Spatial Analysis of Structural Determinants of Child Poverty Incidence in Nigeria

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Abstract:

Despite goal four of Millennium Development Goals (MDGs) targets set by the United Nations for the nations of the world to reduce child mortality to its half by 2015, Nigerian children are still greatly affected by the incidence of poverty. We focus on the social attributes of the local area to assess what the geographic place represents. Using spatial error regression techniques to analyze Geopolitical Zone census data from Demographic Health Survey and National Living Standard Survey, we examined spatial differentiation in the relationships that generate child poverty and further explore their determining factors. Child poverty was found to be more prominent in the Northern region of the country. However, results from the analysis also established that there is a spillover of child poverty existed among the GPZs. While social and economic factors that influence the probability of child poverty varied across difference Geopolitical Zones (GPZs). Poverty incidence in a GPZ influenced the neighboring GPZ. Results also showed that local-area processes are at play with implications for more nuanced theoretical models and anti-child poverty policies that consider systematic differences in factors contributing to child poverty according to the social, infrastructural, agro ecological and economic contexts.

Acknowledegment:

JEL Codes: J13, O18

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We focus on the social attributes of the local area to assess what the geographic place represents. Using spatial error regression techniques to analyze Geopolitical Zone census data from Demographic Health Survey and National Living Standard Survey, we examined spatial differentiation in the relationships that generate child poverty and further explore their determining factors.

Child poverty was found to be more prominent in the Northern region of the country. However, results from the analysis also established that there is a spillover of child poverty existed among the GPZs. While social and economic factors that influence the probability of child poverty varied across difference Geopolitical Zones (GPZs). Poverty incidence in a GPZ influenced the neighboring GPZ. Results also showed that local-area processes are at play with implications for more nuanced theoretical models and anti-child poverty policies that consider systematic differences in factors contributing to child poverty according to the social, infrastructural, agro ecological and economic contexts.

Keywords: Child poverty, spatial error regression, poverty incidence, GPZs, Nigeria.

JEL Classification: I32, J13, O18

1.0 INTRODUCTION

1.0 Background of Study

Among the most vulnerable and poverty stricken in the society are the children that are of age that range from 0 to 15 years. The welfare of the children in the society is a measure of economic and social development of that society therefore it is required deliberate attention by the government owing the substantial proportion of children in world population, for instance, children of age 0 to 14 years constituted about 43.6% of the total population (Nigeria Demographics Profile, 2014).

Basically, child is defined internationally in terms of age category as any person that is between the age of 5 and 17 years. While according to UNICEF, child poverty refers to children, who experience and witness deprivation of the material resources required to survive, develop and thrive, leaving them unable to enjoy their rights, achieve their full potential, or participate as full and equal member of the society. Also, child wellbeing indices is defined in terms of indices such as child labour, child schooling/education, street children and child health and nutrition. The child labour and child schooling are regarded as two sides of the same coin. For example, child wellbeing is defined in term of exploitative child labour occurs when children, especially young ones, are exposed to long hours of work in dangerous environment or are entrusted with too much responsibility without compensating psychosocial reward, or work. In addition, such activities are carried out at the expense of schooling, thereby children are not adequately prepared for the future in a modernizing society (Grootaert and Kanbur, 1995; UNICEF, 2004). The street child on the other hand is defined as any child who may have parents or guardians in the locality or elsewhere but are living and working in the street. Most often street children are not distinguished in child labour analysis. And child schooling defined in terms of child that are roaming around the street with being enrolled to any school, therefore, depriving the child to his to education.

Despite the growing concern of various international organizations and the nations of the world evident in policy and programmes formulation and implementation, for example goal four of Millennium Development Goals (MDGs) targets set by the United Nations for the nations of the world to reduce child mortality to its half by 2015, many countries are still affected by the incidence of child poverty and malnutrition especially the developing countries.

One third of children in the developing countries lack access to basic sanitation while one fifth of children in the developing countries lack access to clean and potable water in their household

(UNICEF 2009). Statistics from Insight Development Research analysis in 2009 revealed that no less than 600 million children worldwide are growing in absolute poverty and more than 10 million children under-five years die every year mostly from preventive and or curable diseases (UNICEF 2011). Among these disease included respiratory illness, diarrhea and protozoal infection, as well as conflict and HIV/AIDS. Malnutrition, stunted growth, poor hygiene, lack of access to safe water and adequate sanitation remains the main drivers of more than half of these deaths (UNICEF, 2005). More than 90% of child death under the age of 18 occur before the age of five (UNDG, 2003). Ninety-three percent of all under-five deaths currently occur in Africa and Asia combined and 40% occur in just three countries: India, Nigeria and the Democratic Republic of Congo. (UNICEF, 2008). This clearly necessitate a need to tackle the growing trend of child poverty incidence in the world, more particularly in the developing countries where child poverty is a phenomenon.

