 Changes in Destitution

Lastly, this section analyses trends in destitution, using a second vector of deprivation cutoffs (Section 2.1) for the same countries and periods, in order to explore the changes over time in the destitute subset of the poor in comparison with those who are poor but not destitute.

Table A.11 presents the levels and changes in destitution and in the headcount ratio of the destitute. Considering a significance level of α=0.05, 28 of the 34 countries reduced destitution and 29 reduced its incidence. The largest absolute reduction in destitution (MPI_T^D) was seen in Ethiopia, followed by Niger, Ghana, Bolivia, Rwanda, Tanzania, Nepal, Haiti, Bangladesh (2004-2007), and Zambia – all of them Low Income or Least Developed Countries except Ghana and Bolivia. Armenia, Egypt, Jordan, Madagascar, and Pakistan had no change in destitution.

In nearly all these countries, destitution is being reduced in relative annualized terms faster than multidimensional poverty. In Ethiopia, Guyana, Niger, and Tanzania that is also true in absolute terms. When this happens, the destitute are being reached, and poverty reduction is clearly pro-poorest.

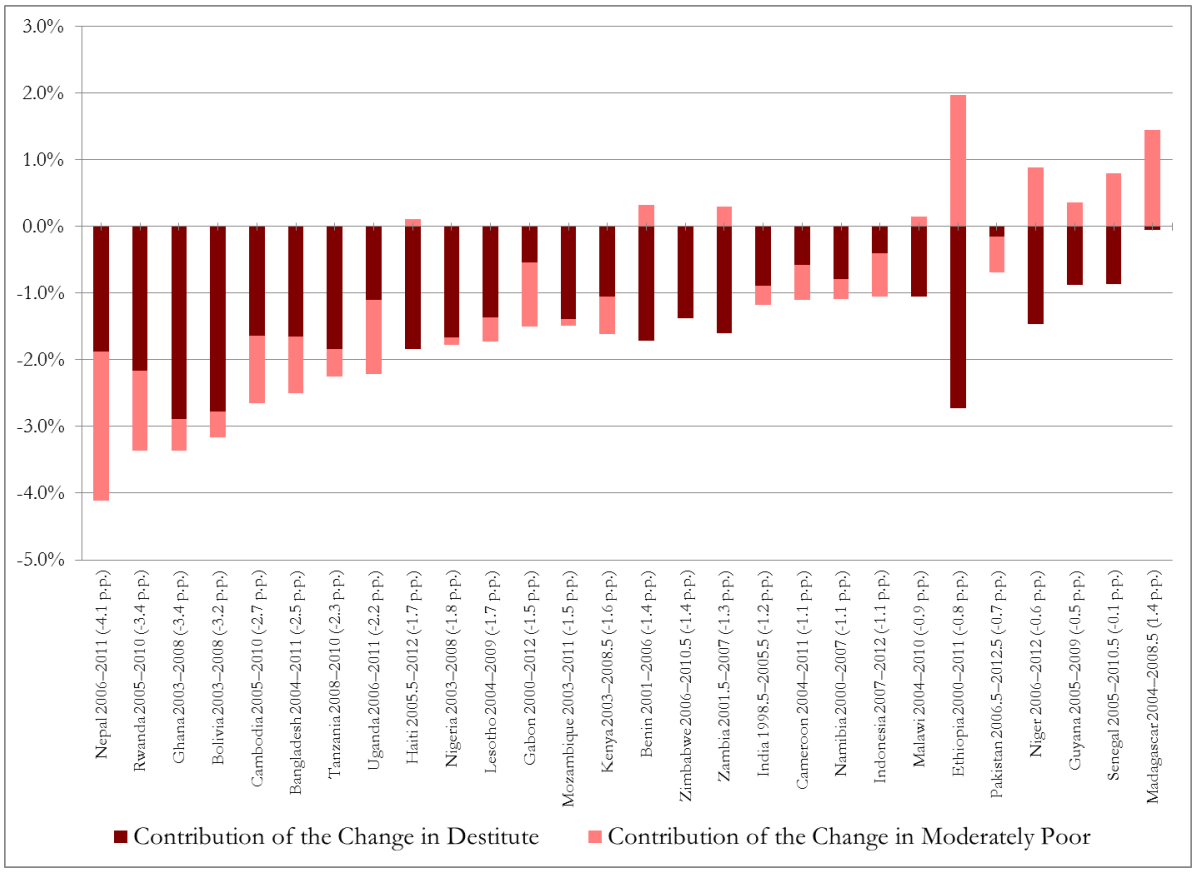
Between 2000 and 2011, Ethiopia reduced the percentage of the population who were destitute by fully 30 percentage points and reduced intensity among the destitute by 10 percentage points. It achieved significant reductions in all indicators and the strongest gains in water, sanitation, and educational variables.

Comparing the annualized absolute changes in the MPI poverty headcount ratio (Table 3) and in the MPI_T^D destitute headcount (Table A.11), performance is not uniform across both the poor and the subset who are destitute. Of course this also depends upon initial levels of destitution. Figure 5 illustrates the decomposition of the change in the multidimensional headcount ratio into change according to two groups: those who are destitute and the non-destitute poor, whom we call 'moderately poor', following the methodology developed by Alkire and Seth (2015).[35]

For instance Ethiopia, Pakistan, and Malawi reduced the incidence of multidimensional poverty at similar absolute rates, between 0.7 and 0.9 percentage points per year. But patterns vary: in Malawi, the most pro-poor, destitute people mostly moved out of poverty altogether. Ethiopia mostly graduated destitute people to moderate poverty. Pakistan, the least pro-poor, reduced moderate poverty, leaving destitution nearly untouched. These comparisons need to be made carefully, however.

35 We are grateful to Suman Seth for this graphic.

Figure 5: Breaking Down the Change in Multidimensional Headcount Ratio into Change in Moderate Poverty and Change in Destitute



The incidence of destitution at the starting year was much higher in Ethiopia, 82.1% in 2000, than in Pakistan, 23.2% in 2007. In Ethiopia the destitute represented 87.7% of the MPI poor, while in Pakistan this proportion was only 47.0%. Therefore, the scope for absolute reduction of destitution incidence was much higher in Ethiopia than in Pakistan.

Similarly, Gabon and Mozambique both cut poverty incidence at the same rate, but Gabon predominantly reduced moderate poverty, whereas in Mozambique, which was more pro-poor, more destitute people exited poverty. Again, in Mozambique the incidence of destitution was 48.5% and the destitute represented 58.9% of the MPI poor; while in Gabon the incidence of destitution was only 10.0% and the destitute represented 28.1% of the MPI poor.

The rural absolute reductions in destitution were statistically significant in 27 countries, which have higher rates of destitution; urban reductions were significant in 20 countries (Table A.12 in Annex 1). In terms of destitution indicators, Cambodia, the Dominican Republic, Ethiopia (2000–2005), Haiti, India, Indonesia, Mozambique, Niger, and Rwanda have registered reductions significant at least at the 5% level in all censored headcount ratios.

7 Concluding Remarks

This paper set out a systemic account of changes over time in multidimensional poverty using the Alkire-Foster Adjusted Headcount Ratio and its consistent sub-indices. It also scrutinized various approaches to assessing the pro-poorness of multidimensional poverty reduction. These techniques were applied to the analysis of changes in multidimensional poverty based on the global MPI and related destitution measure. The analysis focused on 34 countries, covering 2.5 billion people, for which there is a recent MPI estimation and comparable DHS dataset for analysis across time. A rigorous standardization of the MPI indicator sets and parameters were undertaken for those countries for which changes in the survey questionnaire may affect comparability.

Fully 31 out of the 34 countries considered in this paper significantly reduced multidimensional poverty over two or three periods, and 28 of these reduced destitution. Nepal, Rwanda, Ghana, and Tanzania were the best performers in reducing MPI in absolute terms. Armenia, the Dominican Republic, and Bolivia achieved the fastest reductions in relative terms. The relationships between the pace of multidimensional poverty reduction and reduction in $1.25/day poverty were variable, which suggests each measure merits separate analysis.

The paper also assessed different paths to poverty reduction. Methodologically, we considered various approaches to measuring the incidence or intensity effect in reducing the Adjusted Headcount Ratio of multidimensional poverty. Despite being an attractive technique, we found that Shapley decompositions require assumptions that could not be justified empirically in cross-sectional datasets. So we analyse the absolute rates of change in headcount (H) and intensity (A) by countries and region and find an informative range of relative rates of reduction of these two partial indices. Most countries reduced poverty relatively more through a reduction in the incidence of poverty, although in Ethiopia and Niger the MPI was mainly reduced by a decrease in the intensity of deprivation among the poor. This finding demonstrated empirically the value-added of using the adjusted headcount measure MPI, rather than merely a headcount ratio. In terms of dimensional changes, we found significant changes in all ten MPI indicators. The dimensional reduction profile varied across country. Deprivation in nutrition reduced the most in Sub-Saharan Africa and Latin America and the Caribbean, while education indicators did in South Asia. Naturally, panel data would permit a more precise analysis of dimensional pathways to multidimensional poverty reduction.

Next, the paper assessed the extent to which poverty reduction has been pro-poor by decomposing MPI by rural-urban areas, by subnational regions, and by ethnic groups. We found convergence between urban and rural areas in all countries but significant reduction in urban areas only in six countries, as opposed to 30 countries with respect to rural areas. A total of 208 subnational regions, representing 78%

of our sample, showed a statistically significant reduction in MPI. In terms of pro-poor subnational analysis, in 9 out of the 31 countries having regional decompositions, the poorest region experienced the fastest reduction. Countries like Uganda or Nigeria are negative cases where poverty reduction was driven by only a few regions. Finally, three country examples were presented to illustrate decomposition by ethnicity. In Benin, the poorest ethnic groups reduced poverty more slowly, leading to an increase in horizontal inequality; in Ghana ethnic groups reduced poverty at a similar rate, while Kenya's MPI reduction greatly decreased disparities between ethnic groups.

This study could be expanded by harmonizing existing data from the Multiple Indicator Cluster Surveys (MICS) with other MICS and DHS surveys, as well as by including other national household surveys. In addition, 64 new datasets covering 52 countries are expected to be released within three years. Therefore, there is potential to expand this time series analysis for multidimensional poverty monitoring significantly.

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Annex 1: Tables

Table A.1: Levels, Changes and Statistical Significance of Changes in Incidence (H_T)

	Multidimensional Headcount Ratio (H_T)				Annualized Change		t-statistics for difference	
	Year 1		Year 2		Absolute	% Relative		
Armenia 2005–2010	.8	(.2)	.3	(.1)	-.1	-17.6%	2.21	**
Bangladesh 2004–2007	67.1	(.9)	59.0	(1.1)	-2.7	-4.2%	5.03	***
Bangladesh 2007–2011	59.0	(1.1)	49.6	(.9)	-2.4	-4.2%	6.76	***
Benin 2001–2006	79.1	(.9)	72.1	(.8)	-1.4	-1.8%	5.63	***
Bolivia 2003–2008	36.3	(.8)	20.5	(.7)	-3.2	-10.8%	13.15	***
Cambodia 2005–2010	59.2	(1.1)	45.9	(1.1)	-2.7	-5.0%	8.57	***
Cameroon 2004–2011	53.8	(1.3)	46.0	(1.1)	-1.1	-2.2%	4.77	***
Colombia 2005–2010	9.0	(.3)	5.7	(.2)	-.7	-8.9%	8.05	***
Dominican Rep. 2002–2007	9.3	(.4)	5.1	(.3)	-.8	-11.5%	8.59	***
Egypt 2005–2008	8.2	(.4)	6.0	(.3)	-.8	-10.2%	4.69	***
Ethiopia 2000–2005	93.6	(.4)	89.9	(.6)	-.7	-0.8%	3.32	***
Ethiopia 2005–2011	89.9	(.6)	85.2	(.9)	-.8	-0.9%	4.17	***
Gabon 2000–2012	35.4	(1.2)	17.4	(1.0)	-1.5	-5.7%	10.83	***
Ghana 2003–2008	58.7	(1.1)	41.9	(1.2)	-3.4	-6.5%	9.74	***
Guyana 2005–2009	12.7	(1.0)	10.6	(.6)	-.5	-4.4%	1.76	*
Haiti 2005/6–2012	60.6	(1.5)	49.4	(1.3)	-1.7	-3.1%	5.19	***
India 1998/9–2005/6	57.3	(.4)	49.0	(.4)	-1.2	-2.2%	13.43	***
Indonesia 2007–2012	20.8	(.5)	15.5	(.4)	-1.1	-5.7%	8.15	***
Jordan 2007–2009	3.6	(.6)	3.0	(.4)	-.3	-7.8%	0.79	
Kenya 2003–2008/9	60.1	(1.2)	51.2	(1.6)	-1.6	-2.9%	4.18	***
Lesotho 2004–2009	50.8	(1.0)	42.2	(1.4)	-1.7	-3.7%	4.76	***
Madagascar 2004–2008/9	67.0	(2.1)	73.3	(1.1)	1.4	2.0%	2.87	***
Malawi 2004–2010	72.1	(1.0)	66.7	(.8)	-.9	-1.3%	4.33	***
Mozambique 2003–2011	82.3	(.7)	70.3	(1.0)	-1.5	-1.9%	9.90	***
Namibia 2000–2007	41.3	(1.6)	33.7	(1.0)	-1.1	-2.9%	3.03	***
Nepal 2006–2011	64.7	(2.0)	44.2	(2.0)	-4.1	-7.4%	7.30	***
Niger 2006–2012	93.5	(.5)	90.0	(.6)	-.6	-0.6%	4.62	***
Nigeria 2003–2008	63.5	(1.6)	54.7	(.9)	-1.8	-3.0%	4.56	***
Pakistan 2006/7–2012/13	49.4	(.8)	45.2	(1.3)	-.7	-1.5%	2.63	***
Peru 2005–2008	19.5	(1.4)	15.7	(.7)	-1.3	-6.9%	1.68	*
Peru 2008–2012	15.7	(.7)	10.5	(.4)	-1.3	-9.6%	5.55	***
Rwanda 2005–2010	82.9	(.8)	66.1	(1.0)	-3.4	-4.4%	12.60	***
Senegal 2005–2010/11	71.2	(2.4)	70.8	(1.5)	-.1	-0.1%	0.15	
Tanzania 2008–2010	65.6	(1.2)	61.1	(1.1)	-2.3	-3.5%	2.88	***
Uganda 2006–2011	77.9	(1.1)	66.8	(1.5)	-2.2	-3.0%	5.25	***
Zambia 2001/2–2007	72.0	(1.3)	64.8	(1.2)	-1.3	-1.9%	3.09	***
Zimbabwe 2006–2010/11	39.7	(1.1)	33.5	(1.1)	-1.4	-3.7%	3.98	***

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10
Standard errors reported between brackets.

