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ASSESSMENT OF THE BASIC DIMENSIONS OF POVERTY TO CHOICES OF THE POVERTY LINE IN NIGERIA.

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Abstract

Most poverty measures require poverty lines for their computations.This study undertakes an assessment of the basic dimensions of poverty, namely incidence, depth and severity to varying multiple poverty lines in a uni-dimensional setting. Results of the computationally appealing uni-dimensional poverty analysis indicate that the estimated basic dimensions of poverty are sensitive to the choices of the poverty lines with the two-third median per capita household expenditure poverty line having the highest gain in precision when the multiple poverty lines are compared with the conventional two-third mean per capita household expenditure poverty line.The use of a fraction of the poverty line has been validated in the study and a plausible poverty line for future studies is the two-third median per capita poverty line.

Keywords: *Poverty, Poverty line, Poverty measurement, Median per capita.*

INTRODUCTION

The present economic reality in Nigeria is rising poverty level despite the fact the fact she is endowed in human and natural resources. This situation is at variance with the expected correlation between economic growth and poverty. It is expected that an increase in growth should lead to reduction in poverty; however the Nigerian experience contradicts this traditional norm in spite of available endowments like solid minerals, crude oil and vast arable land that could promote agricultural revolution. The National Bureau of Statistics (2012) noted that poverty incidence in Nigeria rose from approximately 27.2% in 1980 to 46.3% in 1985. It reduced partially to 42.7% in 1992 and increased again to 65.6% in 1996. The Bureau again observed that poverty incidence reduced to 54.4% in 2004 and went up again to 69.0% in 2010; and that absolute poverty in Nigeria rose from 54.7% in 2004 to 60.9% in 2010.

The gloomy situation noted above is not unconnected with the issue of corruption and bad governance in Nigeria. The laws against corruption seems not to be working because most of the people involved are influential and highly placed and therefore have the financial might to distort attempts to bring them to justice. A corruption free environment enhances policy intervention to reduce the burden of poverty. Diversion of resources is inevitable in an endemic corruption ridden society like Nigeria. This also explains why development of infrastructure to increase access of the people to the essentials of life has been crippled over time. In the light of this, Chetwynd et al (2003) opined that

increased corruption reduces economic investment, distorts markets, hinders com-petition, creates inefficiencies by increasing the costs of doing business, increases income inequalities, erodes the institutional capacity of government to deliver quality public services, diverts public investment away from major public needs into capital projects (where bribes can be sought), lowers compliance with safety and health regulations, and increases budgetary pressures on government (pp. 6 & 7)

Another reason for the lack of correlation between economic growth and poverty is wide disparity in income. The income distribution is highly skewed. This situation is captured by Omotola (2008) who observed that the "pervasiveness of perverse incentive structures that engender and nourish opportunism at the expense of a fairly even distribution of income and wealth" (p. 498) worsens the poverty situation and concluded that income inequality is a problem fuelling the poverty situation in Nigeria. This inequality in income is also observed by Kakwani and Pernia (2000). They noted that "discrimination on grounds of gender, ethnicity, and religion hurts the poor more than the rich" while manmade barriers prohibiting entry "into certain trades and professions, or into the formal labor market" can also hurt the poor (p.4)

The concept of poverty is very broad with various dimensions depending on how it is viewed. Poverty has always been part of man's history and its meaning has evolved over time. According to Schwartzman (2000), in traditional societies, being poor was the norm and most people were indeed poor. Eradication of poverty, according to him, should be possible now since the condition has become unacceptable presently in modern societies. Various definitions of poverty have been given among which are "poverty is pronounced deprivation in wellbeing" World Bank (2000), and "poverty is not having enough today in some dimension of well-being." Coudouel *et al.* (2002)

The measurement of poverty requires a lot of finance, time and human resources to gather survey data directly from households. According to Haughton and Khander (2009), this is necessary to keep the poor in the agenda of government. Ravallion (1998) gave a strong justification for this by noting that an appropriate poverty measure could be useful in formulating policies affecting the poor and their conditions, targeting domestic and worldwide interventions, monitoring and evaluating projects and policy interventions. Ravillion (1998) proposed three steps in measuring poverty

1. Define the indicator of welfare or wellbeing: in choosing the indicator of welfare, the indicator can be a single indicator, most measures of welfare are based on household consumption expenditure or household income, hence the poverty measurement is uni-dimensional or multiple indicators, for example, living standard, health and education, hence the poverty measurement is multidimensional.
2. Establish a minimum threshold of an indicator of welfare (well being) to classify households into poor or non poor via the poverty line. A summary measure to combine the available information from

the distribution of the selected welfare (well being) indicator is then generated.

