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Human Development, Inequality and Poverty: empirical findings

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JEL Classification numbers: D31, D63, I32, O47

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Abstract

This paper provides a discussion on the empirical findings surrounding the design of human development, inequality and poverty measures. We focus on the United Nations Development Program approach to those issues, in particular regarding the human development index and the multidimensional poverty index.

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Contents

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"Developing better measures is not an end in itself but a means to enhance policies that improve people's lives."

Ángel Gurría

(OECD's Secretary-General)

1. Introduction

The concept of human development, which is a process of enlarging people's choices, is a broad concept and inherently multidimensional. It is already well established that we cannot obtain a comprehensive picture of human development by merely looking at the performance of any single dimension such as income. This is so because not all variables that affect this notion evolve similarly. Table 1 presents illustrations of certain countries from the 1990 Human Development Report (HDR), which show mismatches between performances in monetary and non-monetary dimensions. The first set of three countries – Sri Lanka, Jamaica and Costa Rica – had high life expectancy and adult literacy rates and low infant mortality rates despite low levels of per-capita GNP. In contrast, the second set of three countries – Brazil, Oman and Saudi Arabia – had much lower life expectancy and adult literacy rates and higher infant mortality rates despite much higher levels of per-capita GNP.

Table 1: The Gross National Product Vs. Other Social Indicators

Country	GNP Per Capita US($)	Life Expectancy (Years)	Adult Literacy Rate (%)	Infant Mortality (Per 1,000 Live Births)
Modest GNP per capita with high human development				
Sri Lanka	400	71	87	32
Jamaica	940	74	82	18
Costa Rica	1,610	75	93	18
High GNP per capita with modest human development				
Brazil	2,020	65	78	62
Oman	5,810	57	30	40
Saudi Arabia	6,200	64	55	70

Source: Table 1.1 of Human Development Report (1990)

The lack of perfect synergies between monetary and non-monetary dimensions has shifted the focus from a merely economic growth led development process to a more holistic process of development focusing on monetary as well as non-monetary dimensions. This more holistic process of development calls for a multidimensional

approach to measurement. It should be born in mind that the objective of measurement exercises is to capture and reflect various aspects that assist in guiding better policies towards improving human lives. It is thus crucial that these measurement exercises are technically sound, yet are amicable to practical issues and policy guidance at the same time.

There may be two distinct ways to assess the progress when multiple dimensions are involved. One is to look at the progress in different dimensions separately and the other is to aggregate the performance into a single index to assess the overall progress. One can find good arguments in favour of each of those mechanisms.

There are two key arguments for looking at performance in different dimensions separately. One is that it avoids the loss of information that occurs when we aggregate the performance in different dimensions into a single index. The other is that it does not require making difficult decisions regarding the importance of the different dimensions and the suitability of various aggregation procedures. We also find good reasons to favour a synthetic measure. First, a single index summarizing the overall performance may send a more powerful message than a dashboard of large number of isolated indices (Stiglitz, Sen and Fittousi 2009). This is the reason why the GNP/GDP and the HDI have become more popular and have played effective roles in policy designs than the dashboard of Millennium Development Goals indicators (see Page 22). Second, a single real-valued index satisfies *completeness* and *transitivity*. The first property permits full comparability whereas the second one ensures consistent evaluations. And third, looking at different dimensions separately implies ignoring the joint distribution of achievements across the population. We discuss this issue in detail later on (Page 18).

The Human Development Index (HDI) is one of the social indices, introduced in various Human Development Reports in the past two decades, with the objective of creating a family of rich and highly informative indices helping to assess the degree of development in a large number of countries. Those indicators are aimed at answering a basic question: How have countries progressed in terms of human development over the past decades? The data using the new HDI, introduced in the 2010 HDR, show a relevant worldwide improvement in the level of human development for the period 1980-2013 in all dimensions, even though the rate of improvement varies in different periods. **¡Error! No se encuentra el origen de la referencia.** provides a summary of

the evolution in the world by groups of countries, according to their level of human development. Countries experiencing larger increases in the HDI are the medium or low human development countries.

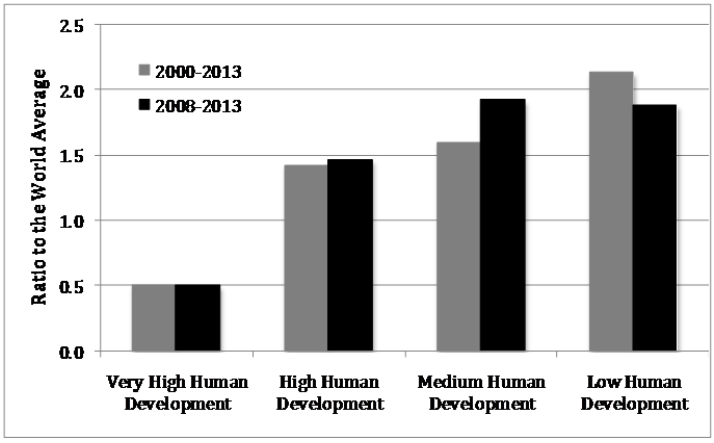
Table 2: The Growth of HDI in the World (1980-2013) by Groups of Countries

	Average Annual HDI Growth				
	1980-2013	**1980-1990**	**1990-2000**	**2000-2013**	**2008-2013**
Very high human development	0.53	0.52	0.62	0.37	0.20
High human development	1.14	1.04	0.81	1.04	0.60
Medium human development	1.41	1.22	1.09	1.17	0.79
Low human development	1.31	0.64	0.95	1.56	0.77
World	**0.77**	**0.66**	**0.67**	**0.73**	**0.41**

Source: UN HDR 2014

The average yearly HDI growth rate for the period 1980-2013 in the world is 0.77, with values of 0.53% for the most developed countries and 1.31% for the less developed ones. Notice that the period 2000-2013 shows larger differences in favour of those countries with low human development, which conveys a rather positive message. The crisis has clearly affected the evolution of human development by reducing the annual rates of growth, as shown in the last column of the table. Yet it might be worth noting that the slowdown is mostly a scale effect, as the shares in the average growth have remained quite stable, as Figure 1 shows. The vertical axis measures the ratio of the average annual HDI growth in different HDI categories to the overall average annual HDI growthd, which is directly computed using the numbers in **¡Error! No se encuentra el origen de la referencia.**. For example, the ratio of the average annual HDI growth of very high human development countries to the world average for the period 2000-2013 is computed as 0.37/0.73 = 0.5, which is the height of the corresponding grey bar in Figure 1.

Figure 1: The Ratio of Regional Growth to Overall Growth in HDI



The country rankings generated by the HDI have received large global attention. A number of practical issues, however, have raised concerns over the application of the index. The first issue that has received great attention is the choice of equal weight for each of the three dimensions (Kelley 1991; Desai 1991). It has been argued that the equal weight structure entails a very strong value judgment. Rankings or comparisons may alter if an alternative weighting structure entailing a different value judgment is selected. This concern has been well-spotted and various data driven techniques, such as principal component analysis (UNDP 1993; Noorbakhsh 1998; Nguefack-Tsague et al. 2011) and data envelopment analysis (Mahlberg and Obersteiner 2001; Despotis 2005), have been used to devise alternative weighting structures. Some of these applications have agreed with the equal weight structure and some have disagreed. An interesting study was pursued by Chaudhury and Squire (2006), who conducted an opinion survey among experts from different countries. Their study found experts somewhat agreed with the equal weight structure of the HDI.

Whichever way the weighting structure is determined, there is always some degree of arbitrariness in the choice and so another branch of literature has taken an alternative route. Instead of developing a new technique for weighting dimensions, these studies have proposed conducting sensitivity analysis (Saisana et al. 2005) and robustness tests (Cherchye et al. 2008; Foster et al. 2009; Permanyer 2011) with respect to the choice of initial weights. These robustness and sensitivity analyses test whether or not a given pair-wise comparison is fully robust to alternative weighting structures and if the comparison is not fully robust then to what extent the comparison is robust. Foster et al. (2009) found that nearly 70 percent of all pair-wise HDI comparisons for various years were fully robust. This implies that no matter how the initial equal

weighting structure is altered, 70 percent of all pair-wise comparisons would not change.[1] When the initial equal weights were allowed to vary by 25 percent in any direction, then nearly 92 percent of pair-wise HDI comparisons were robust. Thus, although there has been a strong animosity against the choice of equal weights, empirical findings tend to agree with this choice (even when there may be particular cases where the directions of pair-wise comparisons alter).

The issue of robustness with respect to the choice of weights is in fact linked to a second issue related to the correlation or statistical association between the component dimensions. If the statistical associations between component dimensions are high, then any debate over the choice of weights loses most of its significance. Cahill (2005) used six alternative weighting structures to compute the HDI ranking using the three highly correlated dimensions of HDI and found HDI rankings across countries to be very highly correlated to each other. In fact, in a hypothetical world, if all three dimensions of the HDI were perfectly positively associated, then any two alternative weighting structures would agree over every pair-wise comparison (Foster, McGillivray and Seth, 2013). If an overall index provides similar rankings to any of its component indices, then what additional information does the aggregate index provide? This was precisely the point made by McGillivray (1991). The Spearman's rank correlation coefficients between three dimensions as well as the rank correlation between the HDI and its component dimensions appeared to be very high (ranging between 0.74 and 0.97 using the data from 1990 Human Development Report). McGillivray and White (1993) also found a very high correlation between the HDI ranking and the ranking based on per-capita GNP that the HDI was trying to replace. This type of high association between the HDI rankings and the rankings according to its component dimensions as well as the high association between the HDI rankings and the per-capita GNP rankings may lead the HDI to be a redundant index (McGillivray 1991).