Table A.2: Levels, Changes and Statistical Significance of Changes in Intensity (A_T)

	Intensity of Poverty (A_T)		Annualized Change		t-statistics for difference	
	Year 1	Year 2	Absolute	% Relative		
Armenia 2005–2010	35.4 (.9)	35.2 (1.7)	-.1	-0.2%	0.13	
Bangladesh 2004–2007	54.3 (.3)	51.8 (.3)	-.8	-1.6%	4.84	***
Bangladesh 2007–2011	51.8 (.3)	49.3 (.4)	-.6	-1.2%	4.69	***
Benin 2001–2006	59.9 (.6)	57.4 (.4)	-.5	-0.9%	3.61	***
Bolivia 2003–2008	48.3 (.3)	43.7 (.4)	-.9	-2.0%	8.87	***
Cambodia 2005–2010	50.5 (.4)	46.1 (.3)	-.9	-1.8%	8.68	***
Cameroon 2004–2011	55.3 (.7)	53.8 (.7)	-.2	-0.4%	1.48	
Colombia 2005–2010	42.9 (.4)	41.0 (.3)	-.4	-0.9%	4.02	***
Dominican Rep. 2002–2007	43.1 (.3)	39.4 (.3)	-.7	-1.8%	7.60	***
Egypt 2005–2008	41.4 (.4)	40.7 (.4)	-.2	-0.5%	1.17	
Ethiopia 2000–2005	72.3 (.3)	67.2 (.4)	-1.0	-1.4%	8.64	***
Ethiopia 2005–2011	67.2 (.4)	61.8 (.5)	-.9	-1.4%	8.65	***
Gabon 2000–2012	45.5 (.4)	43.3 (.4)	-.2	-0.4%	3.46	***
Ghana 2003–2008	52.5 (.4)	48.1 (.5)	-.9	-1.7%	6.53	***
Guyana 2005–2009	39.2 (.8)	39.0 (.5)	.0	-0.1%	0.18	
Haiti 2005/6–2012	55.3 (.7)	50.3 (.5)	-.8	-1.5%	6.21	***
India 1998/9–2005/6	53.1 (.1)	51.9 (.2)	-.2	-0.3%	4.90	***
Indonesia 2007–2012	45.9 (.3)	42.9 (.2)	-.6	-1.3%	8.11	***
Jordan 2007–2009	35.5 (.5)	34.6 (.5)	-.4	-1.2%	1.23	
Kenya 2003–2008/9	49.3 (.5)	47.7 (.7)	-.3	-0.6%	1.87	*
Lesotho 2004–2009	46.8 (.3)	45.0 (.4)	-.4	-0.8%	3.23	***
Madagascar 2004–2008/9	55.8 (.6)	56.5 (.4)	.2	0.3%	0.94	
Malawi 2004–2010	52.8 (.3)	50.1 (.3)	-.4	-0.9%	7.01	***
Mozambique 2003–2011	61.3 (.4)	55.9 (.4)	-.7	-1.2%	9.93	***
Namibia 2000–2007	47.1 (.6)	45.8 (.4)	-.2	-0.4%	1.67	*
Nepal 2006–2011	54.0 (.6)	49.0 (.7)	-1.0	-1.9%	5.68	***
Niger 2006–2012	74.4 (.6)	69.0 (.5)	-.9	-1.3%	7.45	***
Nigeria 2003–2008	57.9 (.7)	57.3 (.4)	-.1	-0.2%	0.57	
Pakistan 2006/7–2012/13	53.4 (.4)	51.8 (.6)	-.3	-0.5%	2.29	**
Peru 2005–2008	43.7 (.5)	42.2 (.4)	-.5	-1.1%	2.23	**
Peru 2008–2012	42.2 (.4)	41.0 (.3)	-.3	-0.7%	2.53	**
Rwanda 2005–2010	55.6 (.3)	49.9 (.3)	-1.1	-2.1%	12.98	***
Senegal 2005–2010/11	61.8 (1.0)	59.7 (.7)	-.4	-0.6%	1.94	*
Tanzania 2008–2010	56.6 (.5)	54.8 (.4)	-.9	-1.6%	3.07	***
Uganda 2006–2011	53.9 (.4)	51.4 (.5)	-.5	-0.9%	3.66	***
Zambia 2001/2–2007	55.1 (.4)	51.2 (.4)	-.7	-1.3%	6.98	***
Zimbabwe 2006–2010/11	45.3 (.3)	43.2 (.3)	-.5	-1.0%	4.51	***

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10
Standard errors reported between brackets.

Table A.3: Multidimensional Poverty and GNI Per Capita Growth

Countries	Multidimensional Poverty			GNI per capita[1]	
	MPI_T Year 1	Annualized absolute change in MPI_T	Annualized relative change in MPI_T	GNI per capita in Year 1, Atlas method (current US$)	Average GNI per capita growth (annual %)
Armenia 2005–2010	0.003	0.000	-17.7%	1,500	6.5%
Bangladesh 2004–2007	0.364	-0.020	-5.7%	430	5.4%
Bangladesh 2007–2011	0.306	-0.015	-5.4%	510	5.5%
Benin 2001–2006	0.474	-0.012	-2.7%	360	0.7%
Bolivia 2003–2008	0.175	-0.017	-12.6%	900	2.5%
Cambodia 2005–2010	0.299	-0.017	-6.7%	460	6.1%
Cameroon 2004–2011	0.298	-0.007	-2.6%	800	0.8%
Colombia 2005–2010	0.039	-0.003	-9.8%	2,930	2.9%
Dominican Rep. 2002–2007	0.040	-0.004	-13.0%	2,780	4.3%
Egypt 2005–2008	0.034	-0.003	-10.7%	1,290	4.9%
Ethiopia 2000–2005	0.677	-0.014	-2.2%	120	3.6%
Ethiopia 2005–2011	0.604	-0.013	-2.3%	160	8.2%
Gabon 2000–2012	0.161	-0.007	-6.1%	3,100	-0.1%
Ghana 2003–2008	0.309	-0.021	-8.1%	320	4.8%
Guyana 2005–2009[3]	0.050	-0.002	-4.5%	1,070	0.0%
Haiti 2005/6–2012[2]	0.335	-0.013	-4.5%	445	0.2%
India 1998/9–2005/6[2]	0.304	-0.007	-2.5%	435	5.1%
Indonesia 2007–2012	0.095	-0.006	-7.0%	1,610	4.8%
Jordan 2007–2009	0.013	-0.001	-8.9%	3,030	4.5%
Kenya 2003–2008/9[2]	0.296	-0.009	-3.5%	410	2.0%
Lesotho 2004–2009	0.238	-0.010	-4.4%	750	-0.1%
Madagascar 2004–2008/9[2]	0.374	0.009	2.3%	290	2.0%
Malawi 2004–2010	0.381	-0.008	-2.2%	220	0.8%
Mozambique 2003–2011	0.505	-0.014	-3.1%	230	4.7%
Namibia 2000–2007	0.194	-0.006	-3.2%	1,950	3.6%
Nepal 2006–2011	0.350	-0.027	-9.1%	350	3.1%
Niger 2006–2012[4]	0.696	-0.012	-1.9%	270	0.9%
Nigeria 2003–2008[3]	0.368	-0.011	-3.2%	410	-
Pakistan 2006/7–2012/13[2]	0.264	-0.005	-2.0%	845	1.8%
Peru 2005–2008	0.085	-0.006	-8.0%	2,700	6.7%
Peru 2008–2012	0.066	-0.006	-10.3%	4,020	5.7%
Rwanda 2005–2010	0.461	-0.026	-6.4%	260	5.6%
Senegal 2005–2010/11[2]	0.440	-0.003	-0.7%	770	1.1%
Tanzania 2008–2010	0.371	-0.018	-5.0%	450	3.5%
Uganda 2006–2011	0.420	-0.015	-3.9%	330	4.5%
Zambia 2001/2–2007[2]	0.397	-0.012	-3.2%	325	-1.4%
Zimbabwe 2006–2010/11[5]	0.180	-0.008	-4.7%	420	-

(1) Data downloaded from World Development Indicators website on January 15, 2014.

(2) In the cases where the survey referred to two years, the GNI per capita presented in the Table corresponds to the average GNI per capita of those two years.

(3) There is no official data on the GNI per capita for Guyana and Nigeria.

(4) The average of the GNI per capita growth for Niger was computed based on the periods 2009 and 2012, as there was no data for previous years.

(5) There is no income data for Zimbabwe.

Table A.4: Annualized Change in the Number of Poor

	MPI Headcount H_T (%)		POPULATION (in Thousands)		TOTAL MPI POOR (in Thousands)			
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Annual absolute change (p.p.)	Annual relative change (%)
Armenia 2005–2010	.8	.3	3,015	2,963	23	9	-3	-17.9%
Bangladesh 2004–2007	67.1	59.0	141,235	146,457	94,804	86,479	-2,775	-3.0%
Bangladesh 2007–2011	59.0	49.6	146,457	152,862	86,479	75,874	-2,651	-3.2%
Benin 2001–2006	79.1	72.1	7,175	8,444	5,674	6,089	83	1.4%
Bolivia 2003–2008	36.3	20.5	9,017	9,834	3,271	2,011	-252	-9.3%
Cambodia 2005–2010	59.2	45.9	13,356	14,365	7,904	6,593	-262	-3.6%
Cameroon 2004–2011	53.8	46.0	17,675	21,156	9,503	9,736	33	0.3%
Colombia 2005–2010	9.0	5.7	43,841	46,445	3,967	2,636	-266	-7.9%
Dominican Rep. 2002–2007	9.3	5.1	8,935	9,615	831	487	-69	-10.1%
Egypt 2005–2008	8.2	6.0	71,778	75,492	5,913	4,497	-472	-8.7%
Ethiopia 2000–2005	93.6	89.9	66,024	76,167	61,791	68,477	1,337	2.1%
Ethiopia 2005–2011	89.9	85.2	76,167	89,393	68,477	76,178	1,284	1.8%
Gabon 2000–2012	35.4	17.4	1,226	1,633	434	284	-12	-3.5%
Ghana 2003–2008	58.7	41.9	20,302	23,110	11,923	9,691	-446	-4.1%
Guyana 2005–2009	12.7	10.6	761	781	97	83	-3	-3.7%
Haiti 2006–2012	60.6	49.4	9,389	10,174	5,691	5,026	-111	-2.1%
India 1998/9–2005/6	57.3	49.0	1,025,015	1,143,289	587,273	560,315	-3,851	-0.7%
Indonesia 2007–2012	20.8	15.5	230,973	246,864	47,948	38,180	-1,954	-4.5%
Jordan 2007–2009	3.6	3.0	5,656	6,181	203	188	-7	-3.6%
Kenya 2003–2008/9	60.1	51.2	33,905	39,825	20,378	20,401	4	0.0%
Lesotho 2004–2009	50.8	42.2	1,912	1,990	971	839	-26	-2.9%
Madagascar 2004–2008/9	67.0	73.3	17,763	20,496	11,903	15,022	693	5.3%
Malawi 2004–2010	72.1	66.7	12,569	15,014	9,059	10,008	158	1.7%
Mozambique 2003–2011	82.3	70.3	19,873	24,581	16,353	17,289	117	0.7%
Namibia 2000–2007	41.3	33.7	1,898	2,081	784	701	-12	-1.6%
Nepal 2006–2011	64.7	44.2	25,634	27,156	16,596	12,003	-919	-6.3%
Niger 2006–2012	93.5	90.0	13,680	17,157	12,790	15,440	442	3.2%
Nigeria 2003–2008	63.5	54.7	132,550	151,208	84,223	82,653	-314	-0.4%
Pakistan 2006/7–2012/13	49.4	45.2	163,928	182,143	80,996	82,400	234	0.3%
Peru 2005–2008	19.5	15.7	27,723	28,626	5,413	4,508	-302	-5.9%
Peru 2008–2012	15.7	10.5	28,626	29,988	4,508	3,149	-340	-8.6%
Rwanda 2005–2010	82.9	66.1	9,429	10,837	7,819	7,165	-131	-1.7%
Senegal 2005–2010/11	71.2	70.8	11,271	13,331	8,026	9,445	258	3.0%
Tanzania 2008–2010	65.6	61.1	42,354	44,973	27,803	27,496	-154	-0.6%
Uganda 2006–2011	77.9	66.8	29,711	36,346	23,133	24,270	227	1.0%
Zambia 2001/2–2007	72.0	64.8	10,625	12,110	7,652	7,847	35	0.5%
Zimbabwe 2006–2010/11	39.7	33.5	12,724	13,359	5,050	4,475	-128	-2.7%

Note: Population figures correspond to United Nations, Department of Economic and Social Affairs, Population Division (2013). World Population Prospects: The 2012 Revision, DVD Edition. Figures for Senegal 2010/11 correspond to the average between both years. When the survey refers to two years, like Zambia 2001/2, we consider the population in the second year of the survey.

Table A.5: Annualized Absolute Change in Raw Headcount Ratios (percentage points)

	Years of schooling	Child school attendance	Child mortality	Nutrition	Electricity	Improved sanitation	Drinking water	Flooring	Cooking fuel	Asset ownership
Armenia 2005–2010	0.0	-0.1	-0.7***	0.1	0.0	2.4***	0.2	-0.2***	-0.6***	-1.4***
Bangladesh 2004–2007	-1.0**	-1.4***	-1.6***	-1.8***	-2.3**	-7.0***	0.0	-1.4**	-0.3	-0.1
Bangladesh 2007–2011	-1.3***	-0.6***	-1.2***	-1.6***	-3.1***	-3.0***	-0.1	-1.3***	-0.9***	1.2***
Benin 2001–2006	-1.2***	-2.1***	-1.5***	-0.6***	-0.8***	-0.5***	-0.3	0.3	0.0	-0.1
Bolivia 2003–2008	-0.3**	-5.2***	-0.9***	-0.3***	-1.8***	-3.9***	-1.4***	-0.8***	-0.7**	-1.6***
Cambodia 2005–2010	-1.3***	-2.3***	-1.7***	-0.4*	-2.3***	-2.5***	-0.6	-0.3**	-0.9***	-1.8***
Cameroon 2004–2011	-0.9***	-0.3	-0.2	0.0	-0.9***	-2.4***	0.0	-0.7***	0.0	-3.2***
Colombia 2005–2010	-0.3***	-0.7***	-0.3***	-0.4***	-0.2**	-0.7***	0.2	-0.4***	-0.4***	-1.1***
Dominican Rep. 2002–2007	-0.5***	-1.6***	-0.5***	-0.1***	-0.7***	-1.0***	1.7***	-0.5***	-0.3*	0.1
Egypt 2005–2008	0.0	-0.7***	-2.2***	0.1	-0.1*	-1.1***	-0.1	-0.6**	-	-0.3**
Ethiopia 2000–2005	-2.2***	-0.8**	-1.3***	-1.0***	-0.1	-1.0***	-6.0***	-0.2	0.1	-0.5***
Ethiopia 2005–2011	-2.3***	-2.8***	-0.7***	-0.8***	-1.2***	-0.6***	2.3***	-0.8***	0.2**	-0.6***
Gabon 2000–2012	-0.5***	-0.5***	-0.2	-0.3***	-1.6***	-0.9***	-1.0***	-1.1***	-1.9***	-0.6***
Ghana 2003–2008	-1.0***	-4.4***	-1.1***	-0.8***	-2.4***	-0.9***	-3.5***	0.6**	-0.7***	-2.2***
Guyana 2005–2009	0.2**	0.4***	-0.7***	-	-0.4	-1.2**	0.0	-0.1	-0.6	-1.0**
Haiti 2006–2012	-1.3***	-1.6***	-0.7***	-1.1***	-0.7	-1.5***	0.5	-0.2	0.2*	-3.3***
India 1998/9–2005/6	-0.5***	-0.2**	-0.6***	-0.6***	-0.9***	-1.6***	-1.1***	-1.6***	-0.3***	-0.8***
Indonesia 2007–2012	-0.2***	-0.4***	-0.5***	-	-1.0***	-2.2***	-2.1***	-0.8***	-3.1***	-3.2***
Jordan 2007–2009	0.4***	2.9***	-0.1	-2.1***	-0.5***	-1.1***	0.0	0.0	0.0	-0.1
Kenya 2003–2008/9	-0.6**	-0.4*	-0.9***	0.0	-0.9**	-2.6***	-2.8***	-0.8*	0.5*	-0.4
Lesotho 2004–2009	-0.6***	-1.1***	-0.8***	-0.2	-2.0***	-1.7***	-1.1**	-1.1***	-0.5	0.2
Madagascar 2004–2008/9	1.1**	0.0	0.8**	2.8***	0.5	-0.4***	-1.8**	-0.2	0.1***	-1.2**
Malawi 2004–2010	-0.9***	-1.1***	1.0***	-0.5***	-0.4***	-1.3***	-2.1***	-0.5*	0.1	-1.7***
Mozambique 2003–2011	-2.2***	-1.4***	-1.1***	-0.5***	-1.5***	-2.4***	-0.4*	-0.2	-0.1	-1.0***
Namibia 2000–2007	-0.2	-0.7***	0.0	-0.4**	-1.1**	-1.2***	-0.9**	-1.2**	-0.5	-1.2***
Nepal 2006–2011	-1.6***	-1.5***	-2.0***	-2.4***	-5.3***	-3.1***	-0.8*	-1.3**	-1.5***	-6.2***
Niger 2006–2012	-1.0***	-2.0***	-1.6***	-0.7**	-0.8***	-0.9***	-2.0***	-0.6**	0.0	-0.2
Nigeria 2003–2008	-0.4	-0.7**	-1.2***	-0.6**	0.7	-4.6***	-3.4***	0.4	0.3	-0.3
Pakistan 2007–2013	-0.4**	-0.9***	-0.1	-	-0.5*	-1.8***	-0.1	-0.7**	-0.6*	-1.9***
Peru 2005–2008	0.1	-0.2	-0.5*	-0.3*	-2.4**	-4.0***	-1.6	0.7	-0.7	-2.0**
Peru 2008–2012	-0.3***	0.0	-0.5***	0.1	-1.9***	-0.3	-1.0***	-1.1***	-1.6***	-2.8***
Rwanda 2005–2010	-1.6***	-1.7***	-1.5***	-1.6***	-1.0***	-7.4***	-4.8***	-1.0***	0.0	-1.5***
Senegal 2005–2010/11	-1.1***	0.1	-0.7	1.6***	-1.8***	-1.7***	-1.9***	-0.3	2.0***	-0.6
Tanzania 2008–2010	-0.7	0.5	-2.8***	-	-1.3**	-4.6***	1.5	-1.6**	-0.5*	-4.5***
Uganda 2006–2011	-0.2	-0.8***	-1.3***	-0.7*	-0.9***	-2.2***	-3.5***	-0.7	-0.1***	-4.1***
Zambia 2001/2–2007	-0.1	-2.7***	-0.2	-2.0***	-0.1	-1.6***	1.7***	0.2	0.1	-2.4***
Zimbabwe 2006–2010/11	-0.1**	-1.1***	0.2	-0.7***	0.1	1.1***	-0.7	-0.8**	0.6	-3.1***