3. In uni-dimensional poverty measurement, the choice of indicator between income and consumption is a concern. According to Coudouel *et. al.* (2002), consumption is better over income if information on all the expenditures of the households is available via household survey. According to them also, consumption reflects a person's well being better than income.

Further reviews on poverty measurements can be seen in the contributions of Oyekale & Oyekale (2012), Oyekale & Oyekale (2013), Ele-Ojo Ataguba et al (2013), Temitayo & Omobowale (2013), Adeoti (2014), Edoumiekumo et al (2014), Idiaye & Omonona (2014), Ologbon et al (2014), Obetta, R. O. (2015) and Ajakaiye et al (2016) to knowledge.

The aim of this present study is to reduce the subjectivity surrounding the choice of the poverty line. This problem of subjectivity is indirectly expressed by Srinivasan (2000) who opined that "poverty estimates are sensitive to the choice of the real poverty line consumption" (p.272). This study therefore receives motivation in the light of Srinivasan's submission in its attempt to assess the sensitivity of the FGT poverty indices to different poverty lines in order to be able to decide the best poverty line for the data under consideration. It is hoped that this will reduce the subjectivity in the choice of the poverty line.

METHODOLOGY

Poverty Lines

Once the indicator of welfare is defined, the next step is to define the poverty line. The poverty line is often said to be subjective. This subjectivity is often an issue in research and efforts need to be made to reduce its effect. The lines can be multiple, so as to show different levels of poverty, for example, moderate and extreme poverty. According to Coudouel *et al.* (2000), there are two major ways of setting poverty lines:

Absolute poverty lines: these are based on some standard of what households should have, in order to meet their basic needs. An absolute poverty line is "fixed in terms of the standard indicator being used and fixed over the entire domain of the poverty comparison" (Ravallion 1992). Thus, the World Bank has absolute poverty lines of $1, $1.25 and $2 per day (Chen and Ravallion, 2008).

Relative poverty lines: an example is the 50% of mean income or consumption. These lines are set with reference to the total of income or consumption in a given country. It is helpful to have a measure such as this to create programs geared towards helping the poor.

According to Coudouel *et al.* (2000), the choice of the poverty line is ultimately arbitrary. In order to ensure wide understanding and wide acceptance of a poverty line, it is important that the poverty line chosen resonate with social norms, with the common understanding of what represents a minimum.

Traditionally, the mean (arithmetic average of a set of values) is used in the calculation of the relative poverty line put at two-third of the mean per capita household expenditure (the proxy for poverty in this study). Expenditure data are highly skewed; as such the mean is not the best measure of location to identify the poor households since it is susceptible to outliers, which are the unusually high expenditures in this case. When the sample size is large and does not include outliers, the mean usually provides a better measure of location. For this study, alternative measures of location are considered; they are geometric mean, harmonic mean and median. Specifically, the following poverty lines will be considered in this study

(i) $^{2}/_{3}$ Mean per capita household expenditure (z_1) – traditional poverty line

(ii) Mean per capita household expenditure (z_2)

(iii) Geometric mean of the per capita household expenditure (z_3)

(iv) Harmonic mean of the per capital household expenditure (z_4)

(v) $^{2}/_{3}$ Median per capita household expenditure (z_5)

(vi) Median per capita household expenditure (z_6)

Foster-Greer-Thorbecke (FGT) Poverty Indices

The indices of poverty measurement proposed by Foster, Greer and Thorbecke (1984) make up the dimensions of poverty for this study. The indices are aggregate functions having per capita expenditure and the poverty line as inputs. Other measures exist but the three basic ones are headcount index(this is the proportion of the population living below the poverty line. It is also known as the incidence of poverty), poverty gap index(measures the extent to which households fall below the poverty line. It is also known as the depth of poverty) and squared poverty gap index(this index puts a higher weight on the poverty of the poorest households).

