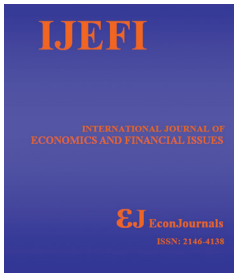

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2017, 7(2), 518-523.

Examınatıon of the Dynamıc Relationship Between Poverty and Inequalıty: Evıdence from Nıgerıa Mıcro Data

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ABSTRACT

A major challenge in both research and policy debate is the understanding of how inequality is related to poverty. Although several studies have shown that inequality plays significant role in the rising poverty, the degree of poverty in any country or region is a function of the extent of inequality in the distribution of their income. In line with this, Dreze and Srinivasan (1996), Bradshaw (2006) opined that the plain meaning of poverty is relative deprivation which is inequality. Conversely, Van der Berg, Lomwel and Ours (2003) argued that a society with high levels of poverty may still be experiencing lower levels of inequality and low poverty co-existing with inequality. Given this contradiction-prone evidence, this study investigates the dynamic relationship between poverty and inequality in Nigeria to ascertain if inequality is a determinant of poverty in a semi-macro panel dataset employing the generalized method of moments method of estimation using panel data in a 4-year round. The result of the study suggests that both present level and past levels of inequality has a significant impact on poverty. It shows further that past levels of poverty positively impacted on the present level of poverty. In addition to unemployment and level of education captured by literacy rate are important factors to be considered in poverty reduction. A major policy implication of the above findings is that lowering the high rate of inequality is important for the reduction of poverty. Consequently, there is need to ensure equity in the distribution of income in the country especially in those states that have very high poverty rate. This can take the form of taxes and transfers using appropriate fiscal policy tools.

Keywords: Poverty, Inequality, Dynamic Panel Data
JEL Classifications: C22, C33, I32

1. INTRODUCTION

It is a general notion among economists that poverty seems to be high majorly as a result of the increasing income inequality. In most countries of the world especially the developing ones, majority lacks the ability to satisfy their essential needs while a hand few enjoy high level of prosperity originating from different sources. As noted by Sen (1999), there are high differences in the prevalence of poverty and in the distribution of income across the different regions and countries of the world. Achieving the goal of poverty reduction seems beyond the understanding of Sub-Saharan Africa countries and many other developing countries. According to Human Development Report of United Nation Development Programme (UNDP) (2014), poverty and inequality have been found to be highest in Sub-Sahara Africa countries where about 410 million were found poor out of its total population of 911.9 million.

Nigeria being described as a lower middle income country by World Fact book (2014) is a country of paradoxes given the abundance of vast human and physical resources. Past and present governments had put in lots of effort towards the growth and development of the country. To this end, various policies such as National Economic Empowerment Development Strategies and subsidy reinvestment and empowerment program-P have been implemented targeting reduction of poverty. Inspite of these efforts, real gross domestic product growth rate and per capita growth rate has been on an average of 7% and 5% respectively since 2003 (World Factbook, 2015; World Bank, 2016) and poverty rate has been on the increase. With a population of over

178.5 million, about 62.9% (111 million) are absolutely poor and United Nation Development Programme (UNDP) (2015) asserted that multidimensional poverty was 53.2% in 2013. Inequality is also on the increase with a Gini index of 43 in 2013 while the ratio of the richest 10% to the poorest 10% was 16.3 in 2010 (UNDP, 2011; FAO, 2015).

A major challenge in both research and policy debate is the understanding of how inequality is related to poverty. Several studies have been carried out on the link on regional, cross country and country specific basis with contradicting conclusions. Thus reducing poverty in the shortest possible time requires an understanding. Studies such as Bourguignon (2003), Kalwij and Verschoor (2007) have come to the conclusion that inequality plays significant role in the rising poverty, the degree of poverty in any country or region is a function of the extent of inequality in the distribution of their income. In line with this, Valentine (1968) in Bradshaw (2006) observed that the plain meaning of poverty is relative deprivation which is inequality. On the other hand, Van der Berg (2003) opined that a society with high levels of poverty may still be experiencing lower levels of inequality and low poverty co-existing with inequality. Implied here is that poverty cannot be the essence of inequality.