Nigeria is among the countries of the world with high child poverty prevalence where majority of children, especially those that are in remote places, face challenges such as poor health, lack of access to quality education, food and social insecurity and lack of care. Child poverty is national phenomenon that is not limited to urban areas or one agro ecological zone but a wide spread problem across the four corners of the nation. Many of the deprived children live in the rural areas and do not have access to fundamental resources that they need for survival like other counterparts in the developed world. In most cases they drink water from unknown sources, flowing rivers and other surface water, no access to toilets, they receive no medical care, living in houses with not less than five people in room, not enrolled in school or no school attendance, no access to information and learning facilities. This situation is quiet unpalatable for children living in absolute poverty, therefore, Nigeria and other developing countries must address the poverty incidence among children(Gordon D. et al 2003).

The United Nations report in 2005 claimed that survival in Nigeria is quiet challenging for the young and adults and majority are barely surviving financially with more than 68% living below US$ 1 a day. Unfortunately, poverty rate is currently on an increasing trend since the 1980s from an average of 27% to 70% in 2003(African Economic Outlook, 2005) while the current economic crises Nigeria is currently, as a result of falling oil price, may put the poverty rate on geometrically increasing trend. In the face of the current economic trends, adults in the household tend to have masterminded coping strategies leaving children who are more vulnerable to suffer more for associated economic problems. A number of poverty surveys has been carried out in Nigeria using various approaches such uni-dimensional approach,

multidimensional approach, monetary and non-monetary approaches among other, only few have considered examination of child poverty using national data. Although Adeoti and Poopola, 2012 and Uguru et al, 2006 examined the determinants of child poverty and child labour respectively, none considered the spatial differences in the studies despite the assertion by Odusola, 1997 and Okunmadewa et al., 2005; NBS that poverty levels varies across regions in Nigeria. Although considering the choice of a specific poverty measure and heterogeneity nature of poverty incidence and income sources, may have major policy contribution to alleviate the lingering child poverty in Nigeria (Sowunmi, 2017).

1.1 Justification of the Study

Among the common goal of nations of the world is reduction and possibly eradication of child poverty (Barrientos & DeJong, 2004). The manifestation of child poverty in the short run is malnutrition in children that are still under-five years of age (UNICEF, 2006) which can be damaging when children are of first few years of age. Lack of food, insufficient breastfeeding as the mothers are malnourished insufficient and lack of quality education, poor health care service and absence of adult care are the root cause of malnutrition. Unfornnately, the long term consequences in the later years of the children's life time when they are old is devastating, irreversible and threatening. Furthermore, these children are likely to fail as parents to ensure that their children have the most effective education and access to the basic resources to improve themselves (Lewit, Terman & Berhman, 1997).

A number of development plans, policies, programmes and policy documents have been put together in order to address child poverty by past governments. Government attempts at reducing child poverty through formulation and implementation of these policies, programmes and huge investments have not had significant intended effects, as the country is still ranked as among the top countries of the world plagued with child poverty. Child Rights Act, Strategy for Acceleration of Girls' Education in Nigeria (SAGEN), National Agency for Prohibition of Trafficking in Persons (NAPTIP), Integrated Child Survival and Development Strategic (ICSD) Framework and Plan for Action, are among other initiatives of the government to address the overall welfare of the population including the children. Overall, there is a long list of policies, guidelines and action plans to enhance child development most of them developed with immense financial and technical assistance from development partners and foreign governments but yet to transform to the much expected child poverty reduction in Nigeria. This

can be attributed to the non-consideration of the heterogeneous nature of child poverty and spatial contiguity of geographical units in their designs.