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10

Table A.6: Annualized Absolute Change in Censored Headcount Ratios (percentage points)

	Years of schooling	Child school attendance	Child mortality	Nutrition	Electricity	Improved sanitation	Drinking water	Flooring	Cooking fuel	Asset ownership
Armenia 2005–2010	0.0	0.0	-0.1**	0.0	0.0	-0.1**	0.0	0.0	-0.0**	-0.0**
Bangladesh 2004–2007	-1.1**	-1.4***	-1.8***	-2.2***	-2.6***	-5.8***	0.0	-2.8***	-2.6***	-2.0***
Bangladesh 2007–2011	-1.4***	-0.8***	-1.3***	-1.8***	-2.8***	-2.7***	-0.2	-2.2***	-2.3***	-1.4***
Benin 2001–2006	-1.2***	-1.9***	-1.6***	-0.7***	-1.3***	-1.5***	-0.6	0.1	-1.4***	-0.5*
Bolivia 2003–2008	-0.4***	-3.9***	-1.5***	-0.4***	-2.2***	-3.1***	-1.6***	-1.9***	-2.1***	-1.7***
Cambodia 2005–2010	-1.4***	-2.3***	-2.0***	-1.1***	-2.7***	-2.8***	-1.2***	-0.3**	-2.7***	-1.7***
Cameroon 2004–2011	-0.9***	-0.3	-0.5**	0.0	-1.1***	-2.1***	-0.4	-1.0***	-1.1***	-2.2***
Colombia 2005–2010	-0.3***	-0.4***	-0.2***	-0.3***	-0.2***	-0.4***	-0.1**	-0.3***	-0.5***	-0.5***
Dominican Rep. 2002–2007	-0.5***	-0.7***	-0.4***	-0.2***	-0.4***	-0.4***	-0.1**	-0.3***	-0.4***	-0.4***
Egypt 2005–2008	-0.2*	-0.6***	-0.8***	0.0	0.0	-0.3***	0.0	-0.3***	-	-0.2***
Ethiopia 2000–2005	-2.2***	-0.9***	-1.3***	-1.0***	-0.4	-1.4***	-5.9***	-0.5*	-0.6**	-0.8***
Ethiopia 2005–2011	-2.3***	-2.8***	-0.7***	-0.9***	-1.3***	-1.1***	2.0***	-1.1***	-0.7***	-1.0***
Gabon 2000–2012	-0.4***	-0.4***	-0.6***	-0.4***	-1.2***	-1.4***	-1.0***	-1.0***	-1.4***	-1.2***
Ghana 2003–2008	-1.1***	-4.1***	-1.5***	-1.1***	-2.8***	-3.5***	-3.2***	0.1	-3.3***	-2.5***
Guyana 2005–2009	0.1***	0.1**	-0.7**	-	-0.1	-0.4**	0.0	0.0	0.0	0.0
Haiti 2006–2012	-1.3***	-1.6***	-1.1***	-1.1***	-1.6***	-1.8***	-0.2	-0.7**	-1.7***	-2.8***
India 1998/9–2005/6	-0.5***	-0.3***	-0.6***	-0.7***	-0.9***	-1.5***	-0.9***	-1.3***	-1.1***	-1.0***
Indonesia 2007–2012	-0.3***	-0.5***	-0.5***	-	-0.5***	-1.0***	-0.8***	-0.5***	-1.2***	-1.2***
Jordan 2007–2009	0.1	0.2	-0.1	-0.7***	0.0	-0.1	-0.1	0.0	0.0	0.0
Kenya 2003–2008/9	-0.6**	-0.4*	-0.9***	-0.1	-1.7***	-2.4***	-2.6***	-1.5***	-1.5***	-1.4***
Lesotho 2004–2009	-0.6***	-0.9***	-0.7***	-0.3	-1.9***	-2.1***	-1.1***	-1.6***	-1.5***	-1.6***
Madagascar 2004–2008/9	1.1**	0.1	0.8**	2.5***	1.2***	1.2**	-0.8	-0.2	1.4***	-0.2
Malawi 2004–2010	-0.9***	-1.1***	0.8***	-0.6***	-1.1***	-1.5***	-2.1***	-1.2***	-0.9***	-1.6***
Mozambique 2003–2011	-2.2***	-1.4***	-1.3***	-0.6***	-1.7***	-2.4***	-0.9***	-1.0***	-1.5***	-1.3***
Namibia 2000–2007	-0.2	-0.7***	-0.1	-0.4***	-1.1***	-1.0***	-0.9***	-1.1***	-0.9**	-1.1***
Nepal 2006–2011	-1.8***	-1.5***	-2.3***	-3.0***	-4.7***	-3.7***	-1.1***	-3.7***	-4.1***	-5.0***
Niger 2006–2012	-1.0***	-2.0***	-1.7***	-0.9***	-0.9***	-1.1***	-2.1***	-0.8***	-0.6***	-0.4
Nigeria 2003–2008	-0.4	-0.7**	-1.6***	-0.8***	-0.1	-4.4***	-2.8***	0.2	-1.5***	-0.8**
Pakistan 2007–2013	-0.5***	-0.8***	-0.1	-	-0.5	-1.2***	-0.1	-0.8***	-0.7**	-1.4***
Peru 2005–2008	0.1	-0.3	-0.5*	-0.3**	-1.5**	-2.1***	-1.1*	-0.7	-1.2*	-1.3*
Peru 2008–2012	-0.4***	-0.1*	-0.5***	0.0	-1.3***	-0.9***	-1.1***	-1.3***	-1.3***	-1.6***
Rwanda 2005–2010	-1.6***	-1.7***	-1.7***	-1.7***	-3.5***	-7.6***	-5.6***	-3.3***	-3.4***	-3.7***
Senegal 2005–2010/11	-1.1***	0.2	-0.6	1.4***	-1.7***	-1.4***	-1.9***	-0.6	1.0**	-0.6
Tanzania 2008–2010	-0.7	0.3	-2.8***	-	-2.3***	-3.8***	-0.8	-2.1**	-2.3***	-3.5***
Uganda 2006–2011	-0.3	-0.8**	-1.6***	-0.7*	-2.2***	-3.4***	-3.9***	-1.8***	-2.2***	-3.9***
Zambia 2001/2–2007	-0.1	-2.5***	-0.5*	-1.9***	-1.1**	-1.9***	0.6	-0.5	-1.1**	-2.3***
Zimbabwe 2006–2010/11	-0.1*	-1.1***	0.0	-0.6***	-1.5***	-1.0***	-1.1***	-1.4***	-1.4***	-2.2***

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10

Table A.7: Indicators Contribution to Annualized Absolute Change in MPI_T

	Decomposition of change in MPI by indicator (%)									
	Years of schooling	**Child school attendance**	**Child mortality**	**Nutrition**	**Electricity**	**Improved sanitation**	**Drinking water**	**Flooring**	**Cooking fuel**	**Asset ownership**
Armenia 2005–2010	1%	23%	48%	-4%	1%	11%	3%	3%	7%	6%
Bangladesh 2004–2007	9%	12%	15%	19%	7%	16%	0%	8%	7%	6%
Bangladesh 2007–2011	15%	8%	14%	20%	10%	10%	1%	8%	9%	5%
Benin 2001–2006	17%	26%	23%	9%	6%	7%	3%	0%	6%	2%
Bolivia 2003–2008	4%	37%	14%	4%	7%	10%	5%	6%	7%	5%
Cambodia 2005–2010	13%	22%	19%	10%	9%	9%	4%	1%	8%	5%
Cameroon 2004–2011	20%	8%	11%	0%	8%	16%	3%	8%	8%	17%
Colombia 2005–2010	16%	21%	13%	14%	3%	7%	3%	5%	9%	9%
Dominican Rep. 2002–2007	20%	31%	16%	7%	5%	5%	2%	5%	5%	5%
Egypt 2005–2008	8%	33%	39%	2%	1%	7%	0%	7%	-	4%
Ethiopia 2000–2005	26%	10%	16%	11%	2%	5%	23%	2%	2%	3%
Ethiopia 2005–2011	30%	35%	9%	11%	6%	5%	-9%	5%	3%	4%
Gabon 2000–2012	10%	10%	14%	10%	9%	11%	8%	8%	11%	9%
Ghana 2003–2008	9%	32%	11%	9%	7%	9%	8%	0%	9%	6%
Guyana 2005–2009	-12%	-12%	110%	-	3%	12%	0%	-1%	0%	0%
Haiti 2006–2012	17%	20%	14%	13%	7%	7%	1%	3%	7%	12%
India 1998/9–2005/6	12%	6%	15%	16%	7%	11%	7%	10%	8%	8%
Indonesia 2007–2012	9%	14%	27%	-	5%	10%	8%	5%	11%	11%
Jordan 2007–2009	-9%	-35%	19%	111%	2%	7%	5%	-1%	1%	0%
Kenya 2003–2008/9	10%	8%	16%	2%	10%	14%	15%	9%	9%	8%
Lesotho 2004–2009	11%	16%	12%	5%	11%	12%	6%	9%	9%	9%
Madagascar 2004–2008/9	20%	1%	15%	47%	8%	8%	-5%	-2%	9%	-1%
Malawi 2004–2010	20%	24%	-16%	12%	8%	11%	15%	8%	6%	11%
Mozambique 2003–2011	26%	17%	15%	7%	7%	10%	3%	4%	6%	5%
Namibia 2000–2007	5%	20%	4%	13%	11%	10%	8%	11%	9%	11%
Nepal 2006–2011	11%	9%	14%	19%	10%	8%	2%	8%	8%	10%
Niger 2006–2012	13%	27%	22%	11%	4%	5%	9%	3%	3%	2%
Nigeria 2003–2008	7%	11%	24%	11%	1%	23%	14%	-1%	7%	4%
Pakistan 2007–2013	16%	27%	3%	-	5%	14%	1%	9%	8%	16%
Peru 2005–2008	-1%	8%	14%	9%	14%	19%	9%	6%	11%	12%
Peru 2008–2012	11%	4%	14%	1%	12%	8%	10%	12%	13%	15%
Rwanda 2005–2010	10%	11%	11%	11%	7%	16%	12%	7%	7%	8%
Senegal 2005–2010/11	60%	-8%	29%	-75%	31%	24%	34%	11%	-17%	11%
Tanzania 2008–2010	9%	-3%	34%	-	9%	16%	3%	9%	9%	14%
Uganda 2006–2011	4%	8%	17%	8%	8%	12%	14%	6%	8%	14%
Zambia 2001/2–2007	1%	36%	8%	26%	5%	9%	-3%	2%	5%	11%
Zimbabwe 2006–2010/11	3%	23%	0%	13%	11%	7%	8%	10%	10%	15%

Table A.8: Levels and Changes in MPI_T, H_T, and A_T by Urban and Rural areas

	Changes in MPI_T															
	Urban Areas								Rural Areas							
	Multidimensional Poverty Index (MPI_T)				Annualized change		t-statistics for difference		Multidimensional Poverty Index (MPI_T)				Annualized change		t-statistics for difference	
	Year 1		Year 2		Absolute	% Relative			Year 1		Year 2		Absolute	% Relative		
Armenia 2005–2010	.000	(.000)	.001	(.001)	.000	27.0%	0.93		.007	(.001)	.001	(.001)	-.001	-26.5%	3.09	***
Bangladesh 2004–2007	.247	(.015)	.184	(.013)	-.021	-9.5%	3.13	***	.397	(.007)	.340	(.008)	-.019	-5.0%	5.00	***
Bangladesh 2007–2011	.184	(.013)	.121	(.007)	-.016	-10.0%	4.20	***	.340	(.008)	.284	(.007)	-.014	-4.4%	5.40	***
Benin 2001–2006	.314	(.014)	.265	(.010)	-.010	-3.3%	2.56	**	.563	(.010)	.505	(.007)	-.012	-2.2%	4.96	***
Bolivia 2003–2008	.063	(.003)	.019	(.002)	-.009	-21.2%	8.49	***	.356	(.009)	.191	(.008)	-.033	-11.7%	14.14	***
Cambodia 2005–2010	.168	(.014)	.051	(.006)	-.023	-21.2%	7.54	***	.322	(.007)	.247	(.007)	-.015	-5.2%	7.66	***
Cameroon 2004–2011	.141	(.011)	.091	(.006)	-.007	-6.2%	4.12	***	.445	(.011)	.393	(.011)	-.007	-1.8%	3.36	***
Colombia 2005–2010	.012	(.001)	.008	(.001)	-.001	-7.3%	4.37	***	.111	(.006)	.067	(.003)	-.009	-9.7%	7.30	***
Dominican Rep. 2002–2007	.022	(.002)	.010	(.001)	-.002	-14.4%	6.52	***	.073	(.004)	.042	(.002)	-.006	-10.5%	6.67	***
Egypt 2005–2008	.013	(.002)	.010	(.001)	-.001	-10.3%	1.79	*	.049	(.003)	.035	(.002)	-.004	-10.3%	4.22	***
Ethiopia 2000–2005	.318	(.018)	.184	(.018)	-.027	-10.3%	5.11	***	.736	(.003)	.661	(.006)	-.015	-2.1%	11.22	***
Ethiopia 2005–2011	.184	(.018)	.201	(.021)	.003	1.5%	0.64		.661	(.006)	.598	(.007)	-.011	-1.7%	7.06	***
Gabon 2000–2012	.096	(.007)	.048	(.004)	-.004	-5.7%	6.30	***	.316	(.012)	.221	(.013)	-.008	-2.9%	5.38	***
Ghana 2003–2008	.165	(.012)	.089	(.007)	-.015	-11.6%	5.33	***	.412	(.008)	.289	(.010)	-.025	-6.9%	9.00	***
Guyana 2005–2009	.051	(.005)	.029	(.004)	-.006	-13.2%	3.48	***	.049	(.006)	.046	(.003)	-.001	-1.6%	0.49	
Haiti 2005/6–2012	.160	(.010)	.112	(.008)	-.007	-5.3%	3.66	***	.444	(.014)	.341	(.012)	-.016	-4.0%	5.74	***
India 1998/9–2005/6	.118	(.005)	.098	(.004)	-.003	-2.6%	3.16	***	.372	(.002)	.323	(.003)	-.007	-2.0%	11.01	***
Indonesia 2007–2012	.055	(.004)	.039	(.002)	-.003	-6.3%	3.55	***	.126	(.004)	.093	(.003)	-.006	-5.8%	6.20	***
Jordan 2007–2009	.012	(.002)	.010	(.001)	-.001	-10.2%	0.82		.017	(.004)	.015	(.003)	-.001	-4.4%	0.33	
Kenya 2003–2008/9	.119	(.010)	.074	(.010)	-.008	-8.3%	3.23	***	.340	(.009)	.285	(.010)	-.010	-3.1%	3.98	***
Lesotho 2004–2009	.081	(.008)	.063	(.007)	-.004	-4.9%	1.72	*	.272	(.006)	.230	(.009)	-.008	-3.3%	3.68	***
Madagascar 2004–2008/9	.195	(.012)	.154	(.009)	-.009	-5.0%	2.41	**	.423	(.018)	.456	(.008)	.007	1.7%	1.81	*
Malawi 2004–2010	.171	(.019)	.175	(.012)	.001	0.4%	0.18		.419	(.005)	.366	(.005)	-.009	-2.2%	7.43	***
Mozambique 2003–2011	.306	(.014)	.195	(.011)	-.014	-5.5%	6.23	***	.604	(.005)	.483	(.008)	-.015	-2.8%	13.56	***
Namibia 2000–2007	.052	(.007)	.051	(.005)	.000	-0.4%	0.13		.272	(.009)	.231	(.007)	-.006	-2.3%	3.19	***
Nepal 2006–2011	.137	(.013)	.069	(.008)	-.014	-12.8%	4.52	***	.388	(.015)	.238	(.013)	-.030	-9.3%	7.68	***
Niger 2006–2012	.384	(.014)	.289	(.012)	-.016	-4.6%	5.20	***	.764	(.007)	.686	(.007)	-.013	-1.8%	8.41	***
Nigeria 2003–2008	.206	(.014)	.136	(.007)	-.014	-8.0%	4.41	***	.451	(.014)	.403	(.008)	-.010	-2.2%	2.69	***
Pakistan 2007–2012/13	.141	(.006)	.112	(.007)	-.005	-3.7%	3.33	***	.326	(.007)	.294	(.011)	-.005	-1.7%	2.45	**
Peru 2005–2008	.016	(.003)	.016	(.002)	.000	-0.5%	0.06		.199	(.014)	.169	(.008)	-.010	-5.3%	1.79	*
Peru 2008–2012	.016	(.002)	.011	(.001)	-.001	-8.9%	2.57	**	.169	(.008)	.113	(.005)	-.014	-9.6%	5.78	***
Rwanda 2005–2010	.299	(.014)	.189	(.015)	-.022	-8.8%	4.02	***	.489	(.006)	.352	(.006)	-.027	-6.4%	16.71	***
Senegal 2005–2010/11	.224	(.017)	.221	(.014)	-.001	-0.3%	0.15		.616	(.015)	.585	(.012)	-.006	-0.9%	1.67	*
Tanzania 2008–2010	.201	(.014)	.175	(.018)	-.013	-6.8%	1.20		.418	(.009)	.382	(.008)	-.018	-4.5%	3.20	***
Uganda 2006–2011	.197	(.020)	.119	(.012)	-.016	-9.6%	3.06	***	.452	(.008)	.383	(.010)	-.014	-3.3%	5.27	***
Zambia 2001/2–2007	.217	(.014)	.155	(.014)	-.011	-5.9%	3.33	***	.497	(.008)	.429	(.007)	-.012	-2.6%	6.09	***
Zimbabwe 2006–2010/11	.019	(.003)	.033	(.005)	.003	13.1%	2.51	**	.252	(.007)	.193	(.006)	-.013	-5.8%	6.35	***