This way of understanding redundancy of an index however can be debated. First, note that the even though the rank correlation coefficients were high when they were computed across all countries, they were not necessarily high across subgroups of countries. For example, the rank correlation coefficients ranged between –0.14 and 0.4 when McGillivray (1991) considered only the low human development countries.

[1] How many pair-wise comparisons are there? If there are 100 countries, then the number of total possible pair-wise comparisons is 100×99/2 = 4950.

Put differently, a high rank correlation between two long lists of country outcomes is perfectly compatible with very large differences between individual realizations. Second, the high statistical associations existed at the aggregate level across countries. This may not necessarily imply that such high associations exist between dimensions at more disaggregated levels – across states/provinces, across municipalities or across households. Therefore a deeper analysis and understanding of the redundancy aspect of an index is required.

A third issue that is often raised relates to the particular functional form used for aggregating the dimensional performances. Note that the tradition HDI until 2009 is obtained by linearly aggregating the performance in three dimensions, which also assumed a strong value judgment. Besides, linear aggregation has a number of drawbacks. It implies assuming perfect substitutability between the components values, i.e., it amounts to admitting that we can substitute, for instance, expected life years by education at a constant rate, no matter the average level of health (see Ravallion 2010 for a discussion on trade-offs between dimensions). In addition, an additive index generates a ranking that is sensitive to the normalization of the different dimensions, where a change in the arbitrary normalization of the underlying variable induces changes in rankings. To counter these limitations of the linear HDI, the 2010 HDR introduced a new aggregation formulation based on geometric mean as discussed in the previous chapter. The country rankings produced by the new HDI was not found to be strikingly different from the rankings produced by the linear HDI using the 2010 country data (UNDP 2010, p. 227).

The geometric mean is a well-known aggregator in economics, corresponding to the familiar symmetric Cobb-Douglas formula for production and utility functions and exhibits much better properties regarding substitutability among the dimensions. However, the benefit of using the geometric formulation may not be fully enjoyed unless appropriate normalizations of the original underlying variables are undertaken. The country rankings are still sensitive to the selection of the minimum values for normalization. For the construction of the HDI, the normalized values of each dimension is obtained by subtracting the minimum value from the original variable in each dimension and then divided by the difference of the maximum and the minimum values. Any change in the minimum values still alters country rankings. One way of encountering this problem is to set the minimum values equal to zero and

then normalize each dimension by dividing the related variable by the corresponding maximum value only (Herrero, Martínez & Villar 2010; Alkire and Foster 2010).

All the relevant practical issues involving the measurement of human development are very important but ignore one key practical issue, which is the consideration of distributional aspects. The discussion until now assumes that dimensional indices are somehow obtained and then they need to be meaningfully aggregated to obtain the index. While doing this, dimensional indices and thus the HDI ignore the existing inequality in human development. In the next section, we discuss how the distribution concerns have been incorporated in the measurement of human development.

2. Distributional Concerns While Measuring Human Development

The first attempt to incorporate the distributional aspects into the measurement of human development was made by Anand and Sen (1995) through capturing inequality across gender in the same three dimensions of the HDI. The index, well-known as the Gender-related Development Index (GDI), is based on the equally distributed equivalent achievements (Atkinson 1970), which is equivalent to generalized means with particular restriction on the relevant parameter. The generalized mean of order α of a vector $y = (y_1, \dots, y_n)$ with n positive achievements is defined as

$$\mu_\alpha(y) = \begin{cases} \left[\frac{1}{n}\sum_{i=1}^{n} y_i^\alpha\right]^{1/\alpha} & \text{for } \alpha \neq 0 \\ \left[\prod_{i=1}^{n} y_i\right]^{1/n} & \text{for } \alpha = 0 \end{cases}.$$

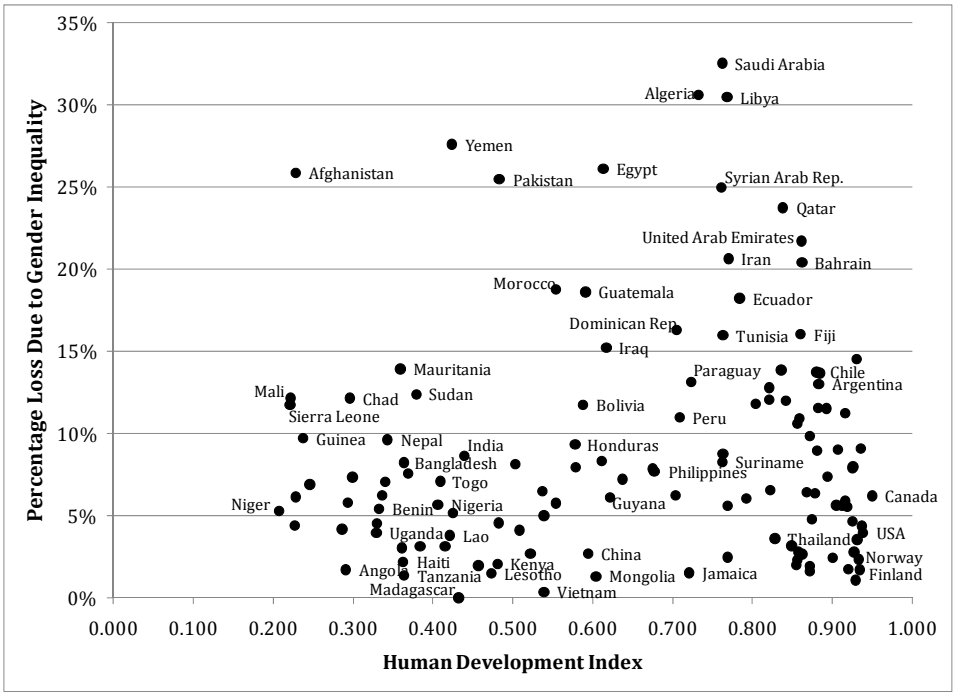
The parameter α is an inequality aversion parameter. When $\alpha = 1$, then $\mu_1(y)$ is the average of all achievements in y without any consideration of inequality between the n elements. However, when $\alpha < 1$, then $\mu_\alpha(y)$ is the equally distributed equivalent achievement of y, which implies that $\mu_\alpha(y)$ would yield the same level of overall achievement had each of the n achievements was equal to $\mu_\alpha(y)$. Higher the aversion to inequality (smaller the value of α) is, lower is the value of $\mu_\alpha(y)$.

The GDI is computed in two steps. First, an equally distributed equivalent achievement for each of the three dimensions is calculated using the male and female achievements. Then, in the second step, the GDI of a country is computed as a simple

average of the three equally distributed equivalent achievements. The GDI can be seen as a gender-inequality adjusted Human Development Index. The loss in human development due to gender inequality can be computed as (HDI – GDI)/HDI.

Figure 2 presents a scatter-plot showing the relation between HDI levels (horizontal axis) and percentage losses in human development due to inequality between gender (vertical axis) across 130 countries for year 1992. There does not appear to be any relationship between the HDI levels and losses in human development due to gender inequality. Thus, it cannot be claimed that countries with lower human development has larger gender disparity. In fact, certain high-medium HDI countries, such as Saudi Arabia and Algeria, appear to have had high levels of gender inequality. Whereas, certain low human development countries, such as Angola and Tanzania, appear to have had very low levels of gender inequality.

Figure 2: HDI and Loss Due to Gender Inequality across 130 Countries in 1992



Source: Computation used data from Tables 1.1, 1.2 and 3.1 of Human Development Report 1995.

Gender inequality only captures inequality between two genders but ignores inequality within groups. Even when human development levels are less unequal across genders, there may exist large inequality across the population. An attempt to incorporate the distributional aspects from a much wider perspective has been made

by Hicks (1997). In order to capture inequality, Hicks computes a Gini coefficient for income distribution, educational distribution, and longevity distribution as follows. The Gini coefficient for the income distribution is computed using the data on income shares by quintile. In other words, the Gini coefficient is computed by certain discrete points from the Lorenz curves. The Gini coefficient of the education distribution is computed also from certain discrete data points by classifying the education data in six categories: no education, some primary education, completed primary education, some secondary education, completed secondary education and some higher education. Finally, the Gini coefficient of the longevity distribution is obtained from mortality statistics (death rates) that were available across age, gender and rural/urban residence for nine consecutive years.

