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Weekly Report

The consequences of inequality: A new measure of human development

Marking the 20th anniversary of the Human Development Index (HDI), the United Nations Development Programme (UNDP) has published a revised measure that also accounts for inequality (IHDI). Countries subject to severe social disparities, particularly Central and South American countries, perform worse than under the classic HDI. Even if the revised measure does not yield fundamental changes in ranking, it provides new insights for policy makers and researchers alike.

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"People are the real wealth of nations"—these were the introductory words in UNDP's first Human Development Report 1990[1]. Focusing on the meaning and measurement of human development, the report aimed at shifting the discourse towards a multidimensional concept of development. While traditional development theory was preliminary concerned with income generation and economic growth, work on multidimensional poverty, particularly Amartya Sen's "capability approach", set the stage for a paradigm shift: Ultimately, development is not about monetary wealth but enlarging people's choices.[2] Introduced in the first 1990 report, the Human Development Index (HDI), was explicitly designed to reflect a multidimensional concept. One fundamental flaw, often critiqued since its creation, however, was its inability to capture socio-economic inequality.

An improved measure of human development

The HDI captures three basic dimensions of human development: A long and healthy life (health), access to knowledge (education) and an appropriate material living standard (income). Each component contributes in equal measure to the aggregated index and was previously measured by following indicators: average life expectancy at birth, adult literacy rate, the gross enrollment ratio and per-capita GDP at purchasing power parity (PPP). Since the most recent report in 2010, the methodology has been slightly revised: Adult literacy and gross enrollment rate are replaced by the mean and expected years of schooling, and GNI per capita replaced GDP per capita. In addition, the three components are aggregated differently: While the arithmetic

[1] United Nations Development Program (UNDP) (1990): Human Development Report: Concept and measurement of human development, Oxford University Press.
[2] Sen, A. (1999), Development as freedom, Oxford University Press.

Table

The ten biggest losers when inequality is taken into account

	All countries (N=139)			OECD nations (N=33)			
	HDI	IHDI	Difference		HDI	IHDI	Difference
			Rankings				
Peru	63	89	−26	South Korea	12	30	−18
Argentina	46	67	−21	Israel	15	26	−11
Panama	54	74	−20	Chile	45	55	−10
South Korea	12	30	−18	USA	4	13	−9
Colombia	79	97	−18	Mexico	56	64	−8
Bolivia	95	112	−17	Italy	23	28	−5
Belize	78	94	−16	Ireland	5	8	−3
Brazil	73	88	−15	France	14	17	−3
Namibia	105	120	−15	Canada	8	10	−2
El Salvador	90	104	−14	Greece	22	24	−2
By comparison:				Germany	10	7	3
			Index points				
Namibia	0.61	0.34	−0.27	Turkey	0.68	0.52	−0.16
Bolivia	0.64	0.4	−0.24	Mexico	0.75	0.59	−0.16
Micronesia	0.61	0.37	−0.24	Chile	0.78	0.63	−0.15
Peru	0.72	0.5	−0.22	South Korea	0.88	0.73	−0.15
Argentina	0.78	0.56	−0.21	Israel	0.87	0.76	−0.11
Panama	0.75	0.54	−0.21	Italy	0.85	0.75	−0.1
Belize	0.69	0.49	−0.2	USA	0.9	0.8	−0.1
Colombia	0.69	0.49	−0.2	Portugal	0.79	0.7	−0.09
Brazil	0.7	0.51	−0.19	Greece	0.85	0.77	−0.09
Guatemala	0.56	0.37	−0.19	Poland	0.79	0.71	−0.09
By comparison				Germany	0.88	0.81	−0.07

HDI: Human Development Index.

IHDI: The HDI was corrected to take into account aspects of inequality within the countries.

Both indices may have values between 0 and 1.

Sources: UNDP, http://hdr.undp.org/en/statistics/data/; calculations by DIW Berlin.

DIW Berlin 2010

In particular Latin American countries have experienced a downgrading when accounting for inequality in the HDI.

mean implied perfect substitutionality across components, the geometric mean explicitly accounts for the independent significance of each component: A decrease in health, for example, can no longer be fully compensated by an increase in education or income. To ensure commensurability, the HDI has been recalculated using the new methodology for 169 countries between 1980 and 2010.