It is therefore apt to shed more light on the present contradiction-prone evidence as well as analyzing the subject using micro data from Nigeria. The adoption of this approach is particularly imperative not only because of the relatively high level of poverty in comparison to other developing countries, but because of the ever rising poverty and inequality in the face of rising economic growth. The above background underscores the need for the present study on the achievement of poverty reduction within the period covered by the study. Thus it becomes important to determine if poverty is a significant function of inequality in Nigeria. The objective of this study is to evaluate the statistical relationship between poverty and inequality in Nigeria. Although Aigbokha (1996; 2000), Bulama (2004), among others, have conducted studies on the relationship between poverty and inequality using ordinary least squares (OLS) method that only gave a partial result since it was carried out on a partial analysis, the adoption of dynamic panel data modeling has been proved to be relevant and useful for understanding interactions of economic variables given that many economies relationships are dynamic in nature. Adopting this approach avails the opportunity of exploring both the cross-sectional effects and the time-series changes in inequality as it impacts poverty. This study is apt because a large number of developing countries are currently engaged in formulating poverty reduction strategies; yet effective policies towards reduction and eliminating of inequality as a route out of poverty are not often considered.

2. METHODOLOGY ON THE EMPIRICAL LINK BETWEEN INEQUALITY AND POVERTY

The study analyzed the relationship between poverty and inequality in Nigeria in a semi-macro panel datasets employing the generalized method of moments (GMM) method of estimation.

Estimating panel data model requires the use of the general model of the form:

$$y_{it} = \alpha_{it} + \beta_i X_{it} + \mu_{it} \quad (1)$$

$$\mu_{it} = \mu_i + \nu_t + \varepsilon_{it} \quad (2)$$

Where, y_{it} is the dependent variable, α_{it}, β_i and X_{it} are k-vectors of non-constant regressors and parameters for i = 1, 2,…, n cross-sectional units and t =1, 2 … T. time series unit; μ_{it} is the general disturbance, which can be a country, state or region specific unobservable effect μ_i, a time specific factor ν_t, and an idiosyncratic disturbance ε_{it}. The fixed effects μ_i act as proxy for other determinants of a state's steady state not included in X_{it} and the time specific factor ν_t controls for shocks common to all states.

Similarly, the general form of a dynamic panel data is given as:

$$y_{it} = \delta y_{i,t-1} + \mu_{it};\ i = 1\text{-}N;\ t=1 \ldots T \quad (3)$$

With,

$\mu_{it} = \mu_i + \nu_{it}$, $\mu_i \sim IID\ (0, \sigma^2\ \mu)$ and $\nu_{it} \sim IID\ (0, \sigma^2\nu)$, independent of each other and among themselves.

Adding exogenous variables to equation 3 gives:

$$y_{it} = \delta y_{i,t-1} + \beta_i X_{it} + \mu_{it} \quad (4)$$

With,

$cov\ (X_{it}, \nu_{it}) = 0$ for all t = 1, 2…T

To take care of the endogeneity challenges posed by the endogenous-explanatory variables, the GMM was introduced into equation 4. Here, ∂y_i was rather estimated as

$$\partial y_i = \hat{y}_i + u_i \quad (5)$$

Submerging equation 5 into equation 4, we have

$$y_{it} = \alpha(\delta y_{i,t-1} + \nu) + \beta_i X_{it} + \mu_{it} \quad (6)$$

Where,

$\delta y_{i,t-1}$ and X_{it} are uncorrelated with μ_{it}

Also,

$$y_{it} = \delta y_{i,t-1} + \beta_i X_{it} + \mu_{it} \quad (7)$$

Where,

t = 1,2…T; i = 1, 2,…N; N is the number of states and T is the number of years. y_{it} is the dependent variable, X_{it} is the vector of control variables added to the models while β_i's are parameters to be estimated.