Then the inequality-adjusted index for each dimension is computed by multiplying the dimensional achievement by a factor that is inversely related to the corresponding Gini coefficient. Let us denote the original dimensional achievements of the three dimensions of the HDI by x_1, x_2, and x_3 and the corresponding dimensional Gini coefficients by G_1, G_2 and G_3. The inequality-adjusted index of dimension i is computed as $x_i \times (1 - G_i)$. The inequality-adjusted HDI, referred by Hicks as the IAHDI, is a simple average of the three dimensional inequality-adjusted indices such that

$$\text{IAHDI} = \frac{1}{3}\sum_{i=1}^{3} x_i \times (1 - G_i).$$

Note that in an ideal situation when there is no inequality across the categories, each inequality-adjusted dimensional index is equal to the corresponding dimensional achievement and the IAHDI is equal to the HDI. On the other hand, if inequality in each dimension increases but the average achievement remains the same, IAHDI falls discounting for the higher inequality.

Table 3: The HDI and the Inequality-Adjusted HDI (IAHDI) for 20 Countries

Country	1995 HDI	IAHDI	Percentage Loss (%)
Korea (Rep)	0.882	0.621	29.6
Hong Kong	0.905	0.633	30.1
Chile	0.880	0.553	31.2
Sri Lanka	0.704	0.483	31.4
Thailand	0.827	0.539	34.9

Costa Rica	0.883	0.561	36.5
Malaysia	0.822	0.519	36.9
Philippines	0.677	0.41	39.5
Venezuela	0.859	0.513	40.3
Colombia	0.836	0.492	41.1
Zimbabwe	0.539	0.316	41.4
Panama	0.856	0.499	41.7
Mexico	0.842	0.488	42.1
Nicaragua	0.611	0.354	42.1
Peru	0.709	0.393	44.6
Honduras	0.578	0.317	45.1
Dom. Rep.	0.705	0.375	46.8
Brazil	0.804	0.416	48.3
Guatemala	0.591	0.256	56.6
Bangladesh	0.364	0.158	56.6

Source: Hicks (1997)

Hicks applied the index to twenty developing countries using HDI data for year 1995 and showed how the country rankings changed when the HDI was adjusted for the existing inequality. For example, Costa Rica and the Republic of Korea had the same level of HDI of 0.883 and 0.882, respectively, in 1995. However, the levels of inequality in all three dimensions were higher in Costa Rica than that in the Republic of Korea. As a result, the IAHDI of Costa Rica was much lower (0.561) than that of the Republic of Korea (0.621). Using the HDI and IAHDI values, Hicks computed the percentage loss in the level of well-being due to the existing inequality in the three dimensions by (HDI – IAHDI)/HDI. The percentage loss ranged from 29.6% for the Republic of Korea to 56.6% for Guatemala and Bangladesh.

Another attempt to incorporate the distributional concerns into the measurement of the HDI has been made by Foster, Lopez-Calva and Szekely (2005). Instead of Gini coefficient to capture inequality across each distribution, they propose a framework based on generalized means. A simple average or arithmetic mean of all elements in y can be obtained by setting $\alpha = 1$ and let us denote it by μ. The Atkinson's measure of inequality of order α can be defined as $I_\alpha = (\mu - \mu_\alpha)/\mu$. This relationship can be expressed as $\mu_\alpha = \mu(1 - I_\alpha)$. Foster, Lopez-Calva and Szekely first propose computing the general mean of order α for each distribution: income, education and health, where inequality within each distribution is captured through the Atkinson's measure of inequality. In the second stage, the three dimensional general means are aggregated using again a general mean of order α to obtain the inequality-adjusted HDI. Note the generalized means at the first stage capture inequality within the distributions and

the second stage generalized mean ensures that the overall index is discounted if the performance in three dimensions is uniform.

The authors apply the family of inequality-adjusted HDI to the data from Mexico accessing a sample of the Population Census for the year 2000. The sample contained 10,099,182 individual records from 2.2 million households, each with information on incomes and education. However, the population census did not include any information on health and so the individual-level health information was imputed from the municipality-level data, which ensured that inequalities in health across households living in different areas are still captured.

Table 4: The HDI and the Inequality-Adjusted HDI for Mexico and Its States

State	HDI ($\alpha = 0$)	HDI ($\alpha = -2$)	Percentage Loss (%)
Distrito Federal	0.740	0.638	13.9
Baja California	0.718	0.615	14.3
Aguascalientes	0.700	0.581	17.0
Nuevo Leon	0.702	0.578	17.6
Baja California Sur	0.704	0.579	17.8
Campeche	0.673	0.547	18.7
Coahuila	0.696	0.564	19.0
Sinaloa	0.682	0.547	19.7
Quintana Roo	0.680	0.544	20.0
Colima	0.688	0.543	21.2
Tamaulipas	0.675	0.528	21.8
Queretaro	0.664	0.515	22.5
Jalisco	0.677	0.525	22.5
Morelos	0.669	0.514	23.2
Sonora	0.685	0.526	23.3
Tabasco	0.665	0.509	23.4
Estado de Mexico	0.682	0.519	24.0
Guanajuato	0.655	0.494	24.6
Chihuahua	0.674	0.507	24.8
Hidalgo	0.645	0.478	25.8
Nayarit	0.664	0.490	26.2
Puebla	0.623	0.455	27.1
San Luis Potosi	0.637	0.464	27.1
Yucatan	0.624	0.450	27.9
Tlaxcala	0.660	0.475	28.1
Durango	0.661	0.471	28.8
Michoacan	0.636	0.451	29.1
Veracruz	0.617	0.434	29.7
Zacatecas	0.648	0.440	32.1

Guerrero	0.597	0.400	33.1
Chiapas	0.574	0.380	33.8
Oaxaca	0.588	0.365	37.9
Mexico	**0.663**	**0.491**	**25.9**

Source: Foster et al. (2005)

In order to make the human development index as comparable as possible with the traditional human development index, certain adjustments are made to the variables. As income is only one component of the Gross Domestic Product, adjustments are made to the household income. Two variables are used to capture the education status of the sample households as in the traditional HDI. One is the literacy variable which is computed as the proportion of literate individuals over 14 years of age to the total number of individuals that are older than 14. The other is the attendance variable, which is the proportion of 6-year-old to 24-year-old individuals attending school. As in the traditional HDI, the education index for each individual is constructed by giving two-third weight to the literacy variable and one-third weight to the attendance variable. However, the health indicator is slightly different, where infant mortality or infant survival rates are used as proxies for the health conditions. Note that this variable is available only at the municipality level and not at the household level and so inequality across health is only captured at the municipality level.

They compute the HDIs ($\alpha = 1$) and inequality adjusted HDIs ($\alpha = -2$) nationally and for all 32 states. The loss of wellbeing due to inequality is computed as (HDI – IAHDI)/HDI. At the national level, the loss of well-being due to inequality appears to be 26%. However, the loss in well-being varies widely from state to state: from nearly 14% in Distrito Federal and Baja California to 38% in the state of Oxaca. The losses of well-being in the states of Chiapas, Guerrero and Zacatecas are more than 30%. The use of an inequality-adjusted HDI causes the ranks of the states to change widely.

A particular measure from the Foster *et al*. (2005) family of measures has been used by Alkire and Foster (2010) to propose the inequality-adjusted Human Development Index. They propose using the measure for $\alpha = 0$, which satisfies certain interesting properties and can be used with the HDI, when a geometric mean is used. Note that meaningful comparison of the HDI with geometric mean and the IHDI proposed by Alkire and Foster (2010) requires that no logarithmic transformation is taken for the income variable. If a logarithmic transformation is taken then there would be an

excess emphasis on income inequality because a logarithmic transformation is already a concave transformation.

Table 5: **The impact of Inequality on Human Development (2013)**

	HDI	Inequality Adjusted HDI	Overall loss (%)
Very high human development	0.890	0.780	12.3
High human development	0.735	0.590	19.7
Medium human development	0.614	0.457	25.6
Low human development	0.493	0.332	32.6

Source: HDR (2014)

The data referring to inequality adjusted HDI show two key messages. First, the inequality adjusted values may considerably change the ranking of individual countries, no matter the level of development (see the Appendix). Second, the overall loss due to inequality is, on average, inversely proportional to the degree of development (we shall come back to this point later on).

A somewhat different approach to reflect inequality in the level of human development has been followed by Grimm *et al*. (2008) by computing HDIs for different income groups. Grimm *et al*. apply their approach to thirteen developing countries, where each country has had a Household Income Survey (HIS) and a Demographic Health Survey (DHS). The household income surveys are used to compute the indices for income education and income; whereas the DHSs are used to compute the life expectancy indices.

In order to compute the quintile based indices, it is important to match the quintiles across two surveys of each country. Grimm *et al*. propose two alternative approaches for this purpose. One is a regression-based method where one first needs to identify a common set of variables in both surveys that are correlated with the income variable in the income survey. The set of variables should include some characteristics of household heads, some characteristics of households and some information on housing conditions. Then income is regressed on the set of common variables from the income survey and the regression coefficients are used to predict household incomes in the demographic health survey, which are used to construct the cumulative distribution of income and thus the income quintiles. The other approach is to use principal component analysis to construct the cumulative distribution of

asset index and then the quintile. In this alternative approach, it is assumed that the asset quintiles yield a consistent classification to what is obtained by observed income in the respective income surveys.

