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RESEARCH PAPER

PROXY MEANS TEST (PMT) ANALYSIS OF POVERTY IN OYO STATE

[1,*]Osowole, OI, [1]Awomokun, G, [2]Nwaka, RN, [3]Balogun, KO

[1]Department of Statistics, University of Ibadan, Oyo State, Nigeria; [2]Department of Mathematics, College of Education, Agbor, Delta State, Nigeria; [3]Federal School of Statistics, Ibadan, Oyo State, Nigeria
Correspondence: Email: academicprofessor2013@gmail.com

ABSTRACT

This study attempts an assessment of the effectiveness of the proxy means test (PMT) procedure in achieving better targeting of the poor in Oyo State, Nigeria. This is because proper identification and corresponding targeting of the poor is still a challenge in poverty analysis in Africa. The PMT method was therefore used to estimate household expenditures, corresponding poverty statuses of the households, inclusion and exclusion rates using data from the National Living Standard Survey (NLLS) for the five poverty lines considered. The PMT method gave higher percentages of the poor compared to the conventional method for all the five poverty lines. The implication of this finding is that the PMT method could indeed be used alternatively for improved targeting of the poor, especially in Oyo State.

Keywords: Poverty, Proxy Means Test (PMT), Poverty lines, Oyo State, Africa

INTRODUCTION

Poverty is multifaceted and may be seen as limitation in terms of political, economic, social and material well-being. This fact about poverty is also captured succinctly by the United Nations (UN) in 1998. The UN noted that ''poverty is fundamentally the inability of having sufficient choices and opportunities…powerlessness and exclusion of households and communities''. Again, World Bank (2000) noted that ''poverty is pronounced deprivation in wellbeing and comprises many dimensions''. Three broad categories of poverty can be recognized in literature. These are relative, absolute and material poverty. Relative poverty means possession of inadequate income thereby limiting maximum engagement in expected social and cultural activities. This limits the actualization of one's potentials to satisfy basic social needs. Absolute poverty means not having enough physiological subsistence like access to health care services, gainful employment and basic education such that human dignity is eroded. People experiencing this kind of poverty are unable to safe because they spend majorly on food and related expenses only. Material poverty is deprivation in physical assets such as live stocks, cash crop trees and farm lands. The issues raised here have also been expressed by Hulme and Mosley (1996); Ajakaiye and Adeyeye (2001); World Bank (2006); Kurfi (2009); Sanusi (2010) and Osowole and Bamiduro (2013).

Poverty is rising in Nigeria particularly among geo-political entities and certain groups. National Bureau of Statistics (NBS) (2012) recent statistics indicated that "although the Nigerian Economy is paradoxically growing, the proportion of Nigerians living in poverty is increasing every year". The ratio in poverty significantly increased from 1980 to 2004. In 2003/2004, the incidence of poverty was 75.5 percent while in 2009/2010; the index of perception for households in poverty had risen to 92.5 percent. Growing unemployment in Nigeria is a concurrent problem with poverty. The percentage of unemployed Nigerians rose by 21.1 percent in 2010 according to NBS statistics and rose by 19.7 percent in 2009.

Further statistics from the NBS reveals that Nigeria's youth population was about 75 million and this was about 55% of the entire population. 81% of the Nigerian youths, according to the additional statistics from the NBS, lacked jobs and approximately 10% of them cannot be employed due to inadequate requisite employment skills needed. We note that household based poverty data are germane in any poverty study just like the one being pursued presently. It is always good for researchers to seek datasets that are comprehensive enough to assist in the achievement of the basic goal of identification of the poor.

Since proper targeting of the poor is still a challenge in Africa, especially Nigeria; this study uses the Proxy Means Test (PMT) method to ensure improved targeting of the poor in Oyo State, Nigeria. PMT method ensures that transfers and benefits are done more efficiently by focusing on household characteristics rather than on household expenditures directly. Other issues about the PMT methodology can be found in Grosh (1994); Grosh & Baker (1995); Grosh & Glinskaya (1997); Handa (2001); Coady *et al.* (2004); Blank (2009); Fernandez (2012); Barrett & Lentz (2013) and Debbie (2014).