Although many researches have been conducted in areas of child welfare and poverty(World Bank (2008), Onah (1996), Echeberi (1997) Ogwumike and Ekpeyong (1996), Anyanwu (l997), Odusola (1997), Adeoti and Popoola(2012), Uguru, 2006), all of these researches neglected the spatial patterning of child poverty in Nigeria and the role of place in aggravating and reproducing poverty while . Neither do all the past researches examined the expanded set of determinants namely, factors related to social capital and political influence inclusive. Or, at best pocket of researches has been done using small unrepresentative sample. Most, if not all of these studies in Nigeria have not used national data to make their conclusion because of unavailability of such data. Also, there are few or no researches on application of spatial econometrics to child poverty. A large difference in the quality of life of the populations in different geographical zone is common not only in developing countries but also in developed countries. This may have contributed to poor policy response to child poverty in Nigeria as the literature has shown that child poverty continued to aggravate. This study was therefore motivated to bridge this gap in literature and proffer recommendations to this vacuum in policy process related to child poverty.

2.0 LITERATURE REVIEW

The concept of child poverty is not easy to define and it is quite cumbersome (Mirugi-Mukundi, 2009) but some researchers have been a measure child poverty using various methodologies and approaches. According to National Demographic Profile in 2014, approximately 60 million children form part of Nigerian population, about 43.2%. Whereas the issue of child poverty is off great concern and it is important to neglect or disregard the prevalence of child poverty in Nigeria (Adeoti and Popoola, 2012). The child poverty situation differs from that of adults therefore cannot be compared making the studies of child poverty is necessity. A child's encounter of poverty requires urgent attention which orthodox and or traditional anti-poverty strategies do not address. The causes and effects of child poverty may have a lasting or even a permanent effect on a child's future (Mirugi-Mukundi, 2009).

In the global study on child poverty by UNICEF in 2007, child poverty indicators and cut offs were determined for a large number of developing countries (Gordon et al, 2003; Gordon et al., 2001; UNICEF, 2004). Using DHS data report, tradition of poverty measure report the headcount or percentage of children who are multidimensionally poor. This approach offered the merit of being easy to estimate and interpret; but does not provide information on the depth and severity of poverty Delamonica and Minujin (2007) and Alkire and Foster (2007, 2011). The Alkire- Foster (AF) method (2007, 2011) combines the counting approach (Gordon et al., 2003 with the literature on axiomatic approaches to multidimensional poverty in welfare economics (Bourguignon and Chakravarty, 2003; Alkire, 2008). It provides multidimensional measure that reflects the intensity of poverty. It also reveals the depth and severity of multidimensional poverty.

Another approach in the recent times in measuring child poverty is income/consumption and the deprivation approach. The study of UNICEF,2007 conducted in Nigeria using MICS data employed both the income/consumption and the deprivation approach to estimate child poverty and deprivations. The use of the income/consumption approach is based on the premise that the household poverty affect children in those households; being the most vulnerable. However, since all indicators of poverty cannot be captured based on money- metric measures, they also adopted the deprivation approach. In the deprivation approach, the seven areas considered as very basic for child survival, growth and development are shelter, sanitation, water, information, food and nutrition, education and health. The study used a set of threshold to categorize Nigerian children into levels of deprivation. Deprivation in each of these areas

exists at two levels namely severe and less severe. The term 'absolute poverty' has also been used to describe a situation where children suffer at least two deprivations.

On the other hand, Alkire and Manuel Roche (2011); Santos Emma and Karma Ura (2008) in their study measured child poverty in Bangladesh and Bhutan respectively using Alkire and Foster (2007) methodology to estimate the headcount, breadth, and severity of the various dimensions of child poverty suing the following selected indicators for children under - five are nutrition, water, sanitation, health, shelter and information. The results show that the Alkire-Foster adjusted headcount ratio produces different ranking than the simple headcount, because it reflects the simultaneous deprivations children experience. Also, Batana (2008) used the Alkire and Foster (2007) method to estimate multidimensional poverty in fourteen sub–saharan African countries based on four dimensions assets, health, schooling and empowerment. Four main results include: Firstly, there are important cross-country differences in multidimensional poverty, Secondly, the ranking of countries based on the Alkire and Foster (2007) multidimensional poverty measure differs from the rankings based on standard welfare measures (HDI and Income poverty). Thirdly, decomposition of multidimensional poverty is more prevalent in rural than urban areas. Finally, decomposition of poverty by dimensions indicates that lack of schooling is the key contributor to multidimensional poverty. The use of Alkire and Foster (2007) method to estimate multidimensional poverty is useful but does not capture geographical differences in its analysis thus, may not be appropriate to be used to analyse the spatial difference of child poverty study, therefore an approach that measure geographic variables is desirable for spatial analysis of child poverty in Nigeria. This is quite missing in literature.