From the above and relying on Blundell and Bond (1998), and Gries and Redlin (2010), the model of this study is specified as

$$Pov_{it} = \lambda_0+\beta_1 Pov_{it-1}+\beta_2 Ineq_{it}+\beta_3 Ineq_{it-1}+\beta_4 HHS_{it}+\beta_5 UNMP_{it} +\beta_6 USW_{it}+\beta_7 ALR_{it}+\alpha_{1t}+\eta_{1t}+e_{1it} \quad (8)$$

Where, Pov = poverty measured by head-count index, Ineq = inequality measured by Gini coefficient, $ineq_{it-1}$ = 1 year lag of inequality, HHS = household size, USW = unimproved source of drinking water, UNMP = unemployment rate, ALR = adult literacy rate, I = 1,2,3,…37 (ith cross sectional unit), t = 1,2,3, 4, 5….N. i denotes the cross-sectional identifier and t is time identifier, α stands for the unobservable and time unvarying characteristic of states, η represents unobservable macro shocks that affect all states in period t and e is an idiosyncratic error. The choice of particular measure of inequality and poverty was determined by convenience given the data problem in Nigeria since other measures can as well be chosen, although each measure may contain information not contained in the other. The parameter β_2 lies between zero and one, the closer it is to one the higher the inequality, but the closer it is to 0, the lower (less serious) the inequality.

In line with literature, the control variables used in this study are household size, unemployment, adult literacy rate and unimproved source of drinking water. The variables included are based on their relevance on the determination of poverty. Unemployment and literacy rate were used as a control variable for education because theoretically, the higher the level of literacy level of an individual, state and country, the more mobile the individual is and more opportunity to get a higher paid job. This increases the welfare of the individual and reduces the probability of being poor. If the gap in literacy rate is wide, it increases the rate of inequality within a given population. For instance, in Nigeria, primary school enrolment in some northern states is as low as 45 percent and as high as 95 percent in some southern states. People in urban areas also generally have greater access to a wider range of educational services than those in rural areas. So, literacy rate in urban areas is generally higher than it is in rural areas. This probably accounts for the high rate of inequality and poverty between the northern and the southern as well as between the urban and rural areas in Nigeria.

Economic theory also postulates that unemployment is positively related to the level of poverty. In the face of unemployment, the individual will not be able to meet up with the needs of life. Households with larger sizes tend to be poorer than smaller households because the dependency will be high; this is positively related to poverty. The unavailability of improved source of water is a major pointer to poverty. Thus there is a positive relationship between unimproved sources of water supply and the tendency of being poor.

3. ESTIMATION PROCEDURE AND DATA

This study employed a dynamic panel data model. The use of panel data set controls for the unobserved effects model can help to isolate the effects of group (state) specific time-invariant characteristics such as natural geographic potential, infrastructural service levels and many more. Panel data models can be used to increase the degrees of freedom, widen the range of variables, and generalize results across cross-sectional units. However, most of our economic models are implicitly or explicitly dynamic in nature (Baltagi and Baldev 2007). Hence, the study chooses to adopt a dynamic analysis in the estimation of the relationship between our variables. The dynamic panel procedure allows us to control for state-specific effects. This was estimated using the system GMM. Estimating the model with pooled OLS, fixed effect or first difference was criticized especially for small sample size like ours (Bond et al., 2001). The OLS estimator assumes that the intercept captures the effect of all omitted, and unobservable variables are the same for all cross-sectional units. This individual effect may correlate with the included explanatory variables. Hence, omitting the individual effect would become part of the error term, which would lead to a bias in the estimates. Fixed effect estimators will give biased and inconsistent estimates. It is only when $T\rightarrow\infty$ will the within estimators be consistent. The random effects GLS estimator and the first-difference estimator are also biased in a dynamic panel data model as a result of poor precision of the first-difference GMM estimator and the problem of weak instruments and characterize this by its concentration parameter τ (Baltagi and Baldev (2007).