Once the quintiles are classified, the dimensional indices of income and education indices are constructed from the income surveys and the health indices are constructed from the health surveys. The HDI from the dimensional indices are constructed by using a weighted average, where the weight structure is the same as that of the traditional HDI.

In order to reflect the inequality in HDIs, the authors compute the ratio of HDI between the riches and the poorest quintile. Their results reveal stark differences across countries. The thirteen developing countries may be classified into three groups depending on the inequality in human development between the richest and the poorest quintile. The high inequality countries are Guinea, Burkina Faso, Zambia, and Madagascar, where the HDI for the richest income quintile is 1.7 times or higher than the poorest quintile. The second group of countries include Bolivia, Cameroon, Nicaragua, Cote d'Ivoire, Mozambique, and South Africa, where the ratios of the richest to the poorest range between 1.5 and 1.7. The third group of countries comprises Colombia, Vietnam, and Indonesia, where the ratio of the HDI for the richest to the poorest quintile is smaller but still ranges between 1.3 and 1.5.

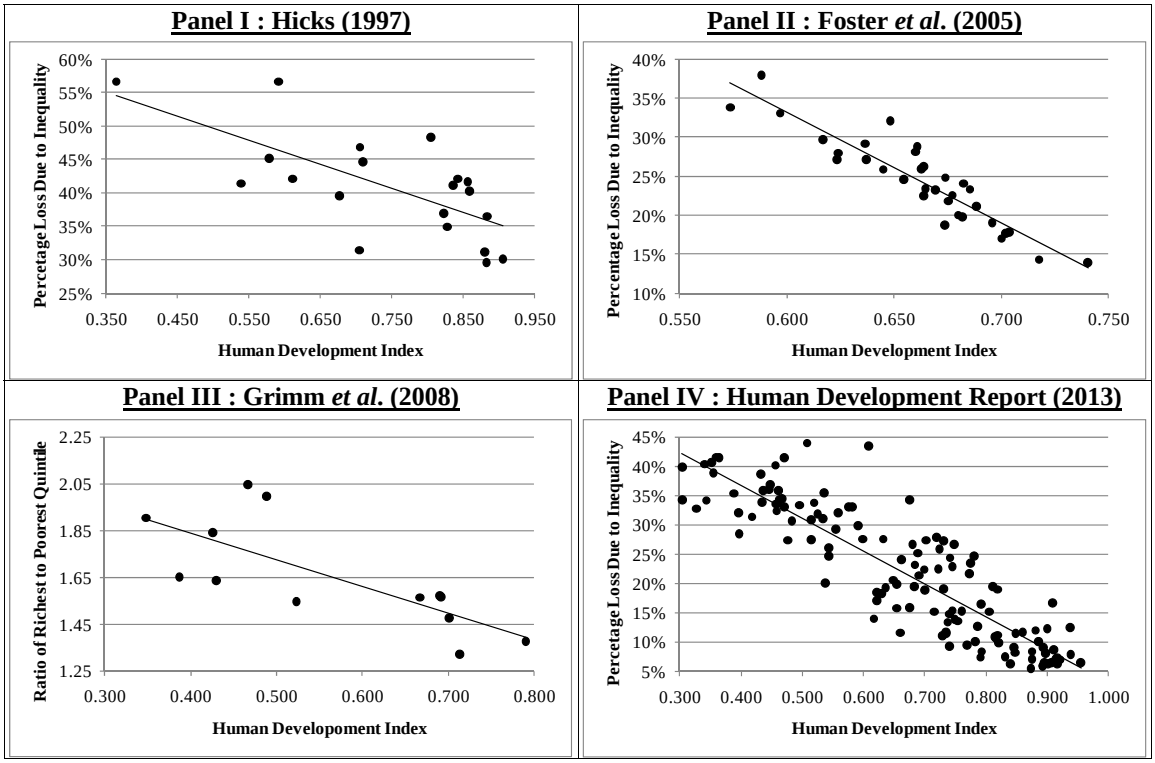
Table 6: Quintile-Specific HDI for Thirteen Developing Countries

Country (HIS/DHS)	1st	2nd	3rd	4th	5th	Overall HDI	5th/1st
Vietnam (2004/2002)	0.627	0.680	0.718	0.765	0.828	0.713	1.32
Columbia (2000/2005)	0.637	0.741	0.800	0.857	0.927	0.790	1.38
Indonesia (2000/2003)	0.593	0.651	0.700	0.764	0.874	0.701	1.47
Cameroon (2001/2004)	0.417	0.477	0.529	0.553	0.644	0.523	1.54
Nicaragua (2001/2001)	0.531	0.629	0.678	0.720	0.830	0.667	1.56
South Africa (2000/1998)	0.561	0.640	0.700	0.743	0.879	0.691	1.57
Bolivia (2002/2003)	0.550	0.640	0.704	0.741	0.863	0.690	1.57
Cote d'Ivoire (1998/1999)	0.343	0.416	0.434	0.515	0.561	0.430	1.64
Mozambique (2002/2003)	0.305	0.355	0.380	0.417	0.504	0.387	1.65
Zambia (2002/2002)	0.317	0.390	0.431	0.476	0.583	0.426	1.84
Burkina Faso (2003/2003)	0.257	0.306	0.331	0.365	0.489	0.348	1.90
Madagascar (2001/1997)	0.343	0.463	0.496	0.563	0.684	0.488	1.99
Guinea (1995/1999)	0.340	0.457	0.490	0.594	0.696	0.467	2.05

Source: Grimm et al. (2008)

One aspect consistent across all these studies is that the level of human development is inversely related to the level of inequality in human development both across countries and within countries. In Figure 3, we present four diagrams in four panels. In each diagram, the level of human development is presented on the horizontal axis and the level of inequality on the vertical axis. Panel I presents the relationship across twenty developing countries computed by Hicks (1997) presented in Figure 3. Panel II presents the relationship across 32 Mexican states computed by Foster *et al*. (2005) presented in Table 4. Panel III presents the relationship across thirteen developing countries computed by Grimm *et al*. (2008) presented in Table 6. Finally, Panel IV presents the relationship between the HDI and percentage loss in human development due to inequality using the inequality-adjusted HDI across 132 countries reported in the 2013 Human Development Report. It is evident that data from each of these four sources result in a strong negative relationship between the level of the HDI and the inequality in Human Development.

Figure 3: Comparison of the Level and Inequality in Human Development



Sensitivity to Joint Distribution

Unlike in the single dimensional context, analysis in the multidimensional context entails two distinct forms of inequality. The first pertains to the spread of the distribution across persons, analogous to unidimensional inequality. The second, in contrast, deals with the joint distribution among dimensions. This second form of inequality is important because a change in the joint distribution may alter individual level evaluations as well as overall inequality. Let us look at the following example of two achievement matrices, where rows denote persons and columns denote indicators.

Achievement Matrix I		
0.90	0.90	0.90
0.30	0.80	0.80
0.30	0.40	0.40

Achievement Matrix II		
0.90	0.90	0.90
0.30	0.40	0.80
0.30	0.80	0.40

It is evident from Achievement Matrix I that person 1 has higher levels of achievement in all three dimensions. Person 2 has higher achievement in the second and third dimensions than those of Person 3, but enjoys the same level of achievement in the first dimension. If we look at the distribution of achievements in each of the three dimensions in Achievement Matrix II, it is clear that each dimensional distribution is identical to the corresponding dimensional distribution in Achievement Matrix I. In other words, the distributions of achievement for the first dimension is (0.30, 0.30, 0.90), that for the second dimension is (0.40, 0.80, 0.90), and that for the third dimension is (0.40, 0.80, 0.90). Therefore, any distributional analysis of human development using the methods presented earlier in this section would make identical conclusions for both achievement matrices. This is because none of these methods reflect joint distribution of achievements.

The question then is: Should any distributional analysis yield the same conclusion? Clearly, in Achievement Matrix I, the third person is the worst off in all dimensions unlike in Achievement Matrix II, where the third person enjoys larger achievement in the second dimension than the second person. Although the dimensional distributions are identical across two distributions, the joint distributions are clearly different. In this sense, one may argue that inequality across the population is higher in Achievement Matrix I than that in Achievement Matrix II. In fact, the association between dimensions in Achievement Matrix I is higher as if the matrix is obtained

from Achievement Matrix II by increasing the association between dimensions. In the literature on multidimensional inequality, poverty and welfare measurement, this type of transformation of achievement matrices is known under different names: *basic rearrangement* (Boland and Proschan 1988), *basic rearrangement-increasing transfer* (Tsui 2002), *correlation increasing switch* (Bourguignon and Chakravarty 2003), *correlation increasing arrangement* (Deutsch and Silber 2005), *association increasing transfer* (Seth 2009, 2013), *correlation increasing transfer* (Tsui 1999) and *unfair rearrangement principle* (Decancq and Lugo 2012).[2] There is thus a clear need for methods that may capture this second form of inequality.