METHODOLOGY

The secondary data used for this study were from the National Living Standard Survey (NLLS) dataset of the NBS published in 2004. The choice of the dataset was based on the fact that it provided comprehensive details on observable characteristics of the household (such as household assets, composition, literacy, dwelling qualities, and per capita expenditure) that could be used in developing a PMT model. Details of the dataset can be found in Osowole and Bamiduro (2013). The dataset consists of a total of 19,158 households.

The PMT Model: The PMT model takes the general form:

$$y = x\beta + e \qquad (1)$$

where:

$$y = \begin{bmatrix} y_1 \\ y_2 \\ . \\ . \\ . \\ y_n \end{bmatrix} \text{ is an } nX1 \text{ vector with } y \text{ as the response variable} (per\ capita\ expenditure).$$

$$x = \begin{bmatrix} 1\ x_{11}\ x_{12} \ldots x_{1k} \\ 1\ x_{21}\ x_{22} \ldots x_{2k} \\ . \\ . \\ . \\ 1\ x_{n1}\ x_{n2} \ldots x_{nk} \end{bmatrix}, is\ an\ nXk + 1\ matrix\ on\ the\ household\ characteristics$$

we note that x represents the independent variables(i. e household observable characteritics)
β *is an nX1 vector of regression parameters* (*taken as PMT weights*)
e is an nX1 vector of random error terms with e $\sim$ N $(0,\sigma^2)$

A stepwise linear regression will be employed in the study to avoid the problem of multi-collinearity in the search for the optimum model.

The predicted household expenditure can be obtained using the PMT score formula given below:

$$\text{PMT } Score_i\ (\hat{y}_i) = \sum_j x_{ij}\beta_j \qquad (2)$$

where:
x_{ij} is the observed characteristic j for household i.

β_j is the PMT tool weight for each household characteristic j.

Next step is to list the households below the poverty line according to their PMT scores and also list the households below the poverty line according to their per capita expenditure. These steps are necessary to be able to obtain the inclusion and exclusion rates. These rates are obtained by comparing the two lists.

Poverty Line: This is the threshold for dividing households into ''poor and non-poor'' based on their per capita expenditures. This is generally the practice under uni-dimensional poverty analysis as in this study. As stated above, the poverty line allows the determination of both inclusion and exclusion rates. Five poverty lines ((2/3)*mean per capita expenditure (PCE), (1/3)*mean PCE, (1/3)*median PCE, mean PCE and median PCE)) will be considered. These poverty lines will lead to different inclusion and exclusion rates. We note also that any household whose observed/predicted expenditure is at most the poverty line is considered ''poor'' otherwise it is ''non-poor''.

Inclusion Rate (IR): This is defined by the proportion of households identified as poor by the PMT model which are also identified as non-poor based on the conventional method for a given poverty line. The formula (3) below helps to derive the inclusion rate. That is,

$$\text{IR} = \frac{\sum_{i=1}^{N}(y_i > Z / \hat{y}_i \leq Z)}{\sum_{i=1}^{N}(\hat{y}_i \leq Z)} \tag{3}$$

Exclusion Rate (ER): This is defined by the proportion of households identified as non-poor by the PMT model which are also identified as poor conventionally for a given poverty line. The exclusion rate can also be derived using the formula below:

$$\text{ER} = \frac{\sum_{i=1}^{N}(\hat{y}_i > Z / y_i \leq Z)}{\sum_{i=1}^{N}(y_i \leq Z)} \tag{4}$$

If IR = ER**, this** implies zero error of classification. That is the household being considered is correctly classified.

RESULTS

Estimation of household expenditures based on the PMT model: The estimates of household expenditures for some samples of households are shown in Table 1. Results for some selected samples are given below because the dataset had a total of 508 households.

Table 1: Estimated household expenditure using the PMT model for selected sample of households

Household number	Predicted expenditure(N)
1	22387.7
20	19633.93
25	13507.96
50	40925.62
100	22387.7
150	19583.82
200	42861.51
250	50648.52
300	66440.93
350	32270.63

Estimation of poverty lines: The estimates of the five poverty lines used in the study are shown in Table 2. These lines are helpful in the determination of household poverty statuses.