Heteroscedasticity and cross sectional dependence are major problems in panel empirical works. If heteroscedasticity is present in a model, the fixed effect, random effect and the OLS estimators produce inconsistent result. Hence, in the face of heteroskedasticity of unknown form, the use of the GMM corrects it making use of the orthogonality conditions to allow for efficient estimation. Cross sectional dependence may arise as a result of spatial correlations, economic distance and common unobserved shocks. In the past decade, literature have been developed for analyzing the effects of cross sectional dependence as well proffering ways of dealing with it in a panel model. The presence of cross sectional dependence is usually tested using the Pesaran (2015), Frees (1995) and Friedman (1937) test statistic among others. Pesaran showed that the CD test can also be applied to a wide variety of models, including heterogeneous dynamic models with multiple breaks and non-stationary dynamic models with small/large N and T. This study made use of the Pesaran (2004) and Friedman (1937) test statistic because of their compatibility to small sample size. The model was also evaluated on the following criteria: (i) The presence of unobserved time- and state-specific effects, (ii) the likely endogeneity of some of the regressors, (iii) the presence of overidentified model as well as (iv) autocorrelation correlation.

The datasets for this study covered the 36 states and the Federal Capital Territory. Poverty rate was measured by head count index and Gini coefficient was used to capture Inequality. The data set for the poverty head count and Gini were drawn from the National Consumer survey 1992, the 1996 general household survey (GHS), 2003/2004 National Living Standard Survey (NLSS) and the harmonized Nigeria Living Standard Survey (HNLSS) 2009/2010 survey as published in the National Bureau of Statistics (NBS) for the various years. The Harmonized Nigeria Living Standard Survey (HNLSS) 2009/2010 is an enlarged scope of previous National Consumer Surveys and a follow-up to the Nigeria Living Standard Survey (NLSS) 2003/2004. Gini data for 1992 was sourced from Aigbokhan (2000). The average of the state urban and rural inequality was taken to obtain each state's inequality. Data on unemployment, literacy rate, unimproved source of water

and household size were sourced from the NBS Social Statistics, NBS GHS report 1995-2005, 1999-2011, NBS Annual Abstract of Statistic, National manpower stock and employment generation survey on household and micro enterprise (informal sector), 2010 and NBS National literacy survey in 2010. The quantitative estimation for the study was done using Stata 11.0 version of econometric software package.

4. EMPIRICAL RESULT

4.1. Descriptive Statistics

Table 1 provides the descriptive summary statistics of the variables used for the analysis.

As shown in Table 1 above, a high figure of POV indicated high level of poverty being experienced in the state and country and Inequality measured by Gini coefficient lies between 0 and 1. The closer it is to 1 the higher the level of inequality in the distribution of income. High figures of literacy rate and unemployment indicates high level of literacy and high level of unemployment in the states and country. Furthermore, household size indicates number of people in the household and unimproved sources of water shows the percentage of people living on unclean sources of water. A high figure unimproved sources showed a greater proportion of the population in the state and country living on unclean sources of water. The mean value of poverty across the states was shown to be 56.46, a standard deviation of 19.1 and varied between 19.98 and 95.1. Jigawa state had the highest level of poverty of 95.1 in 2004/2005 while Bayelsa recorded the lowest level of poverty in same year and this was also the lowest over the period of study. This can be attributed to low level of inequality experienced in Bayelsa over the period of study. Inequality had a mean of 0.4, a standard deviation of 0.05 and a minimum value of 0.22 which was experienced in FCT in 1996. The maximum value of inequality was 0.56, experienced in Jigawa state in 1996. It can be inferred that the high level of inequality experienced in Jigawa state in 1996 as compared to other states, have made the state to also experience the highest level of poverty in the following period and over the period of the study. The Literacy rate in Jigawa state was also very low over the period of study.

Literacy rate is a major function of poverty; this can suggest the reason for the high level of poverty even in the face of high growth. The result showed that Lagos state had the highest literacy rate in 2004/2005 while Jigawa state had the lowest level of literacy rate recorded in 1992. The highest level of unemployment was recorded in 2004 and experienced by Zamfara while Adamawa state had the highest number of household size recorded in the same year. All the variables have a positive skewness with the exception of literacy rate. The diagnostics statistics also indicated that all the variables were normally distributed.

