Development Strategy and Policy Analysis Unit • Development Policy and Analysis Division
Department of Economic and Social Affairs

Inequality Measurement

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Summary

There are many measures of inequality that, when combined, provide nuance and depth to our understanding of how income is distributed. Choosing which measure to use requires understanding the strengths and weaknesses of each, and how they can complement each other to provide a complete picture.

Comprehending the impact of policy changes on the distribution of income first requires a good portrayal of that distribution. There are various ways to accomplish this, including graphical and mathematical approaches that range from simplistic to more intricate methods. All of these can be used to provide a complete picture of the concentration of income, to compare and rank different income distributions, and to examine the implications of alternative policy options.

An inequality measure is often a function that ascribes a value to a specific distribution of income in a way that allows direct and objective comparisons across different distributions. To do this, inequality measures should have certain properties and behave in a certain way given certain events. For example, moving $1 from a richer person to a poorer person should lead to a lower level of inequality. No single measure can satisfy all properties though, so the choice of one measure over others involves trade-offs. The following measures differ with regards to the properties they satisfy and information they present. None can be considered superior, as all are useful given certain contexts. A well-balanced inequality analysis should look at several of these measures.

Graphical representation of inequality

Lorenz curve

It is one of the simplest representations of inequality. On the horizontal axis is the cumulative number of income recipients ranked from the poorest to the richest individual or household. The vertical axis displays the cumulative percentage of total income. The Lorenz curve reveals the percentage of income owned by *x* per cent of the population. It is usually shown in relation to a 45-degree line that represents perfect equality where each *x* percentile of the population receives the same *x* percentile of income. Thus the farther the Lorenz curve is in relation to the 45-degree line, the more unequal the distribution of income.

Indices

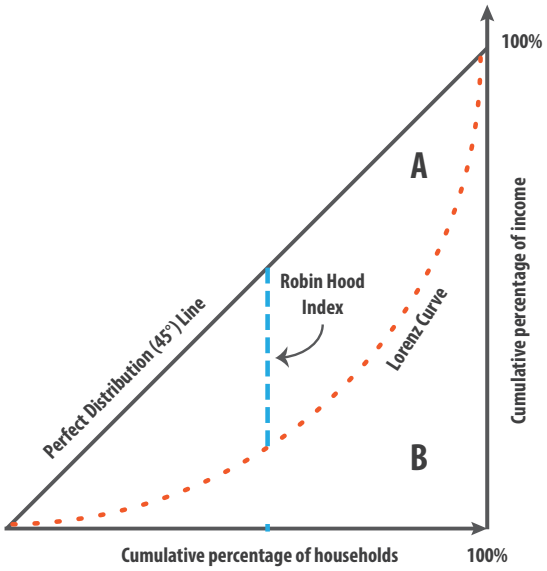
Gini index

It is the most widely cited measure of inequality; it measures the extent to which the distribution within an economy deviates from a perfectly equal distribution. The index is computed as the ratio of the area between the two curves (Lorenz curve and 45-degree line) to the area beneath the 45-degree line. In the figure above, it is equal to A/(A+B). A higher Gini coefficient represents a more unequal distribution. According to World Bank data, between 1981 and 2013, the Gini index ranged between 0.3 and 0.6 worldwide. The coefficient allows direct comparison of two populations' income distribution, regardless of their sizes. The Gini's main limitation is that it is not easily decomposable or additive. Also, it does not respond in the same way to income transfers between people in opposite tails of the income distribution as it does to transfers in the middle of the distribution. Furthermore, very different income distributions can present the same Gini coefficient.

Atkinson's inequality measure (or Atkinson's index)

This is the most popular welfare-based measure of inequality. It presents the percentage of total income that a given society would have to forego in order to have more equal shares of income between its citizens. This measure depends on the degree of society aversion to inequality (a theoretical parameter decided by the researcher), where a higher value entails greater social utility or willingness by individuals to accept smaller incomes in exchange for a more equal distribution. An important feature of the Atkinson index is that it can be decomposed into within- and between-group inequality. Moreover, unlike other indices, it can provide welfare implications of alternative policies and allows the researcher to include some normative content to the analysis (Bellù, 2006).

Development Issues are intended to clarify concepts used in the analytical work of the Division, provide references to current development issues and offer a common background for development policy discussions. This note was prepared by Helena Afonso, Marcelo LaFleur and Diana Alarcón in the Development Strategy and Policy Analysis Unit in the Development Policy and Analysis Division of UN/DESA. For more information, contact: alarcond@un.org. The full archive is available at: www.un.org/en/development/desa/policy/wess/



Lorenz Curve and Robin Hood Index

Hoover index (also known as the Robin Hood index, Schutz index or Pietra ratio)

It shows the proportion of all income which would have to be redistributed to achieve a state of perfect equality. In other words, the value of the index approximates the share of total income that has to be transferred from households above the mean to those below the mean to achieve equality in the distribution of incomes. Higher values indicate more inequality and that more redistribution is needed to achieve income equality. It can be graphically represented as the maximum vertical distance between the Lorenz curve and the 45-degree line that represents perfect equality of incomes.

Theil index and General Entropy (GE) measures

The values of the GE class of measures vary between zero (perfect equality) and infinity (or one, if normalized). A key feature of these measures is that they are fully decomposable, i.e. inequality may be broken down by population groups or income sources or using other dimensions, which can prove useful to policy makers. Another key feature is that researchers can choose a parameter α that assigns a weight to distances between incomes in different parts of the income distribution. For lower values of α, the measure is more sensitive to changes in the lower tail of the distribution and, for higher values, it is more sensitive to changes that affect the upper tail (Atkinson and Bourguignon, 2015). The most common values for α are 0, 1, and 2. When α=0, the index is called "Theil's L" or the "mean log deviation" measure. When α=1, the index is called "Theil's T" index or, more commonly, "Theil index". When α=2, the index is called "coefficient of variation". Similarly to the Gini coefficient, when income redistribution happens, change in the indices depends on the level of individual incomes involved in the redistribution and the population size (Bellù, 2006).

Ratios

Ratios constitute the most basic inequality measures available. They are simple, direct, easy to understand, and they offer few data and computation challenges. Accordingly, they do not provide as much information as the complex measures described above.

Decile dispersion ratio (or inter-decile ratio)

It is the ratio of the average income of the richest x per cent of the population to the average income of the poorest x per cent. It expresses the income (or income share) of the rich as a multiple of that of the poor. However, it is vulnerable to extreme values and outliers. Common decile ratios include: D9/D1: ratio of the income of the 10 per cent richest to that of the 10 per cent poorest; D9/D5: ratio of the income of the 10 per cent richest to the income of those at the median of the earnings distribution; D5/D1: ratio of the income of those at the median of the earnings distribution to the 10 per cent poorest. The Palma ratio and the 20/20 ratio are other examples of decile dispersion ratios.

Palma ratio

It is the ratio of national income shares of the top 10 per cent of households to the bottom 40 per cent. It is based on economist José Gabriel Palma's empirical observation that difference in the income distribution of different countries (or over time) is largely the result of changes in the 'tails' of the distribution (the poorest and the richest) as there tends to be relative stability in the share of income that goes to the 'middle' (Cobham, 2015).

20/20 ratio

It compares the ratio of the average income of the richest 20 per cent of the population to the average income of the poorest 20 per cent of the population. Used by the United Nations Development Programme Human Development Report (called "income quintile ratio").

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