Table 2: Estimate of the Poverty Lines

S/N	Poverty Line	Estimate
1	$Z_1 = (2/3)*meanPCE$	N32715.58
2	$Z_2 = (1/3)*meanPCE$	N16357.79
3	$Z_3 = (1/3)*medianPCE$	N13459.35
4	$Z_4 = meanPCE$	N49073.36
5	$Z_5 = medianPCE$	N40378.06

Determination of household poverty statuses: The poverty statuses (poor and non- poor) of the households in this study are determined using the five poverty lines in Table 2 above. Table 3 below gives the statuses for PMT derived expenditures while Table 4 gives the statuses for the observed expenditures (conventional method).

Table 3: Household poverty status for PMT derived expenditures

Poverty Status	Z_1		Z_2		Z_3		Z_4		Z_5	
	No	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*
Poor	211	58.5	63	12.4	45	8.9	432	85	336	66.1
Non poor	297	41.5	445	87.6	463	91.1	76	15	172	33.9

Table 4: Household poverty status for observed expenditures (conventional)

Poverty Status	Z_1		Z_2		Z_3		Z_4		Z_5	
	No	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*
Poor	186	36.6	29	5.7	17	3.3	317	62.4	254	50
Non poor	322	63.4	479	94.3	491	96.7	191	37.6	254	50

Determination of inclusion and exclusion rates: The inclusion and exclusion rates for the five poverty lines are shown in Table 6. The rates are obtained by comparing the poverty statuses (poor and non poor) from the PMT model and the conventional method.

Table 5: Inclusion and exclusion error rates

Rate	Z_1		Z_2		Z_3		Z_4		Z_5	
	No	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*
Inclusion	83	16.3	43	8.5	39	7.7	138	27.2	133	26.2
Exclusion	57	11.2	17	3.3	11	2.2	23	4.5	51	10

DISCUSSION

Household expenditure is regarded as the preferred proxy of poverty in uni-dimensional poverty analysis like in the present study. Poverty lines are usually determined by using a fraction of the total per capita expenditure. The use of observed expenditure data from household surveys directly is often limited by its ineffectiveness in targeting poor households. The PMT method is often seen as an alternative in this regard. The PMT method focuses on household observable characteristics to predict the household expenditures (Nguyen and Tran, 2017). These predicted expenditures are then subjected to the poverty lines under consideration to achieve the classification of households into ''poor and non-poor households''. Thereafter, these classifications from the PMT based expenditures are compared with classification obtained conventionally. These comparisons will lead to the determination of inclusion and exclusion rates.

The derived expenditures from the PMT model ranged from N13507.96 to N66440.93. This is expected because households generally differ in their composition and characteristics. A household with a single member may not spend much unlike another household with several members.

The highest poverty line obtained was N49073.36 for the mean PCE poverty line while the lowest was N13459.35 for the (1/3)*median PCE. The highest number of the poor was obtained for the highest poverty line while the lowest number of the poor was equally obtained for the lowest poverty line. The highest inclusion rate was obtained as well for the highest poverty line. Additionally, the lowest poverty line gave as well the lowest inclusion rate. This may suggest that the highest poverty line performs better than the remaining poverty lines since a higher inclusion rate is always desirable. This finding corroborates the findings of Nguyen and Tran (2017) who observed an inverse relationship between inclusion and exclusion rates when the PMT method was applied to identify the income poor in Vietnam.

CONCLUSION

This study at its onset proposed an alternative method of PMT to target the poor more precisely. The PMT method was found suitable for the dataset considered since it identified higher number of the poor for all the poverty lines used in the study. Furthermore, the PMT method gave higher inclusion rates as well for the five poverty lines adopted in this study. Thus, the PMT method is recommended for use to aid proper targeting of the poor.

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AUTHORS CONTRIBUTIONS

The authors Osowole, OI, Awomokun, G, Nwaka, RN, and Balogun, KO were engaged in different stages of the research including the conception of the research theme, literature search and review, collection of data, data pruning, data analysis, first draft of the manuscript and final review of the draft manuscript.