

Augmented Human Development Index¹

Human wellbeing is widely viewed as a multidimensional phenomenon, in which income is only one facet. Human development, originally defined as a process of enlarging people's choices, namely, enjoying a healthy life, acquiring knowledge and achieving a decent standard of living, provides a multidimensional measure of wellbeing.

These achievements provide individuals with freedom to choose and the opportunity to lead their own lives. Thus, human development can be depicted as positive freedom by which individuals are granted access to resources, including property, that allow them to develop their personal potential.

Dimensions of Augmented Human Development

In order to provide a synthetic measure of augmented human development, its different dimensions are expressed in index form,

- life expectancy at birth as a proxy for a healthy life,
- years of schooling as a proxy for access to knowledge,
- liberal democracy as a proxy for freedom,
- and discounted GDP per head as a surrogate for wellbeing dimensions other than education and health.

Life expectancy is defined as the average number of years of life which would remain for males and females reaching the ages specified if they continued to be subjected to the same mortality experienced in the year(s) to which these life expectancies refer.

Education attainment is measured by the average years of total schooling (primary, secondary, and tertiary) for population aged 15 and over.

The *Liberal Democracy Index* combines the electoral democracy index and the liberal component index. The former incorporates indices of freedom of association, expression, suffrage, and clean elections. The latter includes indices of equality before the law and individual liberty, judicial constraints on the executive, and legislative constraints on the executive.

GDP per head is expressed in 1990 dollars adjusted for its purchasing power adjusted, that is, for the difference in price level across countries (the so-called Geary-Khamis [G-K] 1990 \$).

As social variables (longevity and education) have upper and lower bounds (unlike GDP per head that has not known upper bound), they are transformed non-linearly in order to allow for two main facts: that increases of the same absolute size represent greater achievements the higher the level at which they take place; and that quality improvements are associated to increases in quantity. Thus,

$$I = f(x, Mo, M) = (\log(M - Mo) - \log(M - x)) / \log(M - Mo),$$

¹ The Augmented Human Development Index (AHD_I) is inspired in and adapts from a long run perspective The United Nations Development Programme's *Human Development Index (HDI)* (UNDP, 2014). A detailed explanation of the concept, computation procedures, and analysis of the results is provided in Prados de la Escosura (2021).

Where I is the dimension index, x is an indicator of a country's standard of living, M and M_0 are the maximum and minimum values, respectively, or goalposts, that facilitate comparisons over time and \log stands for the natural logarithm. The index for each dimension ranges between 0 and 1.

In the case of Liberal Democracy Index, as it measures both quantity and quality changes, a linear transformation has been accepted. Thus,

$$I = (x - M_0) / (M - M_0),$$

For GDP per head, as it is intended as crude proxy for those dimensions of wellbeing other than education and health, logarithmic transformation has been introduced. The log transformation implies that, in terms of human development, returns of *per capita* income decline as it reaches higher levels. Given its non-bounded nature, without this transformation, GDP per head would dominate the human development index rendering it redundant. In order to get the income index I I have used the same formula used for liberal democracy, except that x , M , and M_0 are expressed in logs.

Goalposts are set for human development's different dimensions. For life expectancy at birth, the maximum and the minimum values were established at 85 and 20 years, respectively. For years of schooling, maximum and minimum values were set at 15 and 0. In the case of liberal democracy, as it was already in index form, 1 and 0 were accepted as the goalposts. Lastly, for per capita GDP, the maximum and minimum values over 1870-2015 were G-K 1990 \$47,000 and \$100, respectively.

The Augmented Human Development Index

The indices for each dimension are, then, combined using equal weights into an index of human development.

In an attempt to reduce the substitutability between its different dimensions -namely, to avoid that a high achievement in one dimension linearly compensates for a low achievement in another-, the indices for each dimension are combined into a historical index of human development using a geometric average.

If we denote the non-linearly transformed values of life expectancy and education as LEB and EDU , LD to represent those of liberal democracy, and the adjusted *per capita* income as UNY , the historical index of human development can be expressed as,

$$AHDI = LEB^{1/4} EDU^{1/4} LD^{1/4} UNY^{1/4}$$

Time and Spatial Coverage

As regards the time span considered, the initial date, 1870, has been as the starting point because it is when large scale improvements in health, helped by the diffusion of the germ theory of disease since the 1880s, and mass education began in Western Europe and the European Offshoots. It is also in the late nineteenth century when, along the advance in medical knowledge, social spending started expanding in Western Europe and its offshoots. The final year, 2015, has been chosen to capture the effects of the Great Recession (2008-2013).

Over the entire time span, 1870-2015, 115 countries are considered, and its number rises up to 121, 146, 161, and 162 countries for the samples starting in 1913, 1950, 1980, and 1990, respectively. These samples represent above 90 per cent of the world population (and practically 100 per cent after 1950).

References

Prados de la Escosura, L. (2021), "Augmented Human Development in the Age of Globalisation", *Economic History Review* (forthcoming)
United Nations Development Programme (UNDP) (2014), *Human Development Report 2014*, New York: United Nations Development Programme.

Alert: measuring changes in the index

By how much did human development improve over the long run? Given the way in which the index has been computed, the conventional logarithmic rate of variation (as in the case of GDP per head) can be used.