Foster-Greer-Thorbecke (1984) proposed a generalized poverty index (P_α). This is generally referred to as the FGT generalized index of poverty. This poverty index is defined in (2.1).

$$P_\alpha = \frac{1}{N}\sum\left(\frac{z-y_i}{z}\right)^\alpha \mathrm{I}(y_i \le z) \qquad (2.1)$$

where P_α=headcount index when $\alpha = 0$, P_α=poverty gap index when $\alpha = 1$ and P_α=squared poverty gap index when $\alpha = 2$. It should be noted that N, z, y_i and α are the total number of households, poverty line, household per capita expenditure, poverty aversion index respectively, $I(y_i \le z) = 1$ for all the poor households and 0 for all non poor households.

The Headcount Index (P_0)

This is the first basic dimension of poverty. It is the fraction of the population that lives below the poverty line (z). It is also known as the incidence of poverty. It is defined in (2.2)

$$P_0 = \frac{1}{N}\sum \mathrm{I}(y_i \le z) \qquad (2.2)$$

The headcount index is the most commonly used measure of poverty. In particular, it takes no account of the degree of poverty, and would, for example, be unaffected by a policy that made the poor even poorer.

The Poverty Gap Index (P_1)

This is the second basic dimension of poverty. It is also known as the poverty depth index. It a measure of how far apart, a given household is from the poverty line. The index is defined in (2.3) below

$$P_1 = \frac{1}{N}\sum\left(\frac{z-y}{z}\right) I(y \le z) \qquad (2.3)$$

This index represents the lowest cost required for poverty elimination provided transfers were properly done, that is, a transfer from a poor household to a poorer household. It is the total of poverty gaps for households under consideration. This index does not account for the inequality among the poor.

The Squared Poverty Gap Index (P_2)

This is the third basic dimension of poverty. It is also known as the square poverty gap index. It is defined in (2.4)

$$P_2 = \frac{1}{N}\sum\left(\frac{z-y_i}{z}\right)^2 I(y_i \leq z) \qquad (2.4)$$

This index puts a higher weight on the poverty of the poorest households, making it a combined measure of poverty and inequality among the poor. It is also known as the severity of poverty.

Bootstrapping

To estimate the precision $\left(\frac{1}{\sigma^2}\right)$ of the indices, bootstrapping will be used. This is necessary because the indices do not generally have a functional form (they are constants). Hence they need to be treated as random variables so as to be able to obtain relevant descriptive statistics on them. Bootstrapping is basically a re-sampling technique. That is, sampling with replacement. Bootstrapping begins with the generation of a bootstrap sample of size n_1 ($\leq n$), the original sample size) from where bootstrap sub samples will be obtained. The bootstrap approach continues with the computation of desired statistic(s) of interest from each bootstrap sub sample. The statistics of interest in this study are the poverty incidence, depth and severity. The statistics computed from each bootstrap sub sample will enable the determination of the sampling distributions of the statistics of interest.

NUMERICAL ILLUSTRATION

The methods presented in the earlier sections will be applied to secondary data from the National Bureau of Statistics (NBS) of Nigeria. The data used in this study were the Nigeria General Household Survey (GHS) - Panel data as conducted by the NBS in 2012. The GHS-Panel survey is a cross-sectional survey of 22,000 households carried out periodically throughout the country. The three dimensions were calculated for each of the six poverty lines. In bootstrapping, the sample data were treated as the population and a sub-sample of 2300 observations were resampled with replacement 5000 times. For each bootstrapped sub-sample, the dimensions (poverty incidence, depth and severity) were calculated for each poverty line. The mean, variance and precision of each dimension for each poverty line of the bootstrapped sub-samples were also calculated.