On the other hand, there has been an uprising of the incorporation of space (location or geography) in analysis of poverty and some other development studies. The concepts and assumptions of spatial analysis measure geographic variables that exhibit properties of spatial dependency (the tendency of the same variables measured in locations in close proximity to be related). While traditional statistical techniques have treated this feature as nuisance, spatial statistics considers them explicitly. Unlike in the past, spatial models were mainly used in fields such as regional science, urban and real estate economics and economic geography (Pace et al, 1998). However, spatial econometric methods have increasingly been applied in a wide range of empirical investigations in more traditional fields of economics and other applied studies (Rupasingha and Goetz, (2007); Petrucci et al, 2003).

Minot, N. and Baulch, 2013 conducted a study in Vietnam where the spatial patterns and geographic determinants of poverty rate was examined. The findings of their studies revealed that 10 percent point increase in the poverty rate in a district results in 8 percent increase in the poverty rate in a neighbouring district. In a similar study on spatial approach to social and political forces as a determinant of poverty in US, Rupasingha, A. and Goetz S.J. (2007) indicate that a 10 percentage point increase in the poverty rate in a county results in a 2% increase in the poverty rate in a neighboring county. This is strong evidence that spillover effects exist between counties with respect to poverty. Neighbourhood effects on poverty as a result of similarities in socioeconomic and environmental factor are well documented in studies (Birungi et al, 2005; Okwi et al, 2007) carried out in Kenya and Uganda respectively. They reasoned that poverty of a neighborhood is tied to the fortunes of neighbouring areas: there are geographic spillovers in poverty reduction. Reducing poverty in particular neighborhoods affects the poverty of neighboring tracts.

Haven't realized in literature the regional variation of poverty from several studies, to our knowledge in Nigeria and other Sub-Saharan African countries, there is no previous studies with objective of examining child poverty that formally incorporates spatial spill-over effects into the estimated models. Adeoti and Popoola, 2012; Uguru et al, 2006 explored a number of potential explanations for the regional variation in child poverty across Geopolitical Zones in Nigeria. Studies that ignore spatial dependence can produce biased results (coefficient estimates) and lead to ineffective – and possibly counterproductive – recommendations for policies targeted at poverty alleviation.

3.0 METHODOLOGY

3.1 Scope of the study

Nigeria is the most populous country in Africa and the ninth most populous country in the world providing habitation for 1.9% of the world's population as at 2012. There is a forecast that this will rise to 2.2% in 2015, and attain the sixth most populous country rank by 2050. The National Population Commission (NPC) put the population of Nigeria at about 88.5 million in 1991, 140 million in 2006 and 170 million in 2011 (NBS 2013). The 2006 census estimates further claims that 42.3% of the population is between 0 and 14 years of age, while 54.6% of the population is 15 to 65 years of age. The birth rate is significantly higher than the death rate at 40.4 and 16.9 per 1000 people respectively. The study areas are both rural and urban Nigeria. Nigeria is made up of 36 states and a Federal Capital Territory (FCT), grouped into six geopolitical zones: North Central, North East, North West, South East, South South, and South West.

3.2 Source and Type of Data

The study used secondary data comprising mainly of the Demographic and Health Survey (DHS) data collected by Macro International in 2013 and 2003/2004 National Living Standard Survey data by National Bureau of Statistics (NBS). Other source was Food and Agricultural Organisation for the fertility soil map of Nigeria and agro-climatic and environmental data. The DHS survey data is a national representative data. It contains rich demographic data and few relevant socioeconomic data on households and household assets. It provides data on the welfare of children and adult in households.

3.3 Analytical tools and models

The study employed a number of analytical tools based on the objectives of the study. The tools include:

Estimation of Child Poverty: Adult Equivalence Scale (AES approach)

The AES is a tool which is designed to work through the differences, and to ultimately make a transformation from household level to individual level welfare (Streak, Yu & van der Berg, 2008). This approach is applicable in making inference of welfare of an individual in households especially when there is difficulty in making directly estimation of welfare of such individual.

We adopted this approach to estimate the child poverty line from already existing adult poverty line in Nigeria following STATS, 2008 study in South Africa where child poverty line was estimated using this approach.

The adult equivalence scale (AES) which gives the adult a "1" as a benchmark was then used to come up with the weight for different age groups.