One such family of indices that incorporates this second as well as the first form of inequality has been proposed by Seth (2009, 2013). These indices are based on generalized means as the family of measures proposed by Foster *et al*. (2005). However, the order of aggregation is different. First, for each person's achievements across all dimensions are aggregated using a generalized mean of order β to obtain an overall well-being score for each person and then these overall well-being scores are aggregated using a generalized mean of order α to obtain the inequality-adjusted human development index. Thus, the family of indices has two parameters α and β. When $\alpha = \beta$, then the sub-family of indices belongs to the Foster *et al*. (2005) family of indices. When $\alpha < \beta$, then if two joint distributions have identical dimensional distributions but different associations between dimensions, then the level of human development is lower when the association between dimensions is higher.

Seth (2009) had applied the index to the same Mexican dataset used by Foster *et al*. (2005), but because of certain differences in normalizations the final values differ from that of Foster *et al*. The ranking of 32 states is indeed different when an index sensitive to both forms of inequality was used. However, the point of using such an index can be clarified using an example in the table below following Seth (2009). The state of Tabasco is chosen at random and the achievements are transformed in such a way that each dimensional distribution remains unchanged but the association between dimensions increases. Table 7 summarizes the post-transfer human development scores of Tabasco for different approaches. Note that the development scores of Tabasco that are based on the traditional HDI ($\alpha = \beta = 0$) and the Foster *et al*. index ($\alpha = \beta = -2$) are the same in the pre- and post-transformation situation.

[2] In case Achievement Matrix II is obtained from Achievement Matrix I, the transformation is referred as weak rearrangement by Alkire and Foster.

However, Tabasco's level of human development falls when an index sensitive to both forms of inequality was used. Before transformation, Tabasco scored 0.254; whereas after transformation the score drops to 0.244. Therefore, Tabasco's level of human development is adversely affected due to higher association between dimensions.

Table 7: Level of Human Development Before and After Transformation

State	HDI ($\alpha = 1, \beta = 1$)	Foster et al (2005) ($\alpha = -2, \beta = -2$)	Seth (2009) ($\alpha = -3, \beta = -1$)
Pre-transformation	0.719	0.296	0.254
Post-transformation	0.719	0.296	0.244

Seth (2013) has also applied an index from this family to study the change in the level of welfare between 1997 and 2000 in Indonesia using the Indonesian Family Life Surveys. The normalizations of the indicators are slightly different from the normalizations used by Foster *et al*. (2005) and Seth (2009). Instead of normalizing all variables between zero and one, Seth (2013) pursues an approach analogous to poverty analysis by identifying a threshold for each dimension below which a person is identified as deprived and not deprived otherwise. Then the achievements of each person in each dimension are divided by the corresponding threshold and these normalized values are assumed to be comparable across dimensions. For example, a person receives a value of one whenever the person is deprived in any dimension. This type of normalization implicitly assumes that the level of well-being is not bounded from above. Another major difference in the empirical study of Seth (2013) than Foster *et al*. (2005) and Seth (2009) is the choice of indicators. Although the same three dimensions – standard of living, education, and health – have been used, the standard of living has been assessed by per-capita expenditure, education has been assessed by years of education completed and health is assessed by the body mass index. The study focuses only on those who are 15 years or older.

The study has made an interesting finding. When an index with $\alpha = \beta = 1$ (traditional HDI formulation) is used, then no statistically significant change in well-being is observed either at the national level or across rural and urban areas. However, when an index with $\alpha = -1$ and $\beta = 0.1$ is used, then the level well-being increases statistically significantly both at the national level and across rural and urban areas. Why the level of well-being improved when adjusted for inequality? It turns out that although the average per-capita expenditure has fallen between 1997 and 2000, the

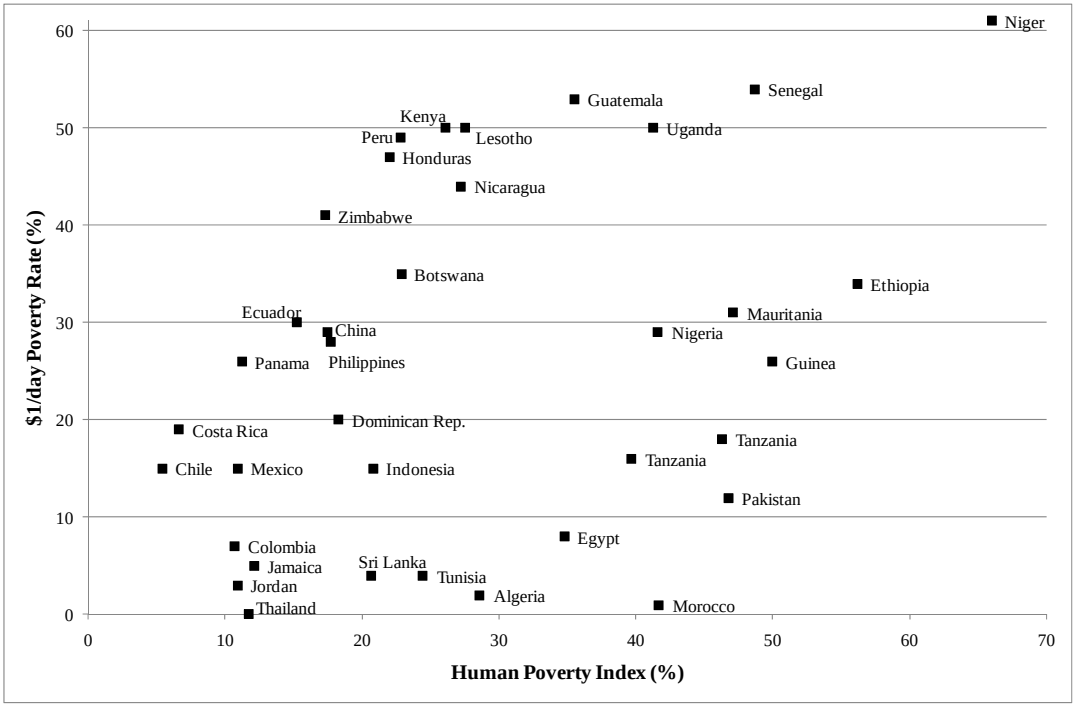
inequality also has gone down. Even though the pairwise association between dimensions have been higher in 2000 than in 1997, which have an adverse impact on the level of well-being, the reduction in inequality within dimensions has dominated the increase in association.

Note that not considering the information regarding joint distribution during multidimensional evaluation is indeed an important omission. On the other hand, an analysis with such requires that information on all dimensions and indicators should be available for each unit of analysis from the same source. In case this requirement appears demanding, then the distributional analysis may be conducted using the methods outlined earlier in this section. However, given that more and more data are available in recent years further research is required in developing methods that reflect both forms of inequality in the multidimensional context.

3. Poverty Analysis and Applications

Both the measurement of human development and its distributional issues are concerned with the overall progress without paying particular attention to those who are impoverished. With the objective of dealing with the issue of human impoverishment, Anand and Sen (1997) created the Human Poverty Index (HPI). As they explain, the relationship between the HDI and the HPI should be seen as the relationship between the per-capita Gross National Product that measures the overall progress in terms of incomes and an income-based index of poverty. In the 1997 edition of the Human Development Report, two separate Human Poverty Indices were computed for developing countries and for industrialized countries. The Human Poverty Indices were generalized means of dimensional deprivations which has been outlined in the theoretical chapter on the measurement on human development and human poverty of this book. The HPIs of developing countries were not found to be highly correlated with the $1/day poverty rates as presented in the 1997 Human Development Report as presented in Figure 4.

Figure 4: The Relationship between the HPI and $1/day across Developing Countries



Source: Human Development Report 1997 (Figure 1.1)

Even though the HPI was a composite index, as the traditional HDI, it could not earn similar popularity because of two main reasons. First, it is not intuitively as appealing as the HDI. The formulation is not as straightforward as the HDI and thus it is difficult to provide an intuitive interpretation of the HPI that could be used for meaningful purposes. The second reason is that unlike the $1/day (currently $1.25/day) poverty measure, HPI could not provide an answer to the question: How many poor are there in a country? For meaningful policy analysis, it is probably more useful to look at deprivation in each indicator separately or at the dashboard of indicators such as those in Millennium Development Goals.

Table 8: Millennium Development Goals

Goal	Number of Targets	Number of Indicators
1. Eradicate extreme poverty and hunger	2	5
2. Achieve universal primary education	1	3
3. Promote gender equality and empower women	1	4
4. Reduce child mortality	1	3
5. Improve maternal health	1	2
6. Combat HIV/AIDS, malaria and other diseases	2	7
7. Ensure environmental sustainability	3	8
8. Develop a global partnership for development	7	16

	18	**48**

Source: Indicators for Monitoring the Millennium Development Goals: Definitions Rationale Concepts and Sources, United Nations, 2003

In the United Nations Millennium Declaration of 2000, eight Millennium Development Goals outlined in Table 8 consisting of 18 time bound targets were adopted by 189 countries. In order to accomplish these goals and targets, the international organizations such as the World Bank, the International Monetary Fund (IMF), the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD) had come together with the United Nations to agree on 48 indicators. Most of these 18 targets were aimed to be met by year 2015.