4.2. Consistency and Efficiency Check of Result

4.2.1. Heteroscedasticity test

Table 2 showed that there is heteroscedasticity in the equation using the Modified Wald test of groupwise heteroscedasticity. Therefore, the null hypothesis was rejected. This was corrected by running a robust standard error estimate.

4.2.1.1. Cross sectional dependence (CD) test

Cross sectional dependence test was carried out on the model using the Pesaran (2004) and Friedman (1937) methods and the result presented in Table 3. The null hypothesis for both tests is that there is cross sectional independence among the cross sectional units.

Table 3 showed that we do not fail to accept the alternative hypothesis for Pesaran (2004) while the null hypothesis for Friedman was accepted. The contradicting result thus led to an inclusive result. However, Pesaran (2004) noted that the problem of the CD test is that in a stationary dynamic panel data model it will fail to reject the null of error cross sectional independence.

The presence of the cross sectional dependence can be corrected using the common correlated effects (CCE) estimator proposed by Pesaran (2006) and the sieve bootstrapping. The CCE estimator is only applicable for a large sample size while the sieve bootstrapping method is only applicable when T>N: If, N>T, the problem Nickell bias arises and the bootstrapping method fails. For this study, both methods could not be used as a result of the small sample size and N>T. But it has been shown by Sarafidis (2008) that the dynamic panel GMM estimators does not require cross-sectional independent errors for consistency, however, if there is such dependence, this is weak. Although, Sarafidis et al (2009) showed that the standard dynamic panel data IV and the differenced GMM estimator are inconsistent as N tends to infinity for a fixed T because the moment conditions used by these estimators are invalid under error cross-sectional dependence, hence they suggested the use of system GMM.

However, Sarafidis (2008) and Sarafidis et al. (2008) noted that in the face of cross sectional dependence (homogenous and heterogeneous), the system GMM estimator, can be a reliable. Also, the over identifying restrictions test is regarded as a

Table 1: Descriptive statistics

Variable	POV	INEQ	ALR	UNMP	HHS	USW
Mean	56.45791	0.400651	57.43851	9.536486	4.649797	38.44047
Median	56.45000	0.393650	64.19000	6.400000	4.460000	38.51000
Maximum	95.07000	0.555000	94.43000	61.30000	8.900000	85.60000
Minimum	19.98000	0.215000	5.400000	0.200000	2.810000	0.400000
SD	16.78373	0.052422	22.79977	9.970741	1.052252	21.29731
Skewness	0.036621	0.514603	−0.653151	1.598197	1.104492	0.025288
Kurtosis	2.313745	3.888238	2.256125	6.669800	5.008021	1.920720
Observations	148	148	148	148	148	148

Source: Author's computation using data sourced

misspecification test, because it is usually designed to detect violations of moment conditions, which are the heart of GMM methods. Thus, it has the power under the alternative hypothesis of heterogenous error cross section dependence. Hence for this study, the presence of cross sectional dependence was corrected by employing the one step system GMM.

4.2.2. Dynamic panel-data estimation, one-step system GMM

The result in Table 4 shows that previous level of poverty affected the present level of poverty positively and is statistically significant. This suggests that poverty across the states is a positive function of past levels of poverty. States with higher level of poverty in the previous period tended to experience lower poverty reduction. This supports the vicious circle of poverty. The result also indicated that 1% increase in previous levels of poverty leads to 5% increase in present level of poverty across states. The present and previous level of inequality had a significant impact on poverty across the state and the country at large at 5% level of significance. Although while the present level of inequality had a positive effect in line with our theoretical expectation, previous level showed a negative impact on the level of poverty across states. The implication of this is that poverty is highly affected by inequality in Nigeria. This is because a unit increase in present level of inequality brought about 83.3% increase in poverty while a unit increase in lagged levels of inequality reduced poverty by 119.3%. This is contrary to the findings of Kurita and Kurosaki (2007) for Thailand. Also unemployment had positive and significant relationship with poverty. The effect of unemployment was higher in the face of high male unemployment as in the case of Nigeria. The result showed that 1% increase in the unemployment rate for the state and applied to the country leads to 77% increase in poverty. This finding is in congruous with economic theory and previous studies such as Budiantara et al. (2011), Osinubi (2005), Islam (2004). Literacy rate was also found to be significantly related to poverty. This supports the findings of Psacharopoulos et al. (1995) that the spread of education reduces the incidence of poverty. Specifically, the study found that 1% increase in literacy rate and unimproved source of water leads to 85% fall and 0.7% increase in poverty rate in the states and across the states. Household size showed a negative and insignificant relationship with poverty. It showed that 1 person increase in household size leads to a 1.652 fall in poverty. This is however, contrary to our expectation. Ringen (1991), Lanjouw and Ravallion (1995), Buvinic and Gupta (1997), Prykhodko (2006), Meyer and Nishimwe-Niyimbanira (2016) who found that increase in the male unemployment rate and high female-headed households are undoubtedly associated with increases in poverty.

