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Measuring Inequality with Household's Assets in India

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Abstract
Commonly available survey data for developing countries often do not include income or expenditure data. Household income or expenditure data are used to measure current and long-term welfare of households and within-country inequality. The availability of household survey data has increased the understanding of within-country inequality and its determinants. This paper measured the inequality in living standard based on wealth index using Gini coefficient for India also separately for rural and urban areas.
Keywords - Wealth Index, Standard of Living Index, Inequality, Gini Index

Introduction

The wealth index is a composite measure of a household's cumulative living standard. The wealth index is calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. Theoretically, measures of household wealth can be reflected by income, consumption or expenditure information. However, the collection of accurate income and consumption data requires extensive sources for household surveys.Socioeconomic status has been long thought to be associated with health status.

The distribution of income and wealth (and indeed the re-distribution thereof) in India is core to political debate in the country. Government policies currently being debated within the ruling party, the tri-partite alliance and in the public domain (ranging from Black Economic Empowerment to nationalization of the mining industry) are influenced by this key factor. At the heart of the debate is the Gini coefficient, which is the international standard for measuring the distribution (or dispersion) of income and wealth in a country. Although it is seldom directly referred to in debate, the Gini coefficient which recently featured in the media in a series of articles and discussions shows that South Africa has one of the highest Gini coefficients in the world1 in terms of both income and wealth (thus the greatest dispersion between the rich and the poor in terms of income and wealth distribution). The potential impact of income and wealth distribution on future political developments in the country is clear.

Nevertheless, there are a number of theoretical reasons why wealth inequality, which the asset-index measure may better capture, may be of more importance for development

purposes than income or consumption inequality. In the models of Banerjee and Newman (1993) and Galor and Zeira (1993), it is the wealth distribution which determines investment in physical and human capital in economies with indivisible investments and credit market imperfections. Bardhan, Bowles and Gintis (2000) survey a variety of other mechanisms through which wealth inequality can affect economic performance. Empirically, cross-country studies which examine the relationship between initial inequality and subsequent growth have found a stronger effect of land and human capital inequality, than of income inequality, suggesting that it is asset inequality which matters more (see, e.g. Birdsall and Londoño, 1997).Consumption is viewed by many as "the best measure of the economic component of living standards" (Deaton and Grosh, 2000, p. 95), and is thus the preferred unit of analysis for study of poverty and inequality in developing countries. Filmer and Pritchett (2001) in viewing both the asset index and non-durable consumption as proxying unobserved long-run economic status or living standards, and hence inequality measures of both as proxying for inequalities in long-run living standards.

Data Description

This paper used a dataset of household's which is obtain from Demographic and Health Survey (DHS) India name household's dataset 2005-06. There are thirty variables which are used to calculate wealth index dataset of households collected by National family health Survey (NFHS-3) on Indian households based on questionnaire of households.

Statistical Tool Used

The Gini coefficient is defined as a ratio of the areas on the Lorenz curve diagram in Fig-1. If the area between the line of perfect equality and Lorenz curve is A, and the area under the Lorenz curve is B, then the Gini coefficient is A/(A + B). Since A+ B = 0.5; the Gini coefficient, G = 2A = 1 - 2B. If the Lorenz curve is represented by the function Y = L(X), the value of B can be found with integration and:

$$G = 1 - 2\int_0^1 L(x)dx$$

In some cases, this equation can be applied to calculate the Gini coefficient without direct reference to the Lorenz curve. Sometimes the entire Lorenz curve is not known, and only values at certain intervals are given. In that case, the Gini coefficient can be approximated by using various techniques for interpolating the missing values of the Lorenz curve. If(X_k, Y_k) are the known points on the Lorenz curve, with theX_k indexed in increasing order$(X_{k-1} \leq$ *Xk*, so that.

The Gini coefficient is often calculated with the more practical Brown Formula shown below:

$$G = \left|1 - \sum_{k=1}^{n}(X_k - X_{k-1})(Y_k + Y_{k-1})\right|$$

Where G: Gini coefficient

X_k: cumulated proportion of the population variable, for k = 0,...,n, with X_0 = 0, X_n= 1
Y_k: cumulated proportion of the income variable, for k = 0,...,n, with Y_0 = 0, Y_n= 1
is the resulting approximation for G. More accurate results can be obtained using other methods to approximate the area B, such as approximating the Lorenz curve with a quadratic function across pairs of intervals, or building an appropriately smooth approximation to the underlying distribution function that matches the known data. If the population means and boundary values for each interval are also known, these can also often be used to improve the accuracy of the approximation.