The goals capture some but not all aspects of human development and human deprivations (UNDP 2003). Goals 1-6 are related to three key capabilities for human development. Goal 1 on reducing poverty and hunger is related to the capability to having a decent standard of living. Goals 2 and 3 on achieving universal primary education and promoting gender equality (especially in education) and empowering women is related to the key capability to being educated. And goals 4, 5 and 6 on reducing child mortality, improving maternal health and combating major diseases is related to the key capability to living a long and healthy life. Goals 7 and 8 are not directly related to a key capability, but are related to essential conditions for human development. Goal 7 ensuring environmental sustainability and goal 8 ensure strengthening partnership between rich and poor countries, which leads to a better global economic environment.

Progress since 2000, however, has not been uniform across all indicators. As the data in Table 9 reflect, 70 or more developing countries have either met the targets or have made sufficient progress in indicators such as extreme poverty, improved water, education gender parity; where 70 or more countries are either made insufficient progress or moderately and seriously off target in indicators such as under-5 mortality, under-nourishment, improved sanitation, maternal mortality and infant mortality. In fact, only 26 developing countries have met the target or made sufficient progress in improving maternal mortality and only 14 countries have met the target or made sufficient progress in improving infant mortality.

Table 9: Number of Developing Countries with Progress Status in Selected MDG Indicators

Goal	Target/Indicator	MDG Target Met	Sufficient Progress	Insufficient Progress	Moderately Off Target	Seriously Off Target
1	Extreme Poverty ($1.25/day)	66	12	7	4	24
7	Improved Water	64	6	4	11	40
3	Education Gender Parity	61	12	8	8	32
2	Primary Completion	44	9	10	9	44
4	Under-5 Mortality	35	14	20	34	39
1	Under-nourishment	34	7	9	7	70
7	Improved Sanitation	32	10	8	8	60
5	Maternal Mortality	8	18	7	26	74
4	Infant Mortality	6	9	18	32	77

Source: Downloaded from the World Bank website at http://data.worldbank.org/mdgs/progress-status-across-groups-number-of-countries on April 30, 2014.

Indeed, a dashboard of indicators conveys more information in terms of progress in different dimensions. It conveys better than a composite index where the progress has been made and where the progress has not. However, a dashboard of indicators has certain limitations. First, it lacks of a single outline figure like the GDP. If one is interested in knowing whether a country has made progress or not by looking at the MDGs, a conclusion can be made only when either a country has made improvement in all indicators or the country has deteriorated in all indicators. Apart from these two cases it is hard to make any conclusion on progress. It is very difficult to go through all the 48 indicators every time to draw any conclusion. Second, although a dashboard of indicators reflects how many people are deprived in various indicators, it does not reflect how many poor are there at a certain point in time (Alkire, Foster and Santos, 2011). Third, the dashboard of indicators, like any composite index (such as the HPI), does not consider the joint distribution of deprivations. For further discussions on these issues, see Chapter 3 of Alkire et al. (2015).

Let us consider the following example drawing on Alkire and Foster (2011). The example is similar in spirit to the example presented in the previous section.

Deprivation Matrix I

$1.25/day	Under-nourished	Improved sanitation
1	0	0
0	1	0
0	0	1

Deprivation Matrix II

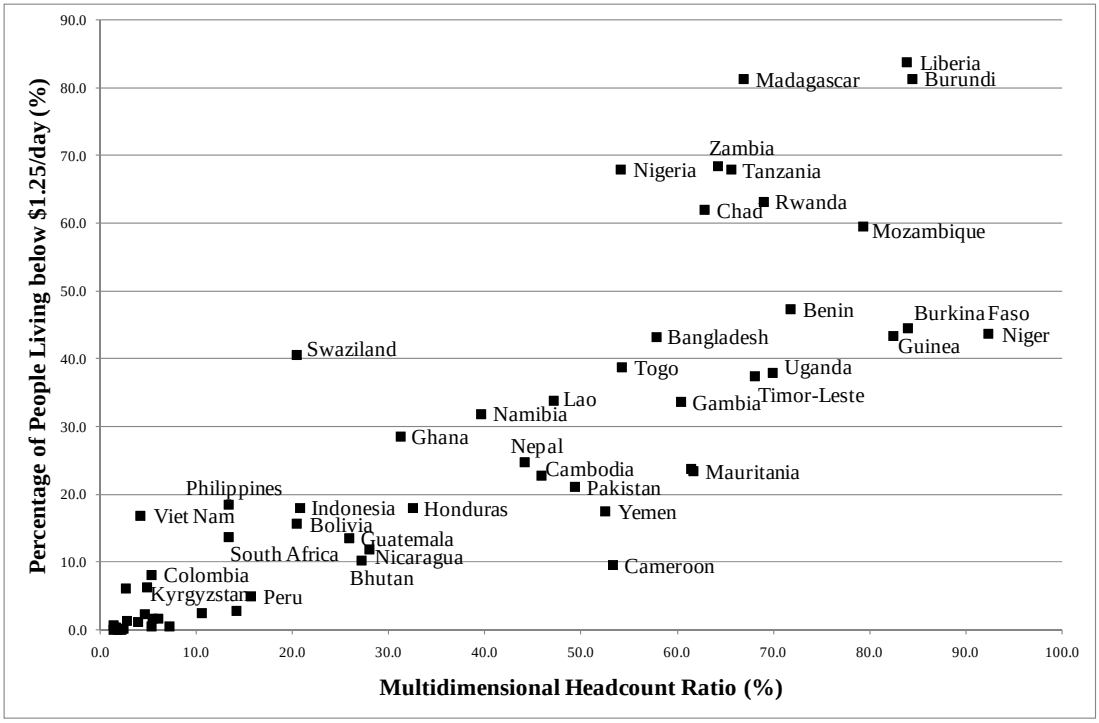
$1.25/day	Under-nourished	Improved sanitation
0	0	0
0	0	0
1	1	1

Suppose there are two hypothetical societies with three persons. The deprivation profile of the two societies in three MDG indicators are summarized in Deprivation Matrices I and II, where rows denote persons. In the matrix, an element equal to one

implies that the person is deprived in the indicator; whereas if the element is equal to zero, it implies that the person is not deprived. It is clear that in Achievement Matrix I, each person has one deprivation. On the other hand, in Deprivation Matrix II, only one person faces all three deprivations. Now both a composite index (such as the HPI) and a dashboard of indicators (for example consisting of the three indicators) would conclude an identical level of poverty in these two societies. In other words, neither composite indices nor dashboard of indicators can identify such difference. Why understanding such difference is crucial in practice? Note that in order to alleviate these deprivations it is more efficient if three different ministries in the second society responsible for these three indicators coordinate with each other to assist the person facing all deprivations. The second reason is it may be possible that in the second society, unlike in the first society, the third person actually represents a minority group living in abject poverty within an affluent society.

Any poverty measurement exercise following Sen (1976) involves two important steps: identification and aggregation. The identification step amounts to singling out who are the poor. This crucial step was ignored by both the HPI and the dashboard of MDG indicators. In the innovative 2010 Human Development Report the new Multidimensional Poverty Index (developed by Alkire and Santos 2010) was introduced which respected these two steps. The construction of MPI and its properties are outlined in detail in the previous chapter. The MPI identifies a person as poor if the person is deprived in a third or more of the ten weighted indicators. The MPI does not necessarily identify the same group of people that are identified as living below $1.25/day. In Figure 5, we compare the percentage of population identified living below $1.25 /day and the percentage of population identified as MPI poor. Although there appears to be a positive correlation, there are several exceptions. For example, let us look at countries where 40-50 percent of the population live between $1.25/day: Swaziland, Bangladesh, Benin, Guinea, Burkina Faso and Niger. Multidimensional headcount ratios of these countries, however, vary from 20 percent to 92 percent. Several other similar examples may be found from the same figure. Inter-temporal analyses have also shown that the reductions monetary poverty and the MPI poverty do not go hand in hand. For a cross country example, see Alkire and Roche (2013) and for an application on India, see Alkire and Seth (2013).