Table A.8: Levels and Changes in MPI_T, H_T, and A_T by Urban and Rural Areas (cont.)

	Changes in H_T															
	Urban Areas								Rural Areas							
	Multidimensional Headcount ratio (H_T)				Annualized change		t-statistics for difference		Multidimensional Headcount ratio (H_T)				Annualized change		t-statistics for difference	
	Year 1		Year 2		Absolute	% Relative			Year 1		Year 2		Absolute	% Relative		
Armenia 2005–2010	.1	(.0)	.2	(.2)	.0	27.0%	0.93		1.9	(.4)	.4	(.2)	-.3	-27.0%	3.17	***
Bangladesh 2004–2007	47.3	(2.5)	37.2	(2.4)	-3.4	-7.7%	2.98	***	72.6	(1.0)	65.3	(1.2)	-2.4	-3.5%	4.51	***
Bangladesh 2007–2011	37.2	(2.4)	26.1	(1.4)	-2.8	-8.4%	4.10	***	65.3	(1.2)	57.0	(1.1)	-2.1	-3.3%	5.12	***
Benin 2001–2006	57.9	(2.0)	49.7	(1.5)	-1.6	-3.0%	3.06	***	91.0	(.8)	85.8	(.8)	-1.0	-1.2%	4.50	***
Bolivia 2003–2008	14.8	(.8)	4.9	(.5)	-2.0	-19.9%	8.26	***	71.0	(1.4)	43.0	(1.5)	-5.6	-9.6%	13.55	***
Cambodia 2005–2010	32.9	(2.4)	12.0	(1.3)	-4.2	-18.3%	7.25	***	63.8	(1.2)	53.4	(1.3)	-2.1	-3.5%	5.98	***
Cameroon 2004–2011	28.1	(1.9)	19.9	(1.3)	-1.2	-4.8%	3.73	***	78.0	(1.4)	70.2	(1.3)	-1.1	-1.5%	4.11	***
Colombia 2005–2010	3.2	(.2)	2.3	(.1)	-.2	-7.0%	4.39	***	25.0	(1.1)	15.7	(.7)	-1.8	-8.8%	7.24	***
Dominican Rep. 2002–2007	5.4	(.4)	2.7	(.2)	-.5	-13.1%	6.17	***	16.4	(.8)	10.4	(.6)	-1.2	-8.7%	5.79	***
Egypt 2005–2008	3.4	(.4)	2.5	(.3)	-.3	-9.5%	1.72	*	11.6	(.6)	8.5	(.4)	-1.0	-9.9%	4.27	***
Ethiopia 2000–2005	60.0	(2.4)	37.2	(3.3)	-4.6	-9.1%	5.60	***	99.1	(.1)	97.1	(.4)	-.4	-0.4%	4.81	***
Ethiopia 2005–2011	37.2	(3.3)	41.3	(3.7)	.7	1.8%	0.87		97.1	(.4)	94.9	(.6)	-.4	-0.4%	2.85	***
Gabon 2000–2012	22.3	(1.4)	11.4	(.9)	-.9	-5.5%	6.60	***	66.3	(2.3)	49.1	(2.8)	-1.4	-2.5%	4.88	***
Ghana 2003–2008	36.2	(2.1)	20.6	(1.4)	-3.1	-10.7%	5.99	***	74.9	(1.1)	58.4	(1.7)	-3.3	-4.9%	7.80	***
Guyana 2005–2009	13.8	(1.4)	8.3	(1.1)	-1.4	-11.9%	3.17	***	12.3	(1.3)	11.5	(.7)	-.2	-1.6%	0.51	
Haiti 2005/6–2012	34.1	(2.0)	25.2	(1.7)	-1.4	-4.6%	3.40	***	77.0	(1.9)	65.9	(1.8)	-1.7	-2.4%	4.38	***
India 1998/9–2005/6	24.9	(.9)	20.9	(.8)	-.6	-2.4%	3.37	***	69.1	(.4)	61.4	(.5)	-1.1	-1.7%	11.82	***
Indonesia 2007–2012	13.2	(.8)	10.2	(.5)	-.6	-5.1%	3.31	***	26.4	(.8)	20.7	(.7)	-1.1	-4.7%	5.57	***
Jordan 2007–2009	3.4	(.7)	2.8	(.4)	-.3	-9.5%	0.78		4.5	(.9)	4.3	(.8)	-.1	-1.3%	0.10	
Kenya 2003–2008/9	26.3	(2.1)	17.5	(2.2)	-1.6	-7.2%	3.01	***	68.4	(1.3)	59.4	(1.6)	-1.6	-2.5%	4.30	***
Lesotho 2004–2009	20.5	(2.0)	16.4	(1.7)	-.8	-4.4%	1.59		57.4	(1.1)	50.4	(1.7)	-1.4	-2.6%	3.27	***
Madagascar 2004–2008/9	38.7	(2.1)	32.8	(1.9)	-1.3	-3.6%	1.93	*	74.7	(2.6)	79.7	(1.1)	1.1	1.4%	1.95	*
Malawi 2004–2010	36.7	(3.3)	39.7	(2.6)	.5	1.3%	0.71		78.5	(.7)	72.0	(.8)	-1.1	-1.4%	5.93	***
Mozambique 2003–2011	58.1	(1.9)	39.2	(2.0)	-2.4	-4.8%	6.97	***	94.4	(.4)	84.5	(.9)	-1.2	-1.4%	9.91	***
Namibia 2000–2007	12.3	(1.7)	11.6	(1.1)	-.1	-0.9%	0.35		57.0	(1.8)	50.1	(1.4)	-1.0	-1.8%	2.97	***
Nepal 2006–2011	27.4	(2.3)	15.4	(1.7)	-2.4	-10.9%	4.31	***	71.3	(2.2)	48.4	(2.3)	-4.6	-7.5%	7.42	***
Niger 2006–2012	69.2	(2.1)	55.5	(1.9)	-2.3	-3.6%	4.88	***	98.8	(.3)	96.7	(.5)	-.3	-0.3%	3.69	***
Nigeria 2003–2008	40.3	(2.4)	27.4	(1.3)	-2.6	-7.4%	4.69	***	75.5	(1.9)	68.4	(1.0)	-1.4	-1.9%	3.04	***
Pakistan 2007–2012/13	30.6	(1.1)	26.3	(1.3)	-.7	-2.5%	2.58	**	58.8	(1.1)	54.4	(1.6)	-.7	-1.3%	2.25	**
Peru 2005–2008	4.0	(.7)	4.2	(.4)	.0	1.2%	0.16		45.1	(2.9)	39.3	(1.7)	-1.9	-4.5%	1.68	*
Peru 2008–2012	4.2	(.4)	2.9	(.3)	-.3	-8.9%	2.63	***	39.3	(1.7)	27.1	(1.0)	-3.0	-8.9%	5.97	***
Rwanda 2005–2010	58.7	(2.3)	40.5	(2.9)	-3.7	-7.2%	3.71	***	87.2	(.8)	70.2	(1.0)	-3.4	-4.3%	13.63	***
Senegal 2005–2010/11	46.1	(3.3)	47.5	(3.0)	.2	0.5%	0.32		91.6	(1.3)	89.5	(1.3)	-.4	-0.4%	1.16	
Tanzania 2008–2010	39.5	(2.4)	34.8	(3.0)	-2.4	-6.2%	1.26		72.8	(1.2)	68.8	(1.1)	-2.0	-2.8%	2.45	**
Uganda 2006–2011	42.4	(3.6)	26.6	(2.7)	-3.2	-8.9%	3.17	***	83.0	(1.1)	73.9	(1.6)	-1.8	-2.3%	4.48	***
Zambia 2001/2–2007	46.0	(2.6)	35.2	(2.9)	-2.0	-4.7%	2.91	***	86.5	(1.1)	81.1	(1.0)	-1.0	-1.2%	3.37	***
Zimbabwe 2006–2010/11	5.0	(.8)	8.3	(1.1)	.7	11.9%	2.49	**	55.2	(1.3)	44.3	(1.4)	-2.4	-4.8%	5.89	***

Table A.8: Levels and Changes in MPI_T, H_T, and A_T by Urban and Rural Areas (cont.)

	Changes in A_T															
	Urban Areas							Rural Areas								
	Intensity of Poverty (A_T)				Annualized Change		t-statistics for difference		Intensity of Poverty (A_T)				Annualized Change		t-statistics for difference	
	Year 1		Year 2		Absolute	% Relative			Year 1		Year 2		Absolute	% Relative		
Armenia 2005–2010	33.3	(.0)	33.3	(.0)	.0	0.0%	0.00	***	35.6	(.9)	36.9	(2.7)	.3	0.7%	0.45	
Bangladesh 2004–2007	52.3	(.8)	49.4	(.8)	-1.0	-1.9%	2.51	**	54.6	(.4)	52.2	(.4)	-.8	-1.5%	4.33	***
Bangladesh 2007–2011	49.4	(.8)	46.2	(.6)	-.8	-1.7%	3.26	***	52.2	(.4)	49.8	(.5)	-.6	-1.2%	4.11	***
Benin 2001–2006	54.2	(1.0)	53.4	(.7)	-.2	-0.3%	0.67		62.0	(.7)	58.8	(.4)	-.6	-1.0%	3.80	***
Bolivia 2003–2008	42.8	(.5)	39.4	(.4)	-.7	-1.6%	5.50	***	50.1	(.4)	44.4	(.4)	-1.1	-2.4%	9.93	***
Cambodia 2005–2010	51.0	(1.1)	42.6	(.8)	-1.7	-3.5%	6.47	***	50.5	(.4)	46.3	(.4)	-.8	-1.7%	7.84	***
Cameroon 2004–2011	50.3	(1.3)	45.6	(.9)	-.7	-1.4%	2.98	***	57.1	(.8)	56.0	(.8)	-.1	-0.3%	0.91	
Colombia 2005–2010	38.2	(.5)	37.5	(.5)	-.1	-0.4%	1.07		44.6	(.5)	42.4	(.4)	-.4	-1.0%	3.61	***
Dominican Rep. 2002–2007	41.1	(.6)	38.2	(.6)	-.6	-1.5%	3.84	***	44.3	(.4)	40.0	(.4)	-.8	-2.0%	6.64	***
Egypt 2005–2008	38.7	(.7)	37.6	(.6)	-.4	-0.9%	1.10		41.9	(.4)	41.4	(.5)	-.2	-0.4%	0.84	
Ethiopia 2000–2005	52.9	(1.4)	49.5	(1.1)	-.7	-1.3%	1.89	*	74.2	(.3)	68.1	(.4)	-1.2	-1.7%	11.81	***
Ethiopia 2005–2011	49.5	(1.1)	48.7	(1.0)	-.1	-0.3%	0.56		68.1	(.4)	63.0	(.5)	-.9	-1.3%	7.92	***
Gabon 2000–2012	42.8	(.7)	41.8	(.6)	-.1	-0.2%	1.08		47.6	(.6)	45.1	(.5)	-.2	-0.4%	3.37	***
Ghana 2003–2008	45.4	(1.1)	43.2	(1.0)	-.5	-1.0%	1.57		55.0	(.5)	49.5	(.6)	-1.1	-2.1%	7.27	***
Guyana 2005–2009	36.9	(.7)	34.7	(.3)	-.6	-1.5%	2.99	***	40.3	(1.1)	40.2	(.6)	.0	0.0%	0.04	
Haiti 2005/6–2012	47.0	(.8)	44.6	(.7)	-.4	-0.8%	2.34	**	57.6	(.8)	51.7	(.6)	-.9	-1.6%	6.01	***
India 1998/9–2005/6	47.5	(.4)	47.0	(.4)	-.1	-0.1%	0.78		53.8	(.1)	52.6	(.2)	-.2	-0.3%	4.63	***
Indonesia 2007–2012	41.3	(.6)	38.7	(.3)	-.5	-1.3%	3.59	***	47.6	(.3)	45.0	(.3)	-.5	-1.1%	5.88	***
Jordan 2007–2009	35.0	(.4)	34.5	(.6)	-.3	-0.7%	0.68		37.1	(1.8)	34.9	(.5)	-1.1	-3.1%	1.18	
Kenya 2003–2008/9	45.4	(1.0)	42.5	(.9)	-.5	-1.2%	2.46	**	49.7	(.6)	48.1	(.7)	-.3	-0.6%	1.76	*
Lesotho 2004–2009	39.3	(.7)	38.3	(.9)	-.2	-0.5%	0.88		47.4	(.4)	45.7	(.4)	-.3	-0.7%	2.90	***
Madagascar 2004–2008/9	50.3	(.7)	47.0	(.8)	-.7	-1.5%	2.96	***	56.6	(.7)	57.1	(.4)	.1	0.2%	0.67	
Malawi 2004–2010	46.6	(1.2)	44.2	(.9)	-.4	-0.9%	1.59		53.3	(.3)	50.8	(.3)	-.4	-0.8%	6.55	***
Mozambique 2003–2011	52.7	(1.1)	49.7	(.7)	-.4	-0.7%	2.29	**	64.0	(.4)	57.2	(.4)	-.9	-1.4%	12.26	***
Namibia 2000–2007	42.0	(.7)	43.7	(.8)	.2	0.5%	1.19		47.7	(.6)	46.2	(.4)	-.2	-0.5%	1.93	*
Nepal 2006–2011	49.9	(1.0)	44.8	(1.1)	-1.0	-2.1%	3.46	***	54.3	(.6)	49.2	(.7)	-1.0	-2.0%	5.54	***
Niger 2006–2012	55.5	(1.0)	52.1	(1.0)	-.6	-1.0%	2.36	**	77.3	(.6)	70.9	(.5)	-1.1	-1.4%	8.68	***
Nigeria 2003–2008	51.2	(1.2)	49.7	(.7)	-.3	-0.6%	1.09		59.7	(.9)	58.9	(.4)	-.2	-0.3%	0.72	
Pakistan 2007–2012/13	46.0	(.6)	42.7	(.7)	-.6	-1.2%	3.45	***	55.4	(.5)	54.0	(.6)	-.2	-0.4%	1.88	*
Peru 2005–2008	40.5	(.9)	38.6	(.4)	-.6	-1.6%	1.90	*	44.1	(.6)	43.0	(.4)	-.4	-0.9%	1.59	
Peru 2008–2012	38.6	(.4)	38.6	(.5)	.0	0.0%	0.03		43.0	(.4)	41.6	(.3)	-.3	-0.8%	2.66	***
Rwanda 2005–2010	50.9	(.8)	46.7	(.7)	-.8	-1.7%	3.47	***	56.1	(.3)	50.2	(.3)	-1.2	-2.2%	12.43	***
Senegal 2005–2010/11	48.5	(1.0)	46.4	(.8)	-.4	-0.8%	1.66	*	67.3	(1.1)	65.3	(.7)	-.4	-0.5%	1.58	
Tanzania 2008–2010	50.9	(.9)	50.3	(1.0)	-.3	-0.6%	0.49		57.4	(.5)	55.4	(.4)	-1.0	-1.7%	3.07	***
Uganda 2006–2011	46.6	(1.4)	44.7	(1.1)	-.4	-0.8%	1.00		54.5	(.5)	51.9	(.5)	-.5	-1.0%	3.70	***
Zambia 2001/2–2007	47.2	(.7)	44.1	(.6)	-.6	-1.2%	3.48	***	57.5	(.4)	52.9	(.4)	-.8	-1.5%	8.05	***
Zimbabwe 2006–2010/11	37.9	(.8)	39.7	(1.2)	.4	1.1%	1.35		45.6	(.4)	43.5	(.3)	-.5	-1.0%	4.43	***