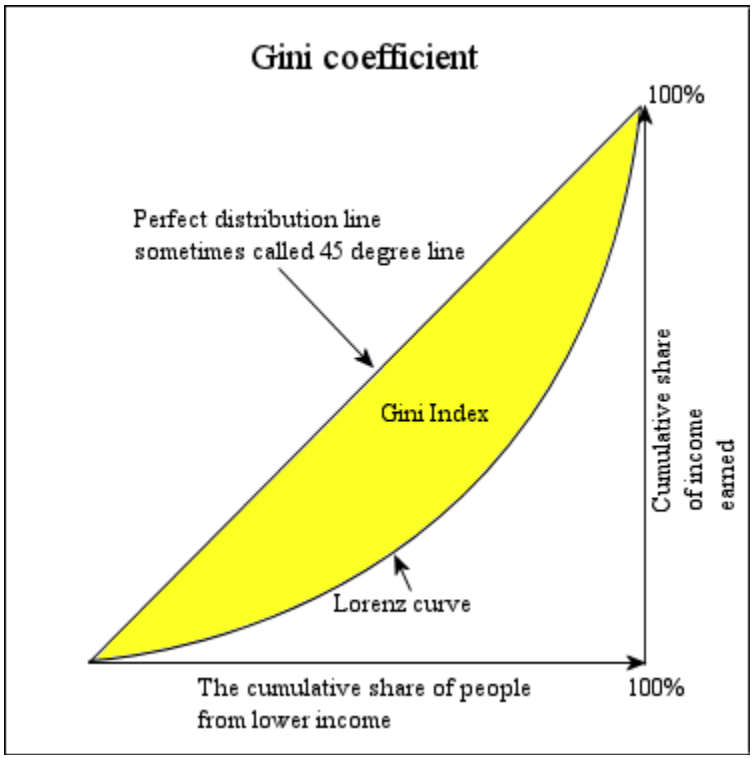

Fig-1- Lorenz curve diagram

Methodology

The SLI of a household has been computed by giving weights to different items and adding these weights. The weights for different items are presented in Table-2. The total score ranges from 0 to 67. Accordingly, scores from 0 to 14 have been considered as Low, scores from 15 to 24 have been considered as Medium and scores from 25 to 67 have been considered as High.

Inequalities in terms of standard of living index have been examined with the help of Lorenz curve and Gini-coefficient. In the Lorenz Curve technique, usually the households (units) are arranged according to the value of the characteristics (SLI). Then, the values (SLI) of the units (households) and the frequencies both are cumulated and taking the total as 1.0 for both the cases, the values x_i and y_i are computed which are the cumulated proportions of frequencies and SLI up to i^{th} unit (household), (i = 1; 2; 3; :n), n being the total number of households. These proportions (x_i and y_i) are plotted on a graph paper. If there is proportionately equal distribution of the frequencies over various values of the variant (SLI), the points would lie in a straight line. This line is called the line of equal distribution. If the distribution items are not proportionally equal, it indicates variability, and the curve would be

away from the line of equal distribution. The farther the curve is from equal distribution, the greater is the inequality in the series. A higher Lorenz Curve implies more social welfare for the same total of SLI. The Gini-coefficient (or the Lorenz ratio as it is frequently called) measures the distance between the line of equal distribution and the Lorenz Curve, which is computed as twice the area of the Lorenz Curve. Gini-coefficient is used to attach some absolute measures to the degree of inequality or to give some idea whether the inequality is large or small. The Gini- coefficient ranges from 0 to 1.
Where, 0 represents perfect equality and 1 represents total inequality.It corresponds to twice the area between the Lorenz curve and diagonal. There are different methodsto calculate the Gini coefficient but a simple formula can be as follows. We know that

$$Gini\ Coefficient = \frac{Area\ between\ Lorenz\ curve\ and\ diagonal}{Total\ Area\ under\ diagonal}$$

Gini coefficient is often calculated from the Brown formula shown below

$$G = \left| 1 - \sum_{k=1}^{n} (X_k - X_{k-1})(Y_k + Y_{k-1}) \right|$$

Where G: Gini coefficient
X_k: cumulated proportion of the population variable, for k = 0,...,n, with X_0 = 0, X_n= 1
Y_k: cumulated proportion of the income variable, for k = 0,...,n, with Y_0 = 0, Y_n= 1

Results

Using the values of wealth index, the Lorenz curves have been plotted for overall India, rural and urban separately which are given in Fig-1, Fig-2 and Fig-3 respectively. Values of Gini coefficients have also been calculated for each area separately and given in Table-1