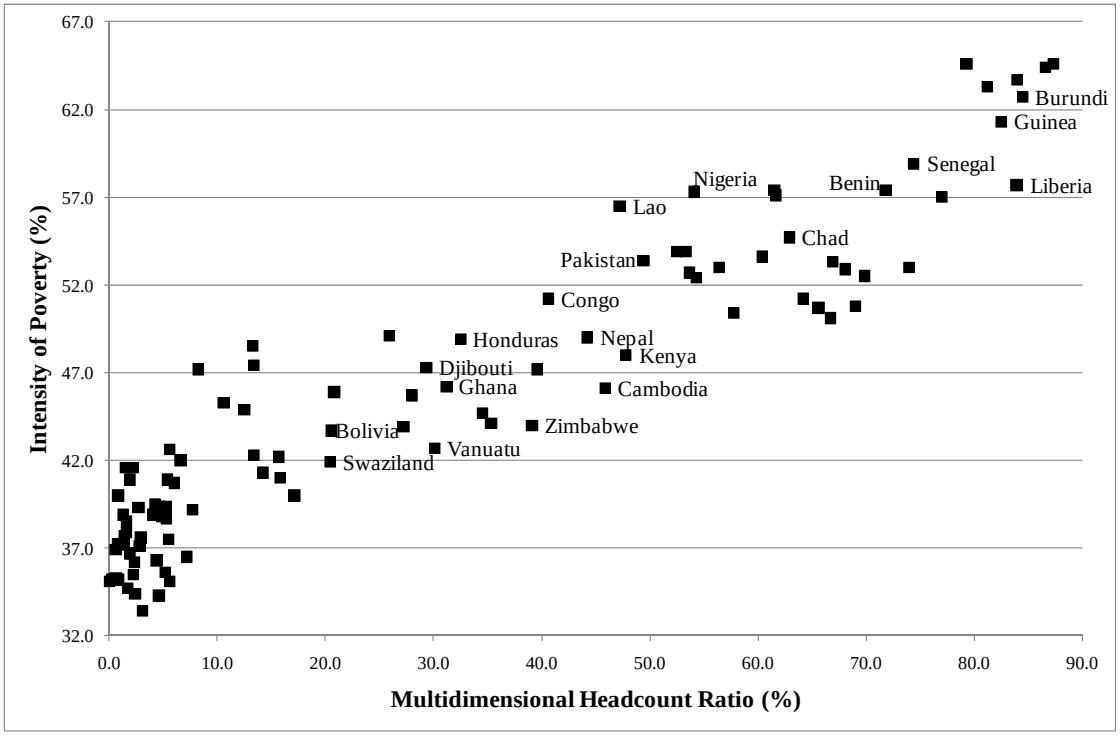
Figure 5: Disparity between $1.25/Day Poverty Rates and MPI Poverty Rates across Developing Countries



Source: The data used from Alkire, Conconni and Roche (2013) accessed on 30 April 2014 obtained at http://www.ophi.org.uk/multidimensional-poverty-index/mpi-data-bank/mpi-data/.

Three properties of the MPI are most frequently used in empirical applications. They are that (i) the MPI is presented as a product of the percentage of the population poor (known as the Multidimensional Headcount Ratio or the incidence of poverty) and the average number of weighted deprivations that the poor people encounter (known as the intensity of poverty), (ii) the MPI is additively decomposable so that the national MPI can be expressed as population-weighted average of subgroup MPIs, (iii) the MPI can be expressed as a weighted average of post-identification dimensional deprivations.

Figure 6: Incidence Vs. Intensity of Poverty



Source: The data used from Alkire, Conconni and Roche (2013) accessed on 30 April 2014 obtained at http://www.ophi.org.uk/multidimensional-poverty-index/mpi-data-bank/mpi-data/.

The usefulness of the first property can be seen in the example in Figure 6, where we plot the relationship between the incidence and intensity of poverty across developing countries. The MPI is a product of incidence and intensity and thus it may be possible that the same level of MPI can be obtained by different combinations of incidence and intensity. If the same level of MPI is obtained from a lower level of incidence but a higher level of intensity, then this means that a smaller fraction of poor people is deprived in a larger number of indicators on average. Let us compare Liberia and Nigeria. Nearly 84 percent of the population is MPI poor in Liberia compared to only around 54 percent of the population in Nigeria. However, the poor are deprived in similar extent on average in both countries. Several other examples can be found from the same figure. The incidence and intensity breakdown is also useful for inter-temporal analysis. While analyzing the evolution of multidimensional poverty in India using MPI, Alkire and Seth (2013) found that in some states, the reduction in MPI was obtained by stronger reductions in incidence; while in other states the strong reduction in poverty was due to relatively larger reductions in intensity.

The other two properties have also been used in various country studies. Roche (2013) for example studied multidimensional child poverty in Bangladesh between

1997 and 2007 and used the dimensional breakdown property to understand the dynamics of poverty reduction. Roche found that the reduction in poverty in the province called Barisal was due to a large reduction in deprivation in water, whereas in other provinces, such as Chittagong and Khulna, the reduction was mostly driven by health and nutrition. Alkire and Seth (2013a) used the subgroup decomposition property while studying the reduction in multidimensional poverty in India between 1999 and 2006. They found that although nationally there was a modest reduction in national multidimensional poverty, the poorest population subgroups (i.e., states, castes and religions) made the slowest progress. For further applications of the technique used for constructing the MPI in the measurement and analysis of poverty, see Batana (2013), Saini (2013), and Alkire and Seth (2013b). A more detailed discussion of the MPI methodology and applications, see Alkire *et al.* (2015).

4. Concluding remarks

The chapter provides a brief outline on the practical issues involving the measurement of human development and poverty. The key aspects refer to multidimensionality, inequality, and poverty, three elements on which there is a large list of contributions and also open a variety of modelling choices.

Discussing multidimensionality implies analysing how to select the relevant dimensions of a given problem, deciding on how to weight its relative importance, and choosing how to aggregate (or not) those dimensions into a single indicator. A dashboard of indicators is sometimes regarded as a better practical choice because it saves the analyst of making those difficult modelling choices. Yet single-valued indicators have the appeal of providing a summary measure of a complex phenomenon that makes easier to grasp the evolution of this phenomenon. Be as it may, there are two considerations worth introducing here. First, that both approaches can be regarded as complementary rather than as alternative. So a single-valued indicator coupled with additional information on particular aspects may be very useful. Second, that in both scenarios one has to deal with the problem of interdependent variables in order to get a sound assessment of the situation.

In the case of human development we find the persistence of three equally weighted dimensions. This choice seems an acceptable approach regarding the equal weight of

those three dimensions even though sooner than later the sustainability dimension should be introduced. Substituting the arithmetic mean by the geometric mean, as a way of aggregating those dimensions, seems a substantial improvement, even though there are still some pending issues, particularly regarding the normalization strategy and the use of logs for the income dimension (see the previous chapter for a discussion). As a consequence, the resulting rates of substitution for those countries with lower levels of human development may become rather odd.

Taking distributive aspects into account is a major step ahead in the measurement of human development. In spite of the different proposal made at different points in time, it took twenty years to introduce this aspect in the assessment of human development. The way in which it has been done is easy and well founded regarding the measurement of inequality. Yet there is still some inconsistency in the way of doing that, as income is measure in logs whereas income distribution is measured without. The logic seems to suffer from this methodological choice. There are also some difficulties when interpreting what inequality means regarding education and health, as it is not clear that a uniform distribution dominates another in which the younger generation exhibits higher values.

The measurement of poverty has been substantially revised since 2010. It now consists of a multidimensional index that applies the less developed countries and is much richer and sounder than former proposals. Yet it is somehow unfortunate loosing the poverty index for highly developed countries in a time in which the economic crisis is hitting very hard on some sectors of those countries.

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Appendix: Human Development Index (HDI), Inequality Adjusted Human Development Index (IAHDI) and Multidimensional Poverty Index 2013

HDI Rank	Country	HDI	IAHDI	Loss Due to Inequality (%)	Rank Difference of HDI & IHDI	MPI
Very High Human Development						
1	Norway	0.944	0.891	5.6	0	..
2	Australia	0.933	0.860	7.8	0	..
3	Switzerland	0.917	0.847	7.7	-1	..
4	Netherlands	0.915	0.854	6.7	1	..
5	United States	0.914	0.755	17.4	-23	..
6	Germany	0.911	0.846	7.1	1	..
7	New Zealand	0.910	..	..	..	..
8	Canada	0.902	0.833	7.6	-2	..
9	Singapore	0.901	..	..	..	..
10	Denmark	0.900	0.838	6.9	0	..
11	Ireland	0.899	0.832	7.5	-1	..
12	Sweden	0.898	0.840	6.5	3	..
13	Iceland	0.895	0.843	5.7	5	..
14	United Kingdom	0.892	0.812	8.9	-4	..
15	Hong Kong, China (SAR)	0.891	..	..	..	..
15	Korea (Republic of)	0.891	0.736	17.4	-20	..
17	Japan	0.890	0.779	12.4	-6	..
18	Liechtenstein	0.889	..	..	..	..
19	Israel	0.888	0.793	10.7	-4	..
20	France	0.884	0.804	9.0	-2	..
21	Austria	0.881	0.818	7.2	4	..
21	Belgium	0.881	0.806	8.5	0	..
21	Luxembourg	0.881	0.814	7.6	3	..
24	Finland	0.879	0.830	5.5	9	..
25	Slovenia	0.874	0.824	5.8	9	0.000
26	Italy	0.872	0.768	11.9	-1	..
27	Spain	0.869	0.775	10.9	1	..
28	Czech Republic	0.861	0.813	5.6	9	0.010
29	Greece	0.853	0.762	10.6	0	..
30	Brunei Darussalam	0.852	..	..	..	..
31	Qatar	0.851	..	..	..	..
32	Cyprus	0.845	0.752	11.0	-3	..
33	Estonia	0.840	0.767	8.7	3	0.026
34	Saudi Arabia	0.836	..	..	..	..
35	Lithuania	0.834	0.746	10.6	-3	..
35	Poland	0.834	0.751	9.9	-2	..
37	Andorra	0.830	..	..	..	..
37	Slovakia	0.830	0.778	6.3	9	0.000
39	Malta	0.829	0.760	8.3	5	..
40	United Arab Emirates	0.827	..	..	..	0.002
41	Chile	0.822	0.661	19.6	-16	..
41	Portugal	0.822	0.739	10.1	0	..
43	Hungary	0.818	0.757	7.4	7	0.016
44	Bahrain	0.815	..	..	..	..
44	Cuba	0.815	..	..	..	..
46	Kuwait	0.814	..	..	..	..
47	Croatia	0.812	0.721	11.2	-2	0.016