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10

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Table A.9: Percentage of Regions that Have Reduced Poverty Figures Significantly

	Percentage of regions that had reductions significant at α=0.05 in…			Percentage of poor in initial year that lived in regions that had reductions in…		
Country and Period	**MPI_T**	**H_T**	**A_T**	**MPI_T**	**H_T**	**A_T**
Bangladesh 2004–2007	83%	33%	83%	92%	55%	70%
Bangladesh 2007–2011	100%	83%	83%	100%	91%	80%
Benin 2001–2006	83%	67%	50%	81%	66%	51%
Bolivia 2003–2008	100%	89%	89%	100%	99%	96%
Cambodia 2005–2010	68%	53%	56%	65%	49%	51%
Cameroon 2004–2011	42%	50%	50%	46%	49%	54%
Colombia 2005–2010	63%	56%	21%	67%	46%	30%
Dominican Rep. 2002–2007	66%	69%	44%	67%	69%	44%
Egypt 2005–2008	33%	33%	0%	82%	82%	0%
Ethiopia 2000–2005	55%	36%	36%	96%	67%	95%
Ethiopia 2005–2011	73%	45%	82%	99%	57%	99%
Gabon 2000–2012	100%	100%	40%	100%	100%	38%
Ghana 2003–2008	100%	100%	100%	100%	100%	100%
Haiti 2005/6–2012	70%	60%	60%	68%	61%	46%
India 1998/9–2005/6	81%	85%	42%	93%	99%	44%
Indonesia 2007–2012	42%	33%	36%	76%	71%	67%
Jordan 2007–2009	0%	0%	0%	0%	0%	0%
Kenya 2003–2008/9	63%	63%	13%	65%	65%	4%
Lesotho 2004–2009	50%	40%	20%	52%	43%	14%
Madagascar 2004–2008/9	0%	0%	0%	0%	0%	0%
Malawi 2004–2010	100%	67%	100%	100%	88%	100%
Mozambique 2003–2011	100%	91%	73%	100%	81%	67%
Namibia 2000–2007	23%	23%	23%	32%	32%	38%
Nepal 2006–2011	77%	85%	38%	79%	86%	39%
Niger 2006–2012	100%	50%	75%	100%	24%	93%
Nigeria 2003–2008	17%	17%	0%	13%	13%	0%
Pakistan 2006/7–2012/13	50%	50%	25%	43%	43%	51%
Rwanda 2005–2010	100%	100%	100%	100%	100%	100%
Senegal 2005–2010/11	18%	18%	18%	21%	21%	20%
Tanzania 2008–2010	25%	25%	38%	12%	25%	30%
Uganda 2006–2011	44%	33%	33%	48%	37%	43%
Zambia 2001/2–2007	67%	56%	78%	67%	56%	78%
Zimbabwe 2006–2010/11	30%	20%	10%	48%	23%	15%

Table A.10: Levels and Changes in MPI_T by Main Ethnic Groups

	MPI_T				Annualized change		t-statistics for difference		Share of population	Share of poor
	Year 1		Year 2		Absolute	% Relative			Year 1	Year 1
Benin 2001–2006	**.474**	**(.008)**	**.414**	**(.006)**	**-.012**	**-2.7%**	**5.70**	*******	**100%**	**100%**
Adja	.472	(.023)	.388	(.015)	-.017	-3.8%	3.15	***	13%	13%
Bariba	.548	(.019)	.501	(.018)	-.009	-1.8%	1.70	*	8%	9%
Dendi	.540	(.055)	.541	(.056)	.000	0.0%	0.01		2%	3%
Fon	.444	(.015)	.365	(.008)	-.016	-3.8%	4.78	***	39%	38%
Yoa and Lopka	.592	(.044)	.507	(.025)	-.017	-3.1%	1.89	*	4%	5%
Bétamaribe	.652	(.033)	.616	(.023)	-.007	-1.1%	0.99		6%	7%
Peulh	.711	(.045)	.712	(.018)	.000	0.0%	0.01		4%	5%
Yoruba	.391	(.035)	.346	(.015)	-.009	-2.4%	1.20		11%	10%
Other	.406	(.035)	.494	(.063)	.018	4.0%	1.18		4%	3%
Missing	.373	(.011)	.313	(.007)	-.012	-3.5%	4.68	***	9%	9%
Ghana 2003–2008	**.309**	**(.007)**	**.202**	**(.007)**	**-.021**	**-8.1%**	**10.39**	*******	**100%**	**100%**
Akan	.235	(.010)	.134	(.009)	-.020	-10.5%	7.65	***	44%	37%
Ga and Dangme	.272	(.023)	.127	(.018)	-.029	-14.2%	4.80	***	7%	6%
Ewe	.288	(.022)	.149	(.016)	-.028	-12.4%	5.31	***	12%	11%
Guan	.300	(.028)	.231	(.051)	-.014	-5.1%	1.38		3%	3%
Mole-Dagbani	.490	(.020)	.362	(.019)	-.026	-5.9%	4.57	***	16%	23%
Grussi	.382	(.039)	.270	(.038)	-.022	-6.7%	2.53	**	2%	3%
Gruma	.563	(.038)	.445	(.053)	-.024	-4.6%	2.58	**	3%	5%
Other	.329	(.051)	.215	(.024)	-.023	-8.2%	4.41	***	6%	6%
Missing	.272	(.013)	.211	(.011)	-.012	-4.9%	3.78	***	6%	6%
Kenya 2003–2009	**.296**	**(.008)**	**.244**	**(.010)**	**-.009**	**-3.5%**	**4.10**	*******	**100%**	**100%**
Kalenjin	.369	(.054)	.297	(.030)	-.013	-3.9%	1.76	*	10%	13%
Kamba	.291	(.018)	.254	(.028)	-.007	-2.4%	1.02		11%	11%
Kikuyu	.160	(.012)	.119	(.013)	-.007	-5.2%	2.28	**	18%	11%
Kisii	.294	(.037)	.223	(.031)	-.013	-4.9%	1.80	*	5%	6%
Luhya	.280	(.015)	.236	(.019)	-.008	-3.1%	1.91	*	14%	13%
Luo	.308	(.019)	.239	(.016)	-.012	-4.5%	2.72	***	11%	12%
Meru	.237	(.027)	.249	(.050)	.002	0.9%	0.18		5%	4%
Mijikenda/Swahili	.393	(.045)	.365	(.047)	-.005	-1.3%	0.49		5%	6%
Somali	.587	(.031)	.454	(.040)	-.024	-4.6%	2.66	***	4%	6%
Others	.430	(.036)	.334	(.041)	-.017	-4.5%	1.84	*	9%	11%
Missing	.233	(.009)	.194	(.011)	-.007	-3.3%	2.70	***	10%	8%

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10
Standard errors reported between brackets.

Table A.11: Levels and Change in Destitution and Headcount Ratio of the Destitute

	Destitution Index				Annualized change		t-statistics for difference		Destitute Headcount ratio (H_T^D)				Annualized change	
	Year 1		Year 2		Absolute	% Relative			Year 1		Year 2		Absolute	% Relative
Armenia 2005–2010	.000	(.000)	.000	(.000)	.000	62.3%	0.91		.0	(.0)	.0	(.0)	.0	57.4%
Bangladesh 2004–2007	.124	(.004)	.097	(.004)	-.009	-7.9%	4.47	***	29.0	(.9)	23.1	(.8)	-2.0	-7.3%
Bangladesh 2007–2011	.097	(.004)	.071	(.003)	-.007	-7.6%	5.69	***	23.1	(.8)	17.4	(.7)	-1.4	-6.8%
Benin 2001–2006	.236	(.009)	.194	(.005)	-.008	-3.8%	4.16	***	48.6	(1.4)	40.0	(.9)	-1.7	-3.8%
Bolivia 2003–2008	.084	(.003)	.023	(.001)	-.012	-22.6%	14.83	***	19.9	(.7)	6.0	(.4)	-2.8	-21.4%
Cambodia 2005–2010	.094	(.003)	.057	(.003)	-.007	-9.3%	8.18	***	22.7	(.8)	14.5	(.7)	-1.6	-8.6%
Cameroon 2004–2011	.115	(.006)	.095	(.005)	-.003	-2.7%	2.52	**	25.3	(1.2)	21.3	(1.0)	-.6	-2.5%
Colombia 2005–2010	.004	(.000)	.002	(.000)	.000	-13.1%	4.94	***	1.0	(.1)	.5	(.1)	-.1	-12.8%
Dominican Rep. 2002–2007	.007	(.000)	.002	(.000)	-.001	-19.7%	7.35	***	1.7	(.1)	.6	(.1)	-.2	-18.7%
Egypt 2005–2008	.005	(.000)	.004	(.000)	.000	-5.6%	1.18		1.2	(.1)	1.0	(.1)	-.1	-5.1%
Ethiopia 2000–2005	.471	(.005)	.339	(.007)	-.026	-6.4%	11.40	***	82.1	(.6)	65.4	(1.1)	-3.3	-4.4%
Ethiopia 2005–2011	.339	(.007)	.248	(.006)	-.015	-5.1%	9.60	***	65.4	(1.1)	52.1	(1.2)	-2.2	-3.7%
Gabon 2000–2012	.040	(.003)	.013	(.001)	-.002	-8.7%	8.03	***	10.0	(.7)	3.4	(.4)	-.5	-8.5%
Ghana 2003–2008	.128	(.005)	.059	(.004)	-.014	-14.2%	10.51	***	28.5	(.9)	14.0	(.9)	-2.9	-13.2%
Guyana 2005–2009	.021	(.003)	.008	(.001)	-.003	-21.8%	4.65	***	5.6	(.7)	2.1	(.2)	-.9	-22.0%
Haiti 2005/6–2012	.138	(.007)	.078	(.004)	-.009	-8.5%	7.21	***	30.1	(1.3)	18.1	(1.0)	-1.8	-7.5%
India 1998/9–2005/6	.142	(.002)	.111	(.002)	-.004	-3.4%	12.92	***	31.3	(.3)	25.1	(.4)	-.9	-3.1%
Indonesia 2007–2012	.027	(.001)	.017	(.001)	-.002	-8.5%	6.44	***	6.2	(.3)	4.2	(.2)	-.4	-7.5%
Jordan 2007–2009	.000	(.000)	.001	(.000)	.000	11.0%	0.30		.1	(.1)	.2	(.1)	.0	14.0%
Kenya 2003–2008/9	.105	(.006)	.076	(.006)	-.005	-5.7%	3.33	***	23.7	(1.1)	17.9	(1.2)	-1.1	-5.0%
Lesotho 2004–2009	.085	(.004)	.056	(.004)	-.006	-7.8%	4.62	***	21.2	(1.0)	14.4	(1.0)	-1.4	-7.5%
Madagascar 2004–2008/9	.136	(.010)	.130	(.005)	-.001	-1.1%	0.59		29.4	(2.1)	29.2	(.9)	.0	-0.2%
Malawi 2004–2010	.123	(.003)	.094	(.003)	-.005	-4.5%	6.82	***	29.7	(.7)	23.4	(.7)	-1.1	-3.9%
Mozambique 2003–2011	.234	(.006)	.169	(.005)	-.008	-4.0%	7.95	***	48.5	(1.2)	37.3	(1.0)	-1.4	-3.2%
Namibia 2000–2007	.074	(.005)	.049	(.003)	-.004	-5.8%	3.25	***	17.4	(1.1)	11.9	(.7)	-.8	-5.3%
Nepal 2006–2011	.141	(.008)	.095	(.008)	-.009	-7.7%	4.11	***	31.9	(1.8)	22.6	(1.7)	-1.9	-6.7%
Niger 2006–2012	.473	(.009)	.378	(.007)	-.016	-3.7%	8.55	***	79.1	(1.1)	70.2	(1.0)	-1.5	-2.0%
Nigeria 2003–2008	.226	(.009)	.185	(.005)	-.008	-3.9%	3.54	***	44.2	(1.6)	35.8	(.8)	-1.7	-4.1%
Pakistan 2007–2012/13	.110	(.004)	.102	(.006)	-.001	-1.2%	1.12		23.2	(.7)	22.2	(1.1)	-.2	-0.7%
Peru 2005–2008	.019	(.002)	.013	(.001)	-.002	-13.5%	2.32	**	5.0	(.6)	3.3	(.2)	-.6	-13.3%
Peru 2008–2012	.013	(.001)	.008	(.000)	-.001	-12.1%	4.50	***	3.3	(.2)	2.0	(.1)	-.3	-11.7%
Rwanda 2005–2010	.151	(.004)	.096	(.003)	-.011	-8.7%	10.55	***	35.0	(.9)	24.2	(.8)	-2.2	-7.1%
Senegal 2005–2010/11	.205	(.013)	.183	(.008)	-.004	-2.0%	1.74	*	41.3	(2.3)	36.5	(1.6)	-.9	-2.2%
Tanzania 2008–2010	.130	(.006)	.108	(.005)	-.011	-8.7%	3.04	***	25.6	(1.1)	22.0	(.9)	-1.8	-7.5%
Uganda 2006–2011	.142	(.006)	.112	(.006)	-.006	-4.6%	3.46	***	33.4	(1.3)	27.9	(1.4)	-1.1	-3.6%
Zambia 2001/2–2007	.165	(.005)	.119	(.004)	-.008	-5.8%	5.51	***	36.6	(1.0)	27.8	(.9)	-1.6	-4.9%
Zimbabwe 2006–2010/11	.069	(.003)	.044	(.003)	-.006	-9.5%	5.76	***	17.6	(.8)	11.4	(.7)	-1.4	-9.2%

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10
Standard errors reported between brackets.