A life worth living, however, is not limited to the factors captured in the classic HDI but extends to dimensions of political participation, ecological sustainability and equal opportunities.[3] Development that solely rests upon an elite's exclusive access to power and resources, for example, impinges on the well-being of the overall populace. Economic, social, and political inequalities may reinforce each other and permanently limit the potential for human

development.[4] Since the HDI does not capture inequality, people can live in countries with the same HDI score, yet still have very different opportunities to "live a life one has reason to value".[5]

In order to address the distributional dimension, the HDI was extended on its 20th anniversary.[6] The inequality-adjusted HDI (IHDI) is a measure of human development that corrects the HDI for inequality in education, health and income. When equality prevails across all three dimensions, HDI and IHDI are identical. As such, the HDI can be interpreted as the maximum attainable or potential IHDI. The greater inequality is, the lower is the IHDI vis-à-vis the HDI.

Strong declines for some countries...

Accounting for inequality in the new IHDI has led to dramatic changes in the ranking for some countries. Peru is the biggest loser among the 139 countries reviewed in 2010: After adjustments for inequality, the Andean nation falls 26 places, from 63rd to 89th (table).

Among the ten countries with the largest losses in rank, eight are located in Central and South America. These are mostly countries where historically strong agricultural concentration has produced above-average inequality.[7] Neglecting the adverse effect of inequality in these countries, the level of human development would have been vastly overstated.

There were also adjustments among the OECD countries. South Korea, previously ranked 12, drops to rank 30 once adjusted for inequality. The US, often cited as the anecdotal example of a highly developed country with high inequality, falls from rank 4 to rank 13. Germany, meanwhile, remains almost unaffected by the adjustments and moves from rank 10 to rank 7.

The changes in index points are also greatest among Central and South American countries. The IHDI for Bolivia, for instance, is almost 25 index points below the HDI, corresponding to the difference in development between Norway and Brazil. Namibia, as an extreme case, has its HDI almost halved once accounting for inequality.

3 Brundtland, G. H., Khalid, M. (1987): Our common future, Oxford University Press.

4 Sen ibid.

5 Sen ibid.

6 UNDP (2010): Human Development Report: The Real Wealth of the Nations: Pathways to Human Development, 20th Anniversary Edition, Oxford University Press.

7 Cristobal, K. (2002): Why East Asia overtook Latin America: Agrarian reform, industrialization and development, Third World Quarterly, 23 (6), 1073-1102.

Box

Calculating HDI and IHDI

Before changes to the calculation method in 2010 were made, the Human Development Index (HDI) was calculated as an arithmetic mean of three sub-indices that each measures various dimensions of human development:

$$HDI_{ARITHMETIC} = 1/3 * [INC+LE+EDUC]$$

Income (INC) is measured as per-capita GDP; health (LE) as life expectancy at birth; education (EDUC) is a weighted average of adult literacy (2/3) and the gross enrollment rate (1/3). Each component is normalized such that the resulting HDI lies between 0 and 1, where a value close to 1 reflects a high standard of development. The methodology of the HDI can be interpreted as an "average of averages": As a first step, the averages of income, health, and education are calculated separately; in a second step, these three averages are aggregated to produce a single HDI value.

With the Human Development Report 2010, however, the UNDP has begun to calculate the HDI in a modified form. Income is now calculated using per-capita GNI and adult literacy and the gross enrollment rate are replaced by the mean and expected years of schooling. Instead of the arithmetic average, the sub-indices are now aggregated using the geometric mean:

$$HDI_{GEOMETRIC} = [INC*LE*EDUC]^{(1/3)}$$

Although the methodological revision leads to little changes in the HDI, the revised aggregation explicitly addresses a conceptual problem of the old HDI—the perfect substitutability among the three dimensions. In contrast to the old index, the multiplicative form implies that a decline in one dimension can no longer be fully compensated by a rise in another dimension.[1]

The new Inequality-adjusted Human Development Index (IHDI) is derived from a special case of the Atkinson Index[2] and accounts for inequality by discounting each sub-index by a factor A, the adjustment factor or "cost" of inequality:

$$IHDI = [(1-A_{LE})*(1-A_{EDUC})*(1-A_{INC})]^{(1/3)} * HDI_{GEOMETRIC}$$

The IHDI measures inequality both within and between dimensions. Inequality within dimension X is measured by the adjustment factor $A_X = 1-g/m$, where g is the geometric mean and m is the arithmetic mean of distribution X. Since the geometric mean assigns less weight to large differences[3], a comparison of both means is an implicit measure of inequality. When g=m, there is no inequality and A=0. Once the distribution of the dimension is unequal, g becomes less than m, where the difference reflects the extent of inequality. Inequality between the dimensions is reflected similarly by the geometric mean of A_X. If there is no inequality between the three dimensions, $A_{LE}=A_{EDUC}=A_{INC}=A$. The resulting IHDI is thus (1-A)*HDI and is higher than in cases where A_X is unequal.