48	Latvia	0.810	0.725	10.6	0	0.006
49	Argentina	0.808	0.680	15.8	-4	0.011
High Human Development						
50	Uruguay	0.79	0.662	16.1	-8	0.006
51	Bahamas	0.789	0.676	14.3	-3	..
51	Montenegro	0.789	0.733	7.2	5	0.006
53	Belarus	0.786	0.726	7.6	6	0.000
54	Romania	0.785	0.702	10.5	4	..
55	Libya	0.784	..	..	..	..
56	Oman	0.783	..	..	..	..
57	Russian Federation	0.778	0.685	12	3	0.005
58	Bulgaria	0.777	0.692	11	5	..
59	Barbados	0.776	..	..	..	..
60	Palau	0.775	..	..	..	..
61	Antigua and Barbuda	0.774	..	..	..	..
62	Malaysia	0.773	..	..	..	..
63	Mauritius	0.771	0.662	14.2	-2	..
64	Trinidad and Tobago	0.766	0.649	15.2	-6	0.020
65	Lebanon	0.765	0.606	20.8	-17	..
65	Panama	0.765	0.596	22.1	-18	..
67	Venezuela (Bolivarian Republic of)	0.764	0.613	19.7	-10	..
68	Costa Rica	0.763	0.611	19.9	-11	..
69	Turkey	0.759	0.639	15.8	-3	0.028
70	Kazakhstan	0.757	0.667	11.9	9	0.001
71	Mexico	0.756	0.583	22.9	-13	0.011
71	Seychelles	0.756	..	..	..	..
73	Saint Kitts and Nevis	0.75	..	..	..	..
73	Sri Lanka	0.75	0.643	14.3	1	0.021
75	Iran (Islamic Republic of)	0.749	0.498	33.6	-34	..
76	Azerbaijan	0.747	0.659	11.8	7	0.021
77	Jordan	0.745	0.607	18.6	-5	0.008
77	Serbia	0.745	0.663	10.9	12	0.000
79	Brazil	0.744	0.542	27	-16	0.011
79	Georgia	0.744	0.636	14.5	4	0.003
79	Grenada	0.744	..	..	..	..
82	Peru	0.737	0.562	23.7	-9	0.043
83	Ukraine	0.734	0.667	9.2	18	0.008
84	Belize	0.732	..	..	..	0.018
84	Macedonia (Former Yugoslav Republic of)	0.732	0.633	13.6	7	0.002
86	Bosnia and Herzegovina	0.731	0.653	10.6	13	0.002
87	Armenia	0.73	0.655	10.4	15	0.001
88	Fiji	0.724	0.613	15.3	6	..
89	Thailand	0.722	0.573	20.7	-2	0.006
90	Tunisia	0.721	..	..	..	0.004
91	China	0.719	..	..	..	0.056
91	Saint Vincent and the Grenadines	0.719	..	..	..	..
93	Algeria	0.717	..	..	..	..
93	Dominica	0.717	..	..	..	0.018
95	Albania	0.716	0.62	13.4	11	0.005
96	Jamaica	0.715	0.579	19	1	..
97	Saint Lucia	0.714	..	..	..	..
98	Colombia	0.711	0.521	26.7	-10	0.022
98	Ecuador	0.711	0.549	22.7	-3	0.024
100	Suriname	0.705	0.534	24.2	-6	0.024
100	Tonga	0.705	..	..	..	..

102	Dominican Republic	0.7	0.535	23.6	-4	0.009
Medium Human Development						
103	Maldives	0.698	0.521	25.4	-7	0.018
103	Mongolia	0.698	0.618	11.5	16	0.065
103	Turkmenistan	0.698	..	..	..	..
106	Samoa	0.694	..	..	..	..
107	Palestine, State of	0.686	0.606	11.7	13	0.005
108	Indonesia	0.684	0.553	19.2	5	0.066
109	Botswana	0.683	0.422	38.2	-21	..
110	Egypt	0.682	0.518	24	-5	..
111	Paraguay	0.676	0.513	24.1	-5	0.064
112	Gabon	0.674	0.512	24	-5	0.070
113	Bolivia (Plurinational State of)	0.667	0.47	29.6	-10	0.089
114	Moldova (Republic of)	0.663	0.582	12.2	16	0.007
115	El Salvador	0.662	0.485	26.7	-7	..
116	Uzbekistan	0.661	0.556	15.8	14	0.008
117	Philippines	0.66	0.54	18.1	10	0.064
118	South Africa	0.658	..	..	..	0.044
118	Syrian Arab Republic	0.658	0.518	21.2	4	0.021
120	Iraq	0.642	0.505	21.4	0	0.045
121	Guyana	0.638	0.522	18.2	10	0.030
121	Viet Nam	0.638	0.543	14.9	15	0.017
123	Cape Verde	0.636	0.511	19.7	4	..
124	Micronesia (Federated States of)	0.63	..	..	..	..
125	Guatemala	0.628	0.422	32.8	-8	0.127
125	Kyrgyzstan	0.628	0.519	17.2	10	0.019
127	Namibia	0.624	0.352	43.6	-22	0.187
128	Timor-Leste	0.62	0.43	30.7	-3	0.360
129	Honduras	0.617	0.418	32.2	-6	0.072
129	Morocco	0.617	0.433	29.7	0	0.048
131	Vanuatu	0.616	..	..	..	0.129
132	Nicaragua	0.614	0.452	26.4	4	0.072
133	Kiribati	0.607	0.416	31.5	-4	..
133	Tajikistan	0.607	0.491	19.2	9	0.054
135	India	0.586	0.418	28.6	0	0.283
136	Bhutan	0.584	0.465	20.4	9	0.119
136	Cambodia	0.584	0.44	24.7	7	0.212
138	Ghana	0.573	0.394	31.3	-1	0.139
139	Lao People's Democratic Republic	0.569	0.43	24.5	8	0.174
140	Congo	0.564	0.391	30.7	0	0.181
141	Zambia	0.561	0.365	35	-4	0.328
142	Bangladesh	0.558	0.396	29.1	4	0.253
142	Sao Tome and Principe	0.558	0.384	31.2	0	0.154
144	Equatorial Guinea	0.556	..	..	..	..
Low Human Development						
145	Nepal	0.54	0.384	28.8	3	0.217
146	Pakistan	0.537	0.375	30.1	2	0.230
147	Kenya	0.535	0.36	32.8	0	0.229
148	Swaziland	0.53	0.354	33.3	-2	0.086
149	Angola	0.526	0.295	44	-17	..
150	Myanmar	0.524	..	..	..	..
151	Rwanda	0.506	0.338	33.2	-4	0.350
152	Cameroon	0.504	0.339	32.8	-2	0.248
152	Nigeria	0.504	0.3	40.3	-14	0.240
154	Yemen	0.5	0.336	32.8	-2	0.283

155	Madagascar	0.498	0.346	30.5	2	0.357
156	Zimbabwe	0.492	0.358	27.2	7	0.172
157	Papua New Guinea	0.491	..	..	..	..
157	Solomon Islands	0.491	0.374	23.8	11	..
159	Comoros	0.488	..	..	..	..
159	Tanzania (United Republic of)	0.488	0.356	27.1	8	0.332
161	Mauritania	0.487	0.315	35.3	-2	0.352
162	Lesotho	0.486	0.313	35.6	-2	0.156
163	Senegal	0.485	0.326	32.9	3	0.439
164	Uganda	0.484	0.335	30.8	5	0.367
165	Benin	0.476	0.311	34.6	0	0.412
166	Sudan	0.473	..	..	..	..
166	Togo	0.473	0.317	32.9	4	0.250
168	Haiti	0.471	0.285	39.5	-3	0.248
169	Afghanistan	0.468	0.321	31.4	7	0.353
170	Djibouti	0.467	0.306	34.6	2	0.139
171	Côte d'Ivoire	0.452	0.279	38.3	-2	0.310
172	Gambia	0.441	..	..	..	0.324
173	Ethiopia	0.435	0.307	29.4	5	0.564
174	Malawi	0.414	0.282	31.9	1	0.334
175	Liberia	0.412	0.273	33.8	-1	0.485
176	Mali	0.407	..	..	..	0.558
177	Guinea-Bissau	0.396	0.239	39.6	-4	0.462
178	Mozambique	0.393	0.277	29.5	2	0.389
179	Guinea	0.392	0.243	38	-1	0.506
180	Burundi	0.389	0.257	33.9	2	0.454
181	Burkina Faso	0.388	0.252	35	2	0.535
182	Eritrea	0.381	..	..	..	..
183	Sierra Leone	0.374	0.208	44.3	-3	0.388
184	Chad	0.372	0.232	37.8	1	0.344
185	Central African Republic	0.341	0.203	40.4	-2	0.430
186	Congo (Democratic Republic of the)	0.338	0.211	37.6	1	0.392
187	Niger	0.337	0.228	32.4	3	0.605

Source: Human Development Report 2014