Table A.12: Levels and Changes in Destitution by Urban and Rural Areas

	Urban Areas							Rural Areas						
	Destitution Index (MPI_T^D)				Annualized change		t-statistics for difference	Destitution Index (MPI_T^D)				Annualized change		t-statistics for difference
	Year 1		Year 2		Absolute	% Relative		Year 1		Year 2		Absolute	% Relative	
Armenia 2005–2010	.000	(.000)	.000	(.000)	.000	0.0%		.000	(.000)	.000	(.000)	.000	62.1%	
Bangladesh 2004–2007	.072	(.008)	.048	(.006)	-.008	-12.6%	2.37 **	.138	(.005)	.111	(.004)	-.009	-7.2%	3.95 ***
Bangladesh 2007–2011	.048	(.006)	.026	(.003)	-.006	-14.6%	3.37 ***	.111	(.004)	.085	(.004)	-.006	-6.5%	4.58 ***
Benin 2001–2006	.113	(.011)	.097	(.008)	-.003	-3.0%	1.14	.306	(.012)	.254	(.007)	-.010	-3.6%	3.92 ***
Bolivia 2003–2008	.022	(.002)	.002	(.000)	-.004	-40.4%	6.90 ***	.183	(.007)	.054	(.003)	-.026	-21.6%	15.09 ***
Cambodia 2005–2010	.047	(.006)	.009	(.002)	-.008	-27.7%	5.86 ***	.102	(.004)	.068	(.003)	-.007	-7.7%	6.59 ***
Cameroon 2004–2011	.038	(.005)	.021	(.003)	-.003	-8.6%	3.16 ***	.186	(.010)	.163	(.009)	-.003	-1.9%	1.78 *
Colombia 2005–2010	.001	(.000)	.000	(.000)	.000	-15.7%	3.01 ***	.012	(.001)	.007	(.001)	-.001	-11.8%	3.93 ***
Dominican Rep. 2002–2007	.002	(.000)	.001	(.000)	.000	-21.2%	4.37 ***	.015	(.001)	.006	(.001)	-.002	-17.2%	6.11 ***
Egypt 2005–2008	.001	(.000)	.001	(.000)	.000	-4.9%	0.40	.007	(.001)	.006	(.001)	.000	-5.1%	1.00
Ethiopia 2000–2005	.115	(.014)	.055	(.007)	-.012	-13.6%	3.77 ***	.530	(.006)	.377	(.007)	-.031	-6.6%	15.91 ***
Ethiopia 2005–2011	.055	(.007)	.054	(.010)	.000	-0.3%	0.08	.377	(.007)	.290	(.007)	-.014	-4.3%	8.49 ***
Gabon 2000–2012	.015	(.002)	.005	(.001)	-.001	-8.4%	3.67 ***	.098	(.007)	.055	(.006)	-.004	-4.7%	4.63 ***
Ghana 2003–2008	.038	(.005)	.012	(.004)	-.005	-20.8%	3.93 ***	.193	(.007)	.096	(.007)	-.019	-13.0%	9.86 ***
Guyana 2005–2009	.021	(.003)	.004	(.001)	-.004	-33.6%	6.57 ***	.021	(.004)	.009	(.001)	-.003	-18.4%	3.08 ***
Haiti 2005/6–2012	.032	(.004)	.014	(.002)	-.003	-12.0%	3.82 ***	.203	(.011)	.121	(.007)	-.013	-7.7%	6.43 ***
India 1998/9–2005/6	.040	(.003)	.031	(.002)	-.001	-3.5%	2.80 ***	.180	(.002)	.147	(.002)	-.005	-2.8%	10.73 ***
Indonesia 2007–2012	.012	(.001)	.008	(.001)	-.001	-7.6%	2.30 **	.038	(.002)	.026	(.001)	-.002	-7.1%	4.71 ***
Jordan 2007–2009	.000	(.000)	.000	(.000)	.000	57.3%	0.97	.002	(.002)	.001	(.001)	.000	-18.8%	0.39
Kenya 2003–2008/9	.026	(.006)	.010	(.003)	-.003	-16.2%	3.05 ***	.125	(.007)	.092	(.007)	-.006	-5.3%	3.10 ***
Lesotho 2004–2009	.011	(.002)	.005	(.002)	-.001	-15.5%	1.96 *	.101	(.005)	.073	(.005)	-.006	-6.3%	3.67 ***
Madagascar 2004–2008/9	.045	(.005)	.023	(.003)	-.005	-13.9%	3.77 ***	.161	(.013)	.147	(.005)	-.003	-2.0%	1.07
Malawi 2004–2010	.037	(.008)	.026	(.005)	-.002	-6.0%	1.26	.139	(.003)	.107	(.003)	-.005	-4.2%	6.84 ***
Mozambique 2003–2011	.091	(.012)	.063	(.006)	-.004	-4.5%	2.11 **	.305	(.007)	.217	(.006)	-.011	-4.2%	9.73 ***
Namibia 2000–2007	.011	(.003)	.013	(.002)	.000	1.5%	0.32	.108	(.007)	.076	(.005)	-.005	-5.0%	3.20 ***
Nepal 2006–2011	.044	(.007)	.020	(.003)	-.005	-14.2%	2.98 ***	.159	(.009)	.106	(.009)	-.011	-7.8%	4.13 ***
Niger 2006–2012	.142	(.011)	.100	(.009)	-.007	-5.7%	2.99 ***	.545	(.008)	.432	(.008)	-.019	-3.8%	9.88 ***
Nigeria 2003–2008	.100	(.011)	.053	(.005)	-.009	-11.8%	4.17 ***	.290	(.013)	.251	(.007)	-.008	-2.9%	2.40 **
Pakistan 2007–2012/13	.048	(.003)	.039	(.004)	-.002	-3.5%	1.78 *	.141	(.005)	.133	(.008)	-.001	-1.0%	0.89
Peru 2005–2008	.003	(.001)	.002	(.000)	.000	-14.4%	1.22	.047	(.006)	.034	(.003)	-.004	-9.6%	1.96 *
Peru 2008–2012	.002	(.000)	.002	(.000)	.000	-2.2%	0.34	.034	(.003)	.020	(.001)	-.004	-12.5%	4.92 ***
Rwanda 2005–2010	.071	(.005)	.039	(.005)	-.006	-11.4%	3.12 ***	.165	(.005)	.105	(.003)	-.012	-8.7%	10.40 ***
Senegal 2005–2010/11	.059	(.008)	.041	(.006)	-.003	-6.2%	1.79 *	.323	(.013)	.297	(.012)	-.005	-1.5%	1.54
Tanzania 2008–2010	.051	(.007)	.043	(.009)	-.004	-8.3%	0.71	.152	(.007)	.128	(.005)	-.012	-8.3%	2.87 ***
Uganda 2006–2011	.032	(.011)	.015	(.004)	-.004	-14.5%	1.57	.158	(.006)	.130	(.006)	-.006	-3.9%	3.06 ***
Zambia 2001/2–2007	.040	(.005)	.033	(.005)	-.001	-3.4%	1.07	.235	(.006)	.166	(.005)	-.013	-6.1%	8.15 ***
Zimbabwe 2006–2010/11	.002	(.001)	.004	(.001)	.000	16.9%	1.34	.099	(.005)	.061	(.004)	-.008	-10.1%	6.39 ***

Note: *** statistically significant at α=0.01, ** statistically significant at α=0.05, * statistically significant at α=0.10
Standard errors reported between brackets.

Annex 2: Summary of Parameters Harmonization for MPI Analysis over Time

- ✓ **Armenia (2005–2010):**
  - Published MPI figures indicate a fall from .004 to .001, while figures adjusted for comparability indicate a fall from .003 to .001.
  - Women's BMI was available for 2005 but not for 2010. For comparability, the 2005 adjusted MPI was recomputed without BMI.
  - Between 2005 and 2010 the compulsory age to start attending primary education changed from 7 to 6 years old. The parameters associated with school attendance were not adjusted.
- ✓ **Bangladesh (2004–2007–2011):**
  - Published MPI figures exist only for 2007 and 2011; the figure for 2004 is a back computation.
  - Published MPI figures indicate a fall first from .365 to .292, and then further to .253. But when adjusted for comparability, MPI figures show a fall from .364 to .306 and then to .245.
  - The sampling frame for adults' anthropometrics and collection of child mortality information changed between the three surveys. In 2004 this information was collected for every ever-married women aged between 13 and 49; in 2007 it was collected for every ever-married women aged between 15 and 49; and in 2011 it was collected for every ever-married women aged between 12 and 49 and, in addition, in households selected for male interviews, anthropometrics were also taken for other groups of women and men (see details in Alkire, Conconi and Seth, 2014b). To create strictly comparable measures, the indicators of women's BMI and child mortality were re-defined taking into consideration only the sample of ever-married women aged between 15 and 49.
  - The 2007 questionnaire includes information that was not available in 2004, namely 'shared toilet', 'mobile phone', 'refrigerator' and 'car/truck'. And the survey questionnaire in 2011 included information on 'time to water', but no information on 'car/truck'. Thus, for comparability purposes, in 2007 and 2011 the indicator of access to sanitation was re-defined excluding information on 'shared toilet' and the indicator of assets was redefined to excluding information regarding 'mobile phone', 'refrigerator' and 'car/truck'.
  - The 2007 and 2011 questionnaires also include improvements in the categories used to measure source of drinking water and flooring, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.
- ✓ **Benin (2001–2006):**
  - A published MPI figure exists only for 2006; the figure for 2001 is a back computation.
  - The published MPI figure indicates a fall from .474 to .412, while the figure adjusted for comparability indicates a fall from .474 to .414.

- The difference is due to an improvement in the survey questionnaire in 2006, which included information regarding 'mobile phone'. To ensure comparability, the 2006 indicator of assets was redefined excluding that information.
- The 2006 questionnaire also includes improvements in the categories used to measure sanitation, source of drinking water, flooring and cooking fuel, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Bolivia (2003–2008):**

- Published MPI figures indicate a fall from .175 to .089 and are comparable.
- The 2008 questionnaire includes improvements in the categories used to measure access to sanitation and drinking water, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Cambodia (2005–2010):**

- Published MPI figures indicate a fall from .251 to .212 while figures adjusted for comparability show a higher fall from .299 to .212 instead.
- The difference is due to the fact that the survey in 2005 only measured anthropometrics for a 50% subsample but the published figure for 2005 included the full sample, hence assuming that all those not measured were not deprived. For comparability, the 2005 adjusted estimate is based only on the nutritional subsample.

✓ **Cameroon (2004–2011):**

- Published MPI figures indicate a fall from .287 to .248 while figures adjusted for comparability show a fall from .298 to .248.
- The difference is due to the fact that the survey in 2004 only measured anthropometrics for a 50% subsample but the published figure for 2005 included the full sample, hence assuming that all those not measured were not deprived. For comparability, the 2004 adjusted estimate is based only on the nutritional subsample.
- The 2011 questionnaire also includes improvements in the categories used to measure access to sanitation and drinking water, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Colombia (2005–2010):**

- Published MPI figures indicate a fall from .040 to .022 while figures adjusted for comparability show a fall from .039 to .023.
- In the 2005 survey, although there was information on child mortality only in the female recode, in the computation of the child mortality indicator it was assumed that such information was also available in the male recode. Thus, households where there were no women eligible for the female interview but there was a man eligible for the male interview, were dropped from the MPI estimation sample because they missed the child mortality indicator. This mistake was corrected in the adjusted MPI.

- There were improvements to the survey in 2010, creating information that was not available in 2005: 'mobile phone' and 'bicycle'. For comparability the adjusted 2010 indicator of assets was defined using the same assets information as in 2005.
- The compulsory age to start attending primary education changed between 2005 and 2010 from 6 to 5 years old. For comparability, parameters in the adjusted 2010 were defined as in 2005.

✓ **Dominican Republic (2002–2007):**

- Published MPI figures indicate a fall from .041 to .018 while figures adjusted for comparability show a fall from .040 to .020.
- The 2002 survey includes information on child mortality for men, while this information is not available in 2007. On the other hand, the 2007 survey included information on 'B/W television' and 'mobile phone'. Thus, for comparability, the indicators of child mortality and assets were re-defined using only the information that was available in both years.
- The 2007 questionnaire also includes small changes in the categories used to measure access to sanitation, drinking water, flooring, and cooking fuel, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Egypt (2005–2008):**

- A published MPI figure exists only for 2008; the figure for 2005 is a back computation.
- The 2008 survey did not collect information on cooking fuel. Thus, to ensure comparability, the adjusted 2005 MPI was computed excluding that indicator. The study uses the published 2008 MPI (.034) and the adjusted 2005 MPI (.024).
- The 2008 questionnaire also includes improvements in the categories used to measure access to sanitation, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Ethiopia (2000–2005–2011):**

- Published MPI figures exist only for 2005 and 2011; the figure for 2000 is a back computation.
- Published MPI figures indicate a fall first from .677 to .562, and then an increase to.564. But when adjusted for comparability, MPI figures show a fall from .677 to .604 and then to .526.
- The 2005 survey only measured anthropometrics for a 50% subsample, but the published figure for 2005 included the full sample, hence assuming that all those not measured were not deprived. For comparability, the 2005 adjusted estimate is based only on the nutritional subsample.
- In addition, improvements in the survey questionnaire were undertaken in 2005 and 2011 which generated information that was not available in 2000: 'source of non-drinking water', 'time to water', 'mobile phone' and 'refrigerator'. For comparability, the adjusted 2005 and 2010 MPI used parameters that were defined as in 2000.

- The 2005 and 2011 questionnaires also include improvements in the categories used to measure source of water and sanitation, but these do not affect the deprivation cutoff or the comparability of MPI estimates.

✓ **Gabon (2000–2012):**

- The published MPI figures indicates a fall from .161 to .070 while figures adjusted for comparability show a fall from .161 to .075.
- The 2000 survey collected BMI information only for women who had children in the previous five years, while the 2012 survey collected that data for all women aged between 15 and 49. To ensure comparability, we computed the 2012 BMI indicator also only considering information from women who had children in the previous five years.
- In the 2012 survey there is also information on 'mobile phone' that was not available in 2000. For comparability, the 2012 assets indicator was defined excluding the information on mobile phone.
- The 2012 questionnaire also includes improvements in the categories used to measure source of drinking water, sanitation, and flooring, but these do not affect the deprivation cutoff or the comparability of MPI estimates.

✓ **Ghana (2003–2008):**

- A published MPI figure exists only for 2008; the figure for 2003 is a back computation.
- The published figure indicates a fall from .309 to .144, while the figure adjusted for comparability shows a fall to .202
- The 2008 survey only measures anthropometrics for a 50% subsample and the published figure for 2008 included the full sample, hence assuming that all those not measured were not deprived. For comparability, the 2008 adjusted MPI is based only on the nutritional subsample.
- Improvements in the survey questionnaire were undertaken in 2008, so for this year we have information on 'mobile phone' that was not available in 2002. For comparability with 2002, parameters in 2008 were defined as in 2002.
- In the 2008 questionnaire there were improvements in the categories used to measure source of water and sanitation, but these do not affect the deprivation cutoff. There were also changes in 'source of non-drinking water' and 'BW/television' but these also do not affect the comparability of MPI estimates.

✓ **Guyana (2005–2009):**

- The published MPI figures indicate a fall from .053 to .030 while figures adjusted for comparability show a fall from .050 to .041
- In the 2005 survey there was information on child mortality only for women. However, in the computation of the child mortality indicator it was assumed that such information was also available for men. Thus, households where there were no women eligible for the female interview but there was a man eligible for the male interview were dropped from

the MPI estimation sample because they missed the child mortality indicator. This mistake was corrected in the adjusted MPI.

- The 2009 survey includes information on nutrition (children undernutrition, women and male BMI) and also information on child mortality from the male recode. To create comparable estimates, the 2009 adjusted MPI was computed without these additional variables, as in 2005.
- In 2009 there is also information on 'BW/television' but this does not affect the results or the comparability of the MPI estimates.

✓ **Haiti (2005/6–2012):**

- Published MPI figures indicate a fall from .299 to .248 while figures adjusted for comparability show a fall only from .335 to .248.
- The difference is mostly due to the fact that the survey in 2006 only measured anthropometrics for a 50% subsample but the published figure for 2005 included the full sample, hence assuming that all those not measured were not deprived. For comparability, the 2004 adjusted estimate is based only on the nutritional subsample.
- In addition, the indicator of drinking water in 2006 was also adjusted in order to consider as deprived those households which source of drinking water is 'water sold by a company'.
- The 2012 questionnaire includes improvements in the categories used to measure drinking water and flooring, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **India (1998/9–2005/6)[36]:**

- A published MPI figure exists only for 2005/6 (.283), the 1998/9 is a back computation.
- The indicator 'flooring' was not present in the first time period so an indicator 'housing' (having a similar headcount to flooring in the 2nd period) was used for comparison.
- The published figure indicates a fall from .304 to .283, while the figure adjusted for comparability shows a larger fall to. 254.
- For the precise definition of the adjusted MPI indicators please see Alkire and Seth (2015).

✓ **Indonesia (2007–2012):**

- Published figures indicate a fall from .095 to .066 and are comparable.

✓ **Jordan (2007–2009):**

- Published MPI figures indicate a fall from .010 to .008, while figures adjusted for comparability show a fall from .013 to .011.
- The differences are due to the fact that both 2007 and 2009 surveys only measured anthropometrics for a 50% subsample but the published figure for both years included the full sample, hence assuming that all those not measured were not deprived. Following

36 See Alkire and Seth (2013) for the analysis on poverty reduction in India.

the same criteria as in other countries, the 2007 and 2009 adjusted estimates are based only on the nutritional subsample.