Table 1- Gini coefficients of overall, rural and urban India

Areas	Ginicoefficient
India	0.28559
Ruralareas	0.21543
Urbanarea	0.31209

Table 2- Variable of household assets, their values and SLI scores

Variable	Value Assigned	SLIScore	Variable	Value Assigned	SLIScore
Housetype	SHNFHS2=3	4	Tractor	SH47W=1	4
	SHNFHS2=2	2	Car	HV212=1	4
Toilet facility/Shared	HV205/ HV225 = 11-15/0	4	Motorcycle/scooter	HV211= 1	3
	HV205/ HV225 = 11-15/1	2	Telephone(mobile or landline)	HV243Aor HV221=1	3
	HV205/HV225 =21-23/0	2	Refrigerator	HV209= 1	3
	HV205/HV225=21-23/1	1	Color TV	SH47J=1	3
Electricity	HV206 =1	2	Bicycle	HV210= 1	2
Cooking fuel	HV226=1,2,4	2	Electric fan	SH47G= 1	2
	HV226=5,6,7	1	Radio/transistor	HV207= 1	2
Drinking water source	HV201 =11-12	2	Sewing machine	SH47K=1	2
	HV201=13-3	1	Black and whiteTV	SH47I=1	2
Separate room for cooking	HV242=1	1	Water pump	SH47U=1	2
Own house	SH58=1	2	Animal-drawn cart	HV243C=1	2
Own agricultural land	SH60 =5-990	4	Thresher	SH47V=1	2
	SH60 =2-4.9	3	Mattress	SH47B= 1	1
	SH60 =0-2,999.8	1	Pressure cooker	SH47C= 1	1
Any irrigated land	SH61=0.0-994.0,999.8	2	Chair	SH47D= 1	1
Any live stock	HV246=1	2	Cot/bed	SH47E=1	1