Table 2: Heteroscedasticity Test; Ho: No heteroscedasticity

Model	χ^2	P
Poverty (Pov_{it})	1242.57	0.0000

Source: Author's computation using data sourced

Table 3: Abridged presentations of cross sectional dependence (CD) test

Model	Pesaran		Friedman	
	Statistics	Probability	Statistics	P
Poverty (pov)	5.485	0.000	4.919	1.0000

Source: Author's computation using data sourced

Table 4: System GMM estimate

Explanatory variables	System GMM Coefficient/standard error	
Pov_{it-1}	0.3358 (0.1249)*	
$INEQ_{it}$	83.2279 (32.9237)*	
$INEQ_{it-1}$	−119.3372 (28.4004)*	
HHS	−1.6521 (2.0393)	
UNMP	0.77804 (0.233123)*	
USW	0.0719 (0.1529)	
ALR	−0.8589 (0.1577)*	
Intercept	102.7309 (16.955)	
F test (7, 36)	Stat 20.74	
Hansen test	Pr>stat=0.0000	
Instrument rank	χ^2 (12)=24.93 P>χ^2=0.096	
AR (1)	Z=−2.65	Pr>Z=0.008
AR (2)	Z=−1.63	Pr>Z=0.104

Author's computation using data sourced. The number of observations used was 111, and the number of groups in the panel was 37, period 1992-2010 using four years panel; Null hypothesis of Sargan/Hansen test: All instruments are valid. *indicates significant at 5% level of significance, GMM: Generalized method of moments

5. CONCLUSION

This study was devoted to determine and understand the existence of a dynamic relationship between inequality and poverty in Nigeria using microeconomic data. Adopting the GMM framework, the study shows clearly that there is a very high level of poverty and inequality in Nigeria and that poverty is highly a function of inequality. Beside, both present and past levels of inequality significantly impacts on the present level of poverty. Addressing poverty tomorrow therefore requires addressing inequality today. This is because it has been demonstrated in this study that a lower initial inequality increases the speed at which poverty headcount index can be reduced in Nigeria. A major policy implication of the above findings is that lowering the high rate of inequality is important for the reduction of poverty. Consequently, there is need to ensure equity in the distribution of income in the country especially in those states that have very high poverty rate. This can take the form of taxes and transfers using appropriate fiscal policy tools. There is also the need for the creation of more jobs by the government and encourage the private sector in the provision of capital for those that have entrepreneurial skill and are being hindered by capital. Furthermore, enhancing our educational system is paramount for effective poverty reduction. The productivity of individuals can be enhanced through a balanced educational system, generating per capita income and a transition from poor to non-poor. It is therefore recommended that revitalizing the educational curriculum as well as increasing the

accessibility of education particularly in the rural areas should be adopted as a key tool to poverty reduction in Nigeria.

Conclusively, poverty and inequality is still rampart in developing countries and are increasing over the years even in the face of increasing growth in Nigeria. The reduction of poverty is topmost in macroeconomic policies of the world particularly the developing countries. There seems yet to be disagreement on the right policy measure to be employed for the effective compartment of poverty. A major rational for these divergent findings can be attributed to the dynamic and complicated nature of poverty. We conclude that since poverty and inequality are two major problems that are eating up the country and are inter woven, policy measure to fight against one should also have the other inbuilt into it.

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