- ✓ **Kenya (2003–2008/9):**
  - Published figures show a fall from .296 to .229 while figures adjusted for comparability show a fall from .296 to .244.
  - The 2008/9 survey includes information on 'mobile phone' which was not available in 2003. For comparability, the 2009 adjusted MPI uses asset parameters defined as in 2003.
  - In 2008/9 questionnaire there were also improvements in the categories used to measure source of water and sanitation, but they do not affect the deprivation cutoff or the comparability of the MPI estimates.
- ✓ **Lesotho (2004–2009):**
  - Published figures indicate a fall from .215 to .156 while figures adjusted for comparability show a fall from .238 to .190
  - The differences are due to the fact that the surveys in 2004 and 2009 only measure anthropometrics for a 50% subsample but the published figure for both years included the full sample, hence assuming that all those not measured were not deprived. Following the same criteria as in other countries, the 2004 and 2009 adjusted estimates are based only on the nutritional subsample.
  - Improvements in the survey questionnaire were undertaken in 2009, creating additional information on child mortality in the male recode and 'mobile phone'. For comparability, parameters in the 2009 adjusted MPI were defined as in 2004.
  - In the 2009 questionnaire there were also improvements in the categories used to measure source of drinking water and sanitation but they do not affect the deprivation cutoffs or the comparability of MPI estimates.
- ✓ **Madagascar (2004–2008/9):**
  - Published figures indicate a fall from .402 to .357, while figures adjusted for comparability actually show an increase from .374 to .414
  - In the 2008/9 dataset the anthropometric information for children under 5 is missing for the full sample. Thus, the 2004 adjusted nutrition indicator does not take into consideration children's nutrition information.
  - The indicator of sanitation in 2004 was adjusted in order to consider as deprived those households in which the sanitation facility was a 'pit latrine with drainage'.
  - The 2009 survey only measures anthropometrics for a 50% subsample, but the published figure included the full sample, hence assuming that all those not measured were not deprived. Following the same criteria as in other countries, the adjusted estimates are based only on the nutritional subsample.
  - The 2009 questionnaire includes information on 'mobile phone' which was not available in 2004. For comparability, the 2009 adjusted MPI uses asset parameters defined as in 2003.

- In the 2009 questionnaire there were improvements in the categories used to measure source of water and sanitation but they do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Malawi (2004–2010):**

- Published MPI figures indicate a fall from .381 to .334 between both years, and these are comparable.
- The 2010 questionnaire includes improvements in the categories used to measure sanitation and drinking water, but these do not affect the deprivation cutoff or the comparability of MPI estimates.

✓ **Mozambique (2003–2011):**

- Published figures indicate a fall from .481 to .389, while figures adjusted for comparability show a reduction from .505 to .393.
- The sanitation categories included in the 2003 questionnaire do not distinguish between a latrine with slab or without. As in the 2011 survey the large majority of the latrines were without slab. We assumed that all latrines in 2003 were without slab. So, the indicator of sanitation in 2003 was adjusted in order to consider as deprived those households in which the sanitation facility was 'pit latrine'.
- The 2009 survey includes information on 'mobile phone' which was not available in 2003. For comparability, the 2009 adjusted MPI uses asset parameters defined as in 2003.
- In the 2009 questionnaire there were also improvements in the categories used to measure source of water, sanitation, flooring, and cooking fuel, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Namibia (2000–2007):**

- A published MPI figure exists only for 2007; the figure for 2000 is a back computation.
- The published MPI figure indicates a fall from .194 to .187, while the figure adjusted for comparability shows a higher reduction to .154.
- Improvements in the survey questionnaire were undertaken in 2007, creating additional information on women's nutrition status, child mortality in the male recode, 'source of non-drinking water', and 'mobile phone'. For comparability, parameters in the 2007 adjusted MPI were defined as in 2000.
- In the 2007 questionnaire there were also improvements in the categories used to measure cooking fuel, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Nepal (2006–2011):**

- Published MPI figures indicate a fall from .350 to .217 and are comparable.
- The only difference between both surveys is that the 2011 one includes 'source of non-drinking water', but this information does not affect the results or the comparability of the MPI estimates.

- ✓ **Niger (2006–2012):**
  - Published figures indicate a fall from .642 to .605, while figures adjusted for comparability show a fall from .696 to .621.
  - The 2006 survey only measured anthropometrics for a 50% subsample, but the published figure for 2006 included the full sample, hence assuming that all those not measured were not deprived. For comparability, the 2006 adjusted estimate is based only on the nutritional subsample.
  - The 2012 survey includes information on 'mobile phone' which was not available in 2006. For comparability, the 2012 adjusted assets indicator does not take into consideration the information on 'mobile phone'.
  - In the 2012 questionnaire there were also improvements in the categories used to measure cooking fuel, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.
  - Between 2006 and 2012 the compulsory age to start attending primary education changed from 6 to 7 years old. The parameters associated with school attendance were not adjusted.
- ✓ **Nigeria (2003–2008):**
  - Published figures indicate a fall from .368 to .310 while figures adjusted for comparability show a fall from .368 to .313.
  - The differences are due to the fact that the 2008 survey includes information on 'mobile phone' which is not available in 2003. For comparability, the 2008 adjusted assets indicator does not take into consideration the information on 'mobile phone'.
  - In the 2008 questionnaire there were improvements in the categories used to measure source of water and sanitation, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.
- ✓ **Pakistan (2006/7–2012/13):**
  - Published figures indicate a fall from .264 to .230 while figures adjusted for comparability show a fall from .264 to .235.
  - The 2006/7 survey did not collect information on nutrition. Thus, to ensure comparability, the adjusted 2012/13 MPI was re-computed excluding that indicator.
  - Improvements in the survey questionnaire were undertaken in 2012/13 which generated information that was not available in 2006/7: information on child mortality in the male recode and 'mobile phone'. For comparability, the adjusted 2012/13 MPI was computed excluding this additional information.
  - In the 2012/13 questionnaire there were also improvements in the categories used to measure flooring, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.
  - The subnational region Gilgit Baltistan was covered by the 2012/13 survey, but not by the 2006/7 survey. Thus, the data from this region was not considered in the analysis.

- ✓ **Peru (2005–2008–2012):**
  - Published figure indicates a fall from .085 to .066 and then further to 0.043; these are comparable.
- ✓ **Rwanda (2005–2010):**
  - Published figures indicate a fall from .426 to .350 while figures adjusted for comparability show a larger decrease from .461 to .330.
  - The surveys in 2005 and 2010 only measure anthropometrics for a 50% subsample, but the published figure for both years included the full sample, hence assuming that all those not measured were not deprived. Following the same criteria as in other countries, the adjusted estimates for both surveys are based only on the nutritional subsample.
  - In addition, the survey in 2010 includes information on 'mobile phone' and 'male BMI' which is not available in 2005. For comparability, parameters in the 2010 adjusted MPI were defined as in 2005.
  - In the 2010 questionnaire there were also improvements in the categories used to measure source of water and sanitation, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.
- ✓ **Senegal (2005–2010):**
  - Published figures indicate an increase from 384 to .439, but figures adjusted for comparability show a decrease from .440 to .423
  - The 2005 survey only measures anthropometrics for one-third of the sample, but the published figure included the full sample, hence assuming that all those not measured were not deprived. To create a comparable measure, the adjusted estimates for 2005 are based only on the nutritional subsample. The 2010 survey also follows a subsample for anthropometrics that was considered for the published figure.
  - Improvements in the survey questionnaire were undertaken in 2010, generating information that was not available in 2005: 'male BMI' and 'mobile phone'. For comparability, parameters in the 2010 adjusted MPI were defined as in 2005.
  - In the 2010 questionnaire there were also improvements in the categories used to measure source of water and sanitation, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.
  - Between 2005 and 2010 the compulsory age for start attending primary education changed from 7 to 6 years old. The parameters associated with school attendance were not adjusted.
- ✓ **Tanzania (2008–2010):**
  - Published figures indicate a decrease from .367 to .332 while figures adjusted for comparability show a decrease from .371 to .335.
  - The published 2008 MPI does not take into account the information on child mortality for men (because this information was not included in the male recode, but in the individual recode). The 2008 adjusted MPI considers this information.

- The 2008 survey did not collect information on nutrition. Thus, to ensure comparability, the adjusted 2010 MPI was re-computed excluding that indicator.
- In the 2010 questionnaire there were improvements in the categories used to measure source of water and sanitation, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Uganda (2006–2011):**

- The published figures indicate that poverty remained unchanged in this period at .367, but figures adjusted for comparability show a decrease from .420 to .343
- The 2006 survey only measured anthropometrics for a third of the sample, but the published figure included the full sample, hence assuming that all those not measured were not deprived. Following the same criteria as in other countries, the 2006 adjusted estimates are based only on the nutritional subsample. The 2011 survey also uses a subsample for anthropometrics, but this was considered for the published figure.
- The 2011 survey includes information on 'male BMI' although 95% of that information is missing. For comparability, this information is excluded in the adjusted 2011 MPI.

✓ **Zambia (2001/2–2007):**

- A published MPI figure exists only for 2007; the figure for 2001/2 is a back computation.
- The published MPI figure indicates a fall from .397 to .328, while the figure adjusted for comparability show a smaller reduction to .332.
- Improvements in the survey questionnaire were undertaken in 2007, generating information that was not available in 2001/2: 'source of non-drinking water' and 'mobile phone'. For comparability, this information is excluded in the 2007 adjusted MPI.
- In the 2007 questionnaire there were also small changes in the categories used to measure source of water, sanitation, flooring and cooking fuel, but these do not affect the deprivation cutoff or the comparability of the MPI estimates.

✓ **Zimbabwe (2006–2010/11):**

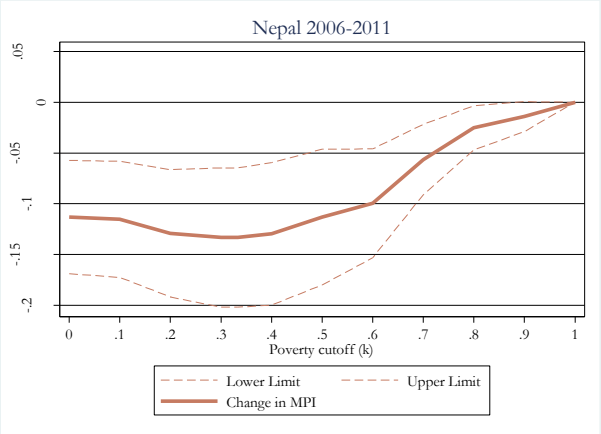
- Published figures indicate a decrease from .180 to .172 while figures adjusted for comparability show a higher decrease from .180 to .145
- The 2011 survey includes information on 'male BMI' which is not available in 2006. For comparability, this information is ignored in the estimation of 2010/11 adjusted MPI.
- In addition, the 2011 survey includes 'source of non-drinking water', but this does not affect the comparability of the MPI estimates.

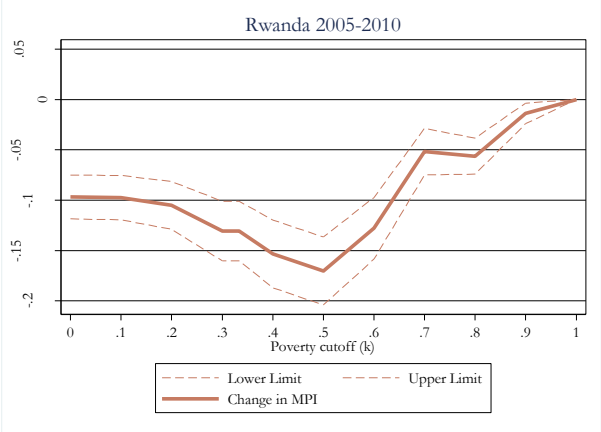
Annex 3: Robustness of Changes in MPI to Decisions in Poverty Cutoff

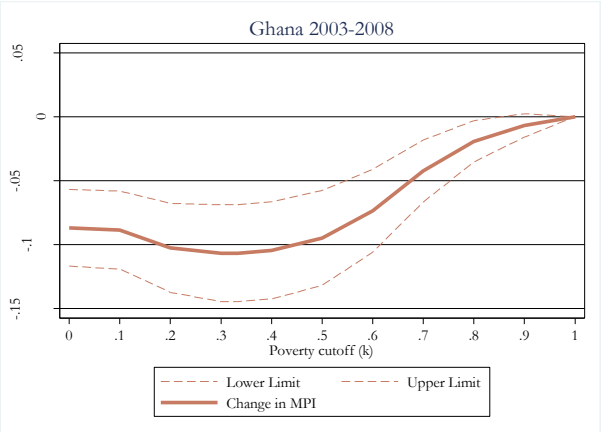
How robust are these changes to decisions on poverty cutoff k?

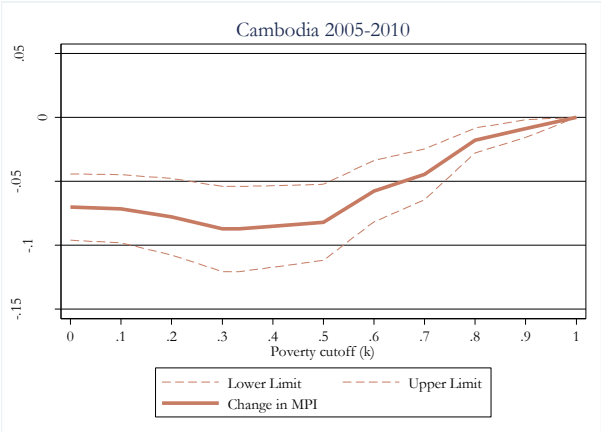
The following set of graphs presents the robustness of the absolute changes in MPI with respect to the poverty cutoff k for a select group of countries. They depict the annualized absolute change in MPI and the respective 95% confidence interval for different poverty cutoffs.

- ✓ *First Group: Among countries with significant progress.* This group presents some of the countries with substantial progress, and it shows that the significance of the poverty reduction is robust to any choice of k value (dotted line represents the upper and lower bound of the confidence interval at β=95%)[37], as the upper limit is always below zero.



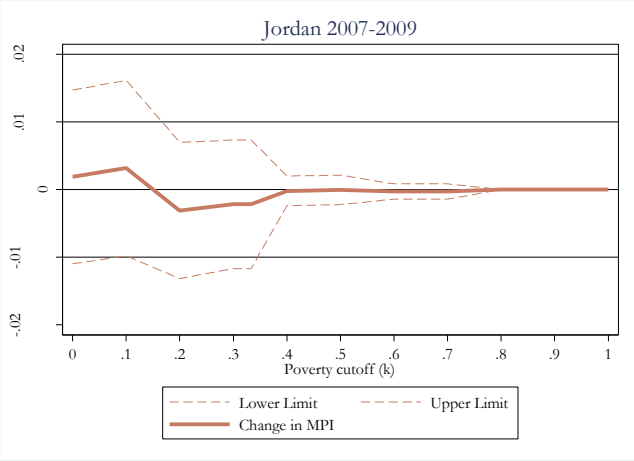


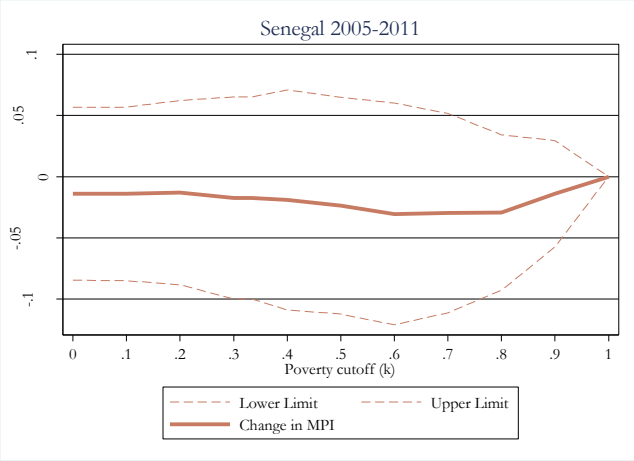




37 The confidence intervals for the change in MPI were estimated assuming that the samples for the two years are independent.

✓ *Second Group: Among countries lacking significant progress.* This group presents the case of Jordan and Senegal and shows how the change between both years is not statistically significant regardless of the choice of poverty cutoff.