1 To illustrate this, consider a country with no education (EDUC=0) as an extreme example. In the old HDI, the additive form would lead to the lack of education being compensated by higher income or health. With the new method, EDUC=0 leads to a value of 0 for the entire HDI.

2 Atkinson, A. B. (1970): On the measurement of inequality. Journal of economic theory, 2 (3), 244-263.

3 This becomes clear when the logarithm of the geometric mean is applied.

... but overall little change to countries' rankings

Despite the extreme differences between IHDI and HDI in some countries, the inclusion of inequality in the IHDI does not lead to substantial changes in the general order of countries. The Spearman coefficient, a measure of correlation between two rankings, is at 0.98 for all countries—an almost perfect correlation.

Indeed, the IHDI can be interpreted as a linear transformation of the HDI. To illustrate this, the figure shows the HDI in relation to the IHDI. In absence of inequality, the IHDI would be the same as the HDI and all values would lie on the 45° line. Comparing the 45° line with the fitted line of the IHDI, however, the adjustment resembles, on average, a downward shift of the HDI curve. On average, the level of human development across countries is considerably lower once inequality within countries is taken into account.

Conclusion

To mark the 20th anniversary of the Human Development Index (HDI), the UNDP has published a revised index of human development that also accounts for inequality (IHDI). Countries with large

social disparities, particularly those in Central and South America, perform worse than under the previous measuring concept. Overall, however, the order of the 139 countries changes very little. Nonetheless, the new index is likely to become an informative source for policy makers and researchers alike.

Whether the IHDI will fully replace the old HDI, meanwhile, is questionable: Given the increased demand for disaggregated data to calculate the adjustment rates, it will be difficult to reconstruct the IHDI for previous decades. Instead of replacing the HDI, the IHDI will likely serve as a complementary indicator.

Besides education, health, and income, a comprehensive index of human development should also include other factors, such as ecological sustainability or happiness. The influential report presented in autumn 2009 by the Stiglitz Commission[8], for instance, calls for a substantial expansion of purely economic indicators. While such an index would ideally reflect human development in all its aspects, the implementation is almost impossible: For example, it is unclear which factors to include and how each factor should be weighted to produce an aggregate index.[9] The HDI and the IHDI, for example, assign equal weights to education, health, and income. Policy makers should be aware that changing prioritization can lead to considerably different outcomes in HDI scores. This problem would be aggravated in an even more complex index. In addition, many variables are often highly correlated, making redundancies unavoidable. Finally, every complex index is hampered by the fact that there is little reliable data for many variables, in particular in developing countries.

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Figure

Relationship between HDI and IHDI 2010
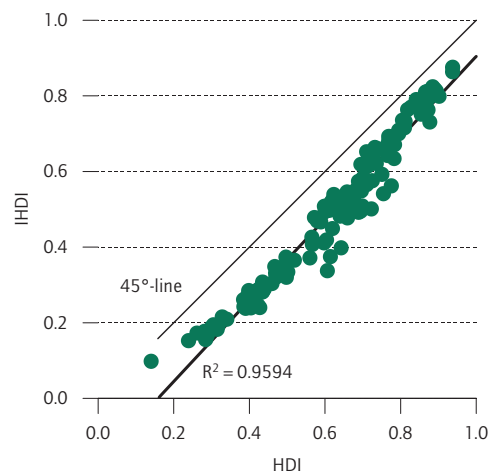
HDI: Human Development Index.
IHDI: The HDI was corrected to take into account aspects of inequality within the countries.
Both indices may have values between 0 and 1. The calculations are based on the values for 139 countries in 2010.

Sources: UNDP, http://hdr.undp.org/en/statistics/data/; calculations by DIW Berlin.   DIW Berlin 2010

Overall, the order changes very little.

8 Stiglitz, J. E., Sen, A., Fitoussi, J.-P.: Report of the Commission on the Measurement of Economic Performance and Social Progress, Paris, 2009.

9 Alkire, S. (2002): Dimensions of Human Development, World Development, 30, 181-205. Alkire, S. and Foster, J. (forthcoming): Counting and Multidimensional Poverty, Journal of Public Economics.