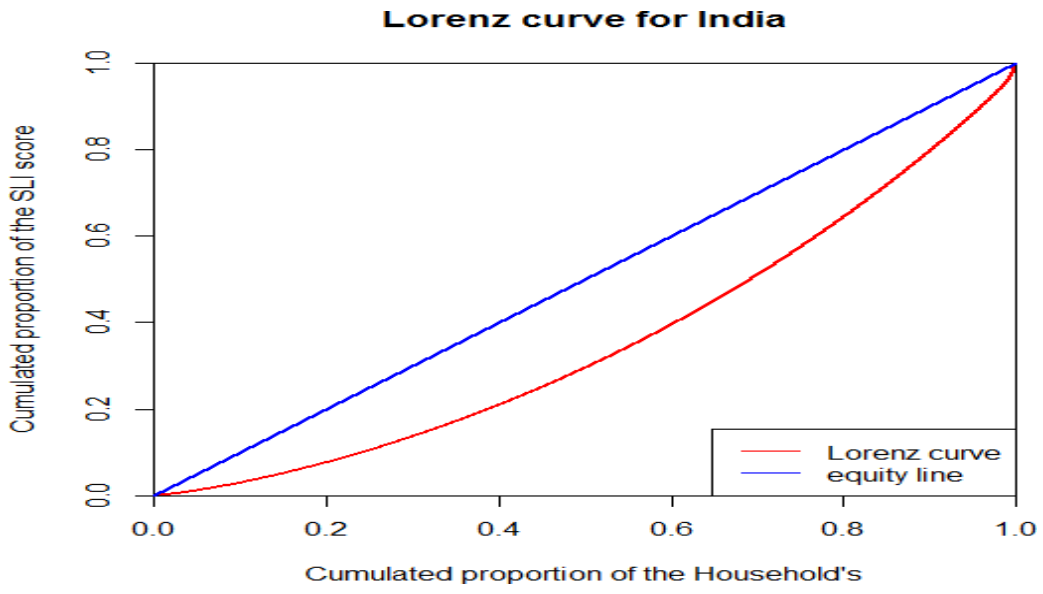

Fig 1- Lorenz curve for overall India

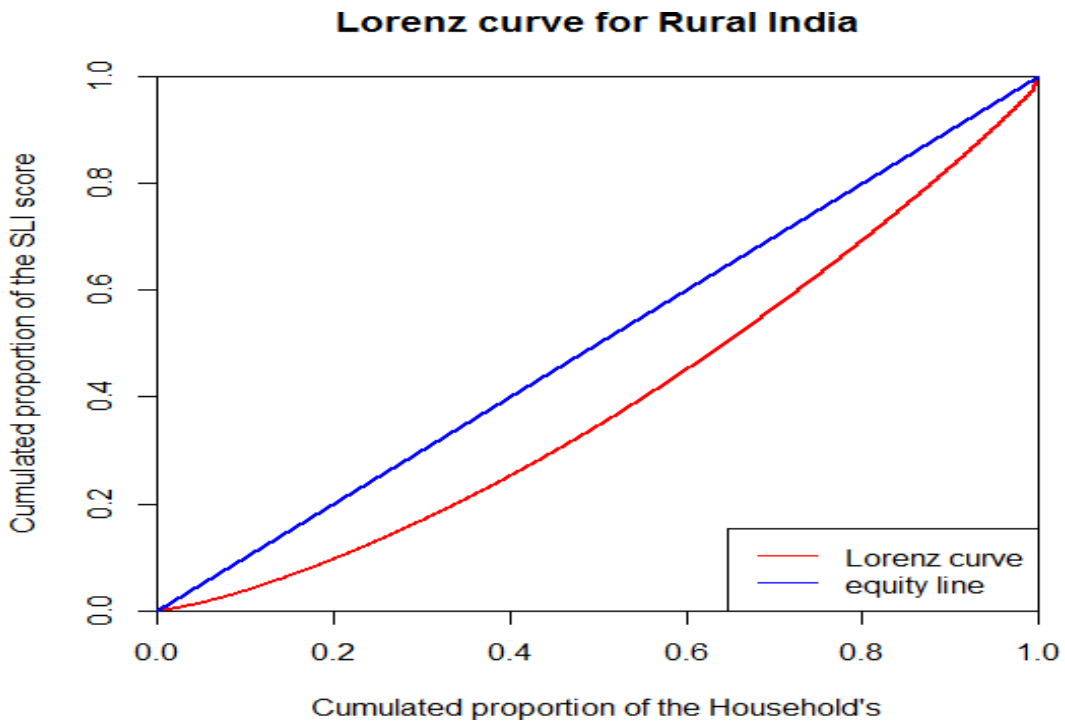

Fig 2- Lorenz curve for rural India

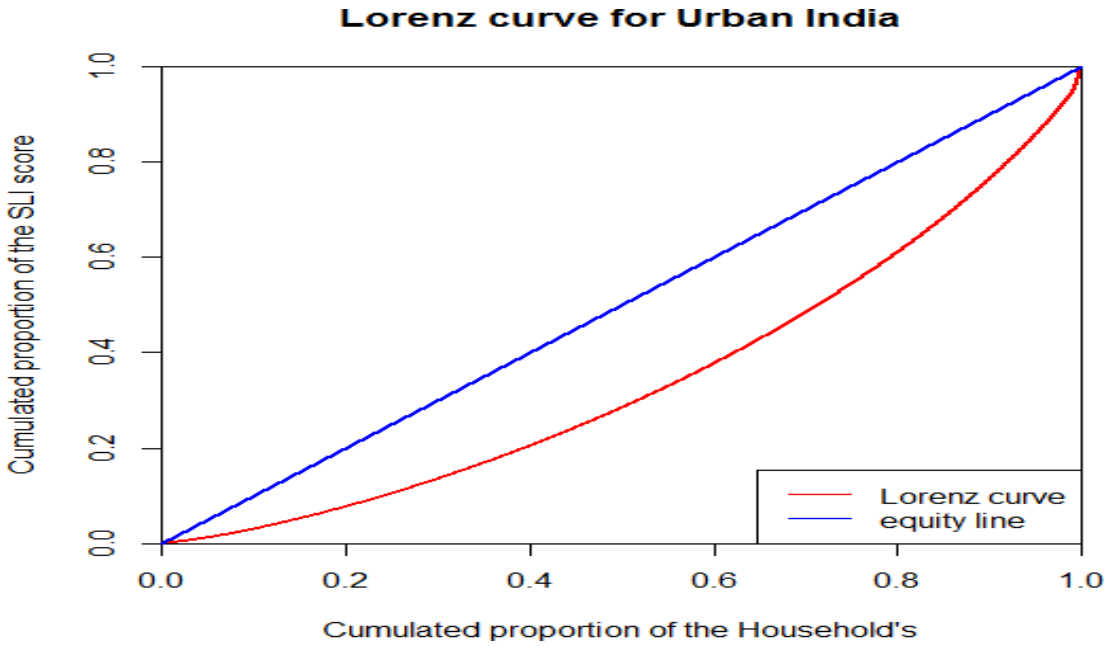

Fig 3- Lorenz curve for urban India

Conclusions

From the Table-1, it can be seen that there is significant inequality in India on the basis of living standard as the value of Gini-coefficient of India is 0.28559. It can also be observe that the inequality in rural areas is less than inequality in the overall area of India as the value of Gini-coefficient in rural area is less than the value of Gini-coefficient of overall India. The value of Gini-coefficient in urban area is 0.31209, which is higher than the rural as well as the overall India. It shows that the inequality in urban India is higher than the rural India.

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