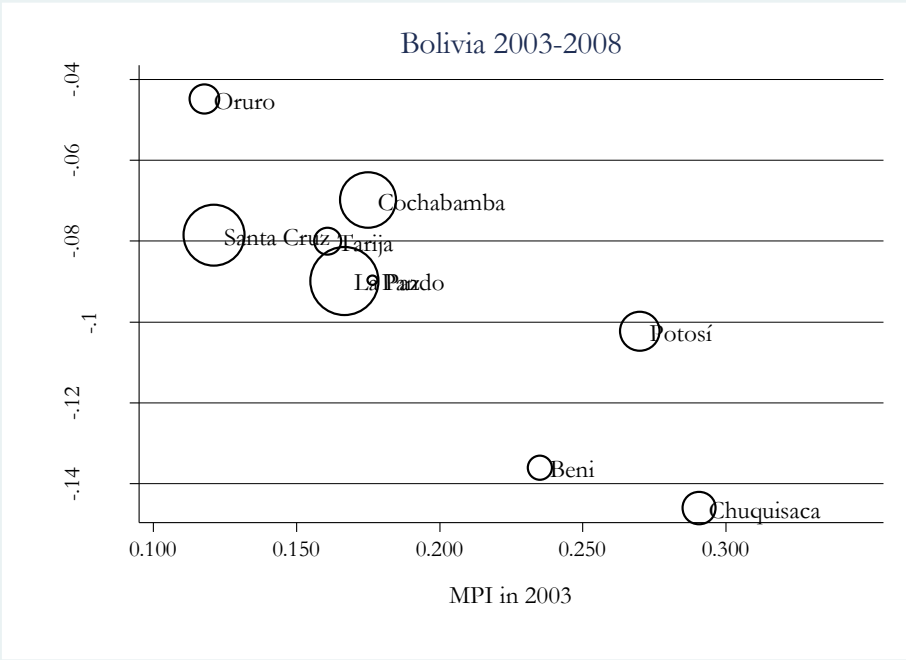


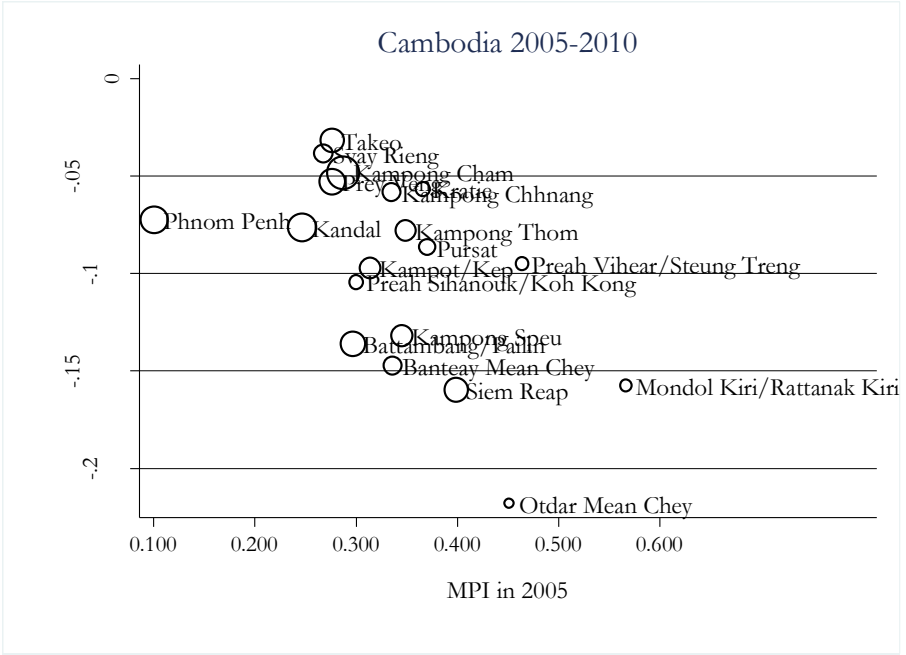


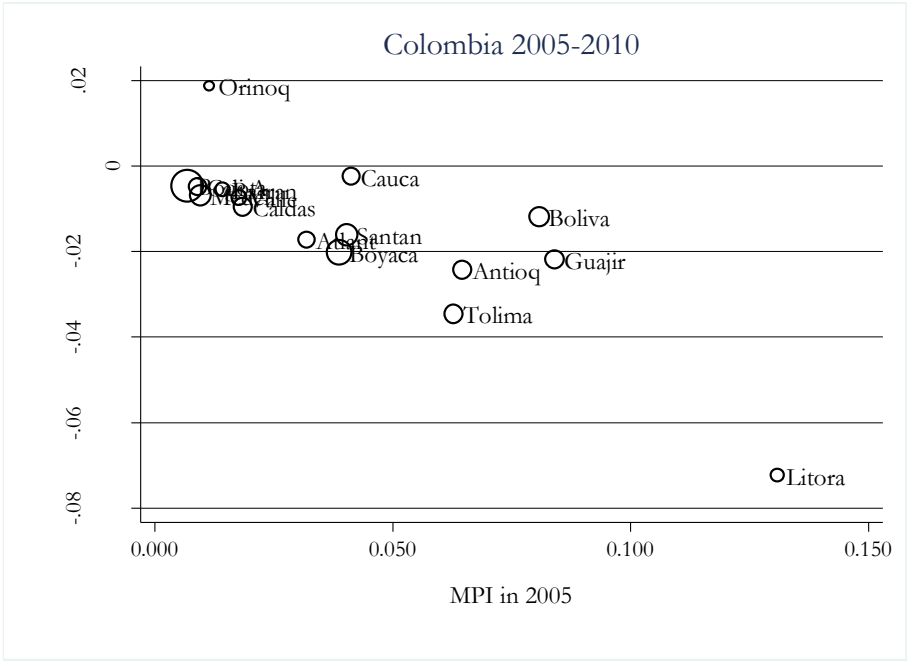
Annex 4: Graphics of Poverty Reduction by Regions

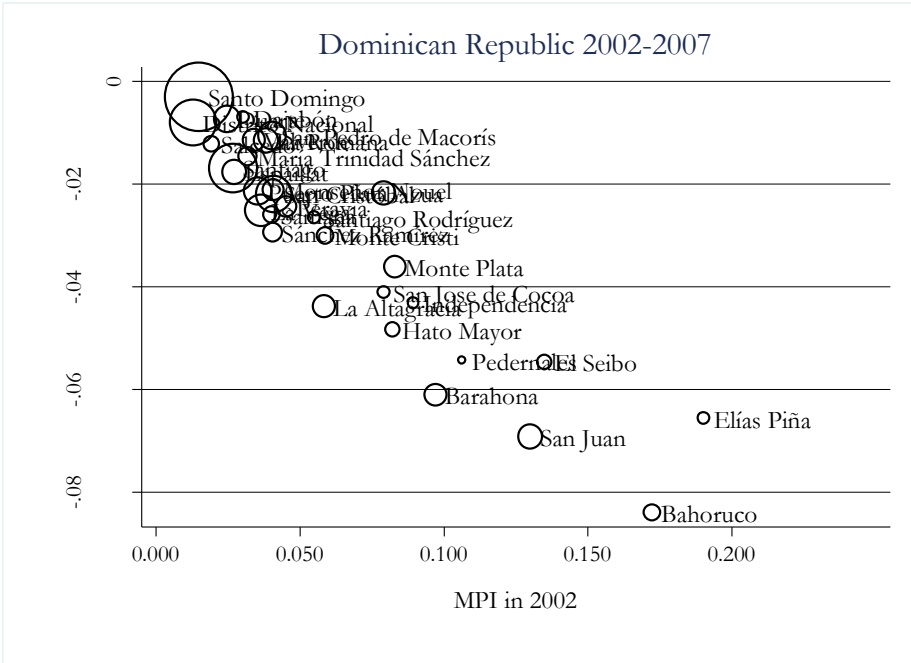
This annex includes graphics with the annualized absolute change in MPI against the initial MPI for all regions for a select group of countries (the size of the bubbles is proportional to the average population of the region in the two periods).

✓ *First Group*: Among countries where the poorest regions tended to reduce poverty faster than least poor regions. Note: Axes vary.

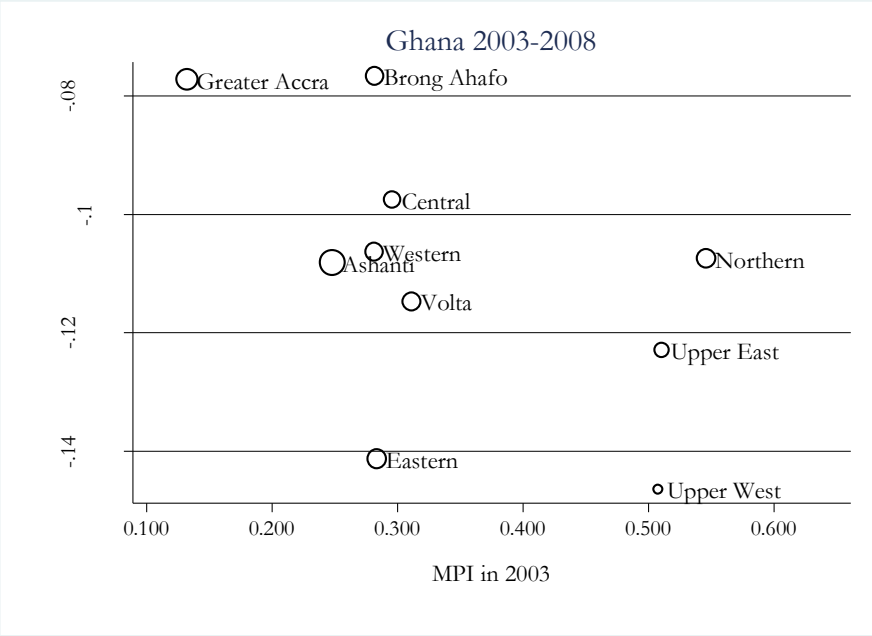


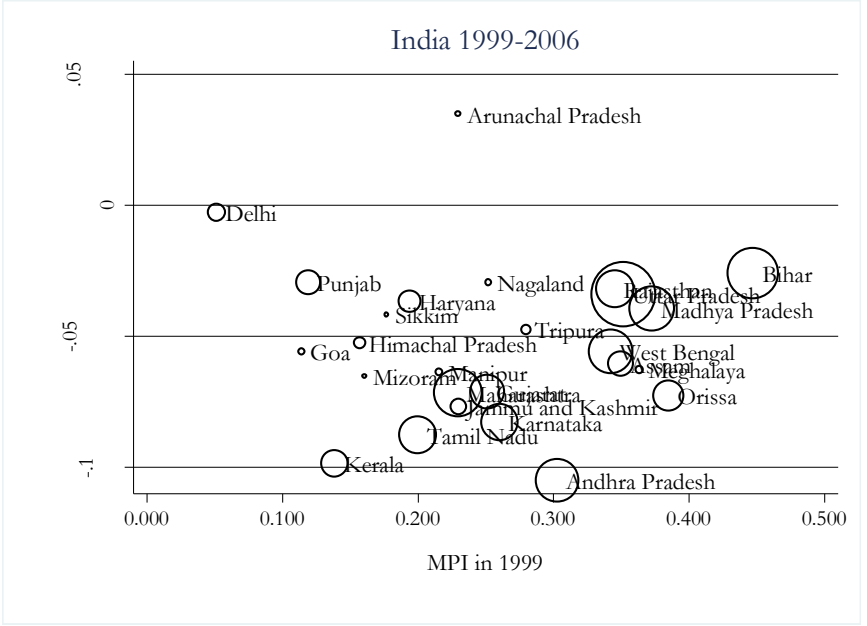


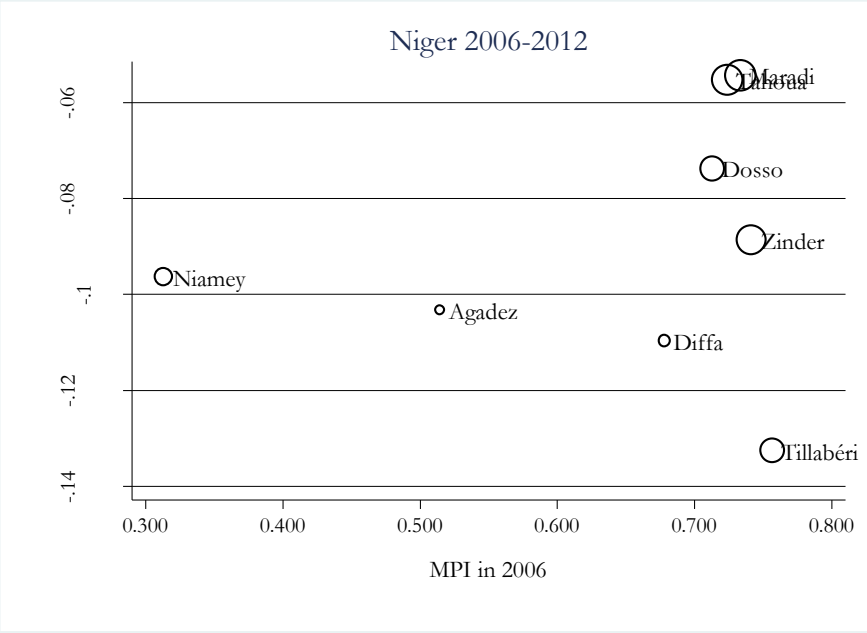

Colombia 2005-2010
.02
0
-.02
-.04
-.06
-.08
0.000
0.050
0.100
0.150
MPI in 2005
Orinoq
Cauca
Boliva
Cardas
Santan
Boyaca
Antioq
Guajir
Tolima
Litora

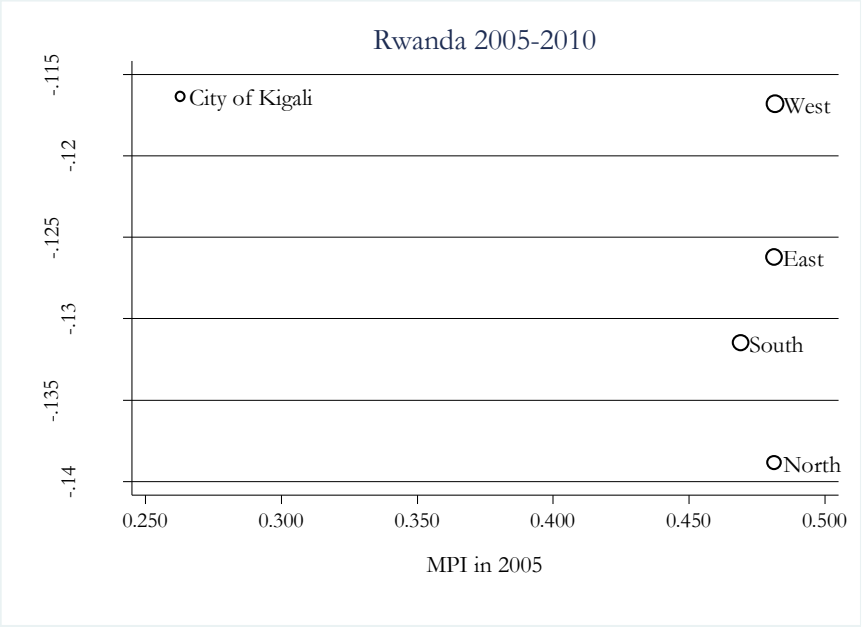

Dominican Republic 2002-2007
0
-.02
-.04
-.06
-.08
0.000
0.050
0.100
0.150
0.200
MPI in 2002
Santo Domingo
Pedro de Macorís
María Trinidad Sánchez
Monte Plata
San Jose de Cocoa
La Altagracia
Hato Mayor
El Seibo
Barahona
Elías Piña
San Juan
Bahoruco

✓ *Second Group:* Among countries where there is not a clear relationship between the initial level of poverty and the speed of poverty reduction. Note: Axes vary.






Niger 2006-2012
-.06
-.08
-.1
-.12
-.14
Maradi
Tahoua
Dosso
Zinder
Niamey
Agadez
Diffa
Tillabéri
0.300
0.400
0.500
0.600
0.700
0.800
MPI in 2006


Rwanda 2005-2010
-.115
-.12
-.125
-.13
-.135
-.14
City of Kigali
West
East
South
North
0.250
0.300
0.350
0.400
0.450
0.500
MPI in 2005