In Table 1 below, the sample size of 4536 observations was treated as the population. Bootstrapped sub-samples of sizes n=2300 each were selected from the population with 5000 iterations. The means of the dimensions of the bootstrapped sub-samples in Table 1 are the same as that of the population; hence the bootstrapped samples are good representative samples of the population. In order of their variances, z_5 (2/3 median) had the smallest variance and hence the highest precision in the three dimensions while the geometric mean had the highest variance and hence the least precision in the three dimensions. The traditional poverty line z_1 (2/3 mean) had the fourth highest precision.

In Table 2 below, when z_1 is compared with z_3, there is a precision loss of 7%, 23% and 32% respectively in the three basic dimensions of poverty. Comparing z_1 with z_6 gives a loss in precision of 2%, 22% and 28% respectively in the three basic dimensions. Comparing z_1 with z_2 gives a precision gain of 4% in the dimension of incidence, precision loss of 42% and 57% in the dimensions of depth and severity. Comparing z_1 with z_4 gives a precision gain of 5% each in the dimensions of incidence and depth while the gain in severity is 11%. Comparing z_1 with z_5 yields a gain in precision of 25%, 73% and 112% in the three basic dimensions respectively.

Table (2) Performances of the traditional poverty line (z_1) against the alternative poverty lines.

Poverty line	% Precision gained or lost against z_1		
	P_0	P_1	P_2
2/3 Mean= ₦73989.9 **(z_1-Traditional poverty line)**	0	0	0
Geometric mean= ₦87417.42 z_3	-0.07	-0.23	-0.32
Median= ₦85906.95 z_6	-0.02	-0.22	-0.28
Mean= ₦110984.9 z_2	0.04	-.42	-0.57
Harmonic mean= ₦71071.76 z_4	0.05	0.05	0.11
2/3 median= ₦57271.3 z_5	0.25	0.73	1.12

CONCLUSION

Findings from this study indicate that the basic dimensions of incidence, depth and severity considered in the study vary with changes in the five poverty lines adopted in this research paper. This is line with the findings of Dhongde and Minoiu (2013, p.11) who noted that "global poverty estimates vary not only in terms of the proportion of the poor, and correspondingly the number of poor, but also in terms of the rates of decline in poverty". Also, the result obtained is not at variance with statistical theory. The median is regarded as the best measure of location for skewed data (expenditure data are generally skewed). Also, the use of a fraction of a measure of location, like the two-third has been corroborated in this study. In the order of precision, two-third median per capita household expenditure poverty line performed best in the three dimensions of poverty. The traditional poverty line, two-third mean per capita household expenditure, had the fourth highest precision after the mean per capita household expenditure poverty line; hence the traditional poverty line is not very suited for the data under consideration.

We recommend based on findings of this study that the poverty line of two-third median per capita household expenditure be considered as a plausible poverty line in future studies. This is not at variance with the relative poverty line used by the European Union. That is 60% of the median incomes of all households. (BBC News, 2008).

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Table(1)Poverty lines and bootstrap estimates

	Poverty dimension			Boostrap estimates			
	P_0	P_1	P_2		P_0	P_1	P_2
2/3 Mean= 73989.9 **(z_1-Traditional poverty line)**	0.41	0.13	0.06	mean	0.4115	0.1346	0.0594
				variance	0.000105	0.000017	0.000006
				Precision 4	9535	57418	169124
Mean= 110984.9 z_2	0.66	0.27	0.14	mean	0.6613	0.2713	0.1422
				variance	0.000101	0.000030	0.000014
				Precision 3	9882	33213	73313
Geometric mean= 87417.42 z_3	0.51	0.19	0.09	mean	0.5096	0.1850	0.0882
				variance	0.000112	0.000023	0.000009
				Precision 6	8930	44262	115311
Harmonic mean= 71071.76 z_4	0.39	0.12	0.05	mean	0.3918	0.1235	0.0536
				variance	0.0001	0.000017	0.000005
				Precision 2	9986	60309	186925
2/3 median= 57271.3 z_5	0.27	0.07	0.03	mean	0.2668	0.0733	0.0291
				variance	0.000084	0.000010	0.000003
				Precision 1	**11907**	**99273**	**358043**
Median= 85906.95 z_6	0.5	0.18	0.08	mean	0.5001	0.1795	0.0848
				variance	0.000108	0.000022	0.000008
				Precision 5	9304	44821	121543