The general approach for using the AES is to use the form introduced by Cutler and Katz (1992) namely:

$$AE = (A + \alpha K)^{\beta} \qquad (1)$$

Where: AE refers to the adult equivalent

A, represents the number of adults in the household

K represents the number of children Į

α adjusts for age equivalences

β adjusts for economies of scale.

The household size element that the AES addresses is that bigger households need larger incomes where income is used as a measure or expenditure where expenditure is used unlike smaller households in order to obtain the same level of welfare. The AES thus gives allowance to analyse the determinants of child poverty through child poverty measurement (Streak et al. 2008).

Streak et al (20 08:7) points out that there is no universal and scientifically determined true value for α. The true costs vary from country to country and are probably different for children of different ages and even gender. In this study, the economies of scale component in the Cutler and Katz formulation is left out, only the adult equalisation is considered for different age group.

The following poverty lines were therefore arrived at using 18 years as the cut off point for children.

Table 1. Estimation of Poverty Lines

Age	Equivalence scale	Poverty line
Below 18 years	$\alpha = 0.8$	N10,588.12
18 and above	$\alpha = 1$	N23,733.00

Empirical Model on Spatial Error Model and Spatial -Lag Regression Techniques

A diagnostic Ordinary Least Squares regression analysis was carried out by expressing the prevalence of child poverty as a function of selected spatial variables. This is to detect spatial dependence, in addition to other standard diagnostics. The OLS regression model is estimated as:

$$y_i = \beta_i X_i + \varepsilon_i \qquad (2)$$

Where:

y_i is a vector average child poverty rates;

X_i is a matrix of independent variables,

β_i is a vector of coefficients,

ε is a vector of random errors.

The geo-referenced independent variables data were grouped under demographic, agro-ecological and environmental, infrastructural, sociopolitical and economic characteristics. The data (household) were based on GPZs.

If spatial autocorrelation is significantly present, the result of OLS regression diagnostics will reveal the cause (spatial-lag or spatial-error) as well as the appropriate model to correct the defect. Either of the models below corrects the defect:

(i) Spatial-error model:

$$y = x_i\beta_i + \left(1-\lambda W_{(e)}\right)^{-1}\varepsilon \qquad (3)$$

(ii) Spatial-lag model:

$$y = \left(1 - \rho W_{(l)}\right)^{-1} x_i\beta_i + \left(1 - \rho W_{(l)}\right)^{-1}\varepsilon \qquad (4)$$

Where:

y is an nx1 vector of dependent variable (average child poverty rate),

x_i an n x k matrix of covariates (independent variables),

β_i is the regression coefficient for the independent variables,

ε is a zero-mean error term,

$W_{(l)}$ and $W_{(e)}$ are n x n spatial-lag and error weight matrices, respectively

{ρ, λ} the associated scalar spatial parameters (measures the extent of spillover).

The appropriate models are shown below:

(i) Statistically insignificant spatial autocorrelation

$$\Pr_{L-L} = \beta_i X_i + \varepsilon_i \qquad (5)$$

$$\Pr_{H-H} = \beta_i X_i + \varepsilon_i \qquad (6)$$

(ii) Statistically significant spatial autocorrelation

Spatial-error model:

$$\Pr_{L-L} = x_i\beta_i + \left(1-\lambda W_{(e)}\right)^{-1}\varepsilon \qquad (7)$$

$$\Pr_{H-H} = x_i\beta_i + \left(1-\lambda W_{(e)}\right)^{-1}\varepsilon \qquad (8)$$

Spatial-lag model:

$$\Pr_{L-L} = \left(1 - \rho W_{(l)}\right)^{-1} x_i\beta_i + \left(1 - \rho W_{(l)}\right)^{-1}\varepsilon \qquad (9)$$

$$\Pr_{H-H} = \left(1 - \rho W_{(l)}\right)^{-1} x_i\beta_i + \left(1 - \rho W_{(l)}\right)^{-1}\varepsilon \qquad (10)$$

Where:

$P_{rL\text{-}L}$ is the vector of poverty rate for only low poverty GPZs that are surrounded by low poverty GPZs.

$P_{rH\text{-}H}$ is the vector of poverty rate for only high poverty GPZs that are surrounded by high poverty GPZs.

The measures of fit in spatial regression model are the Log-Likelihood, Akaike Information Criterion (AIC) and Schwarz Criterion (SC).

3.0 RESULTS AND DISCUSSION

3.1 Estimation of Child Poverty Line in Nigeria

Following Stata, 2008 and Jabulile, 2014 approach of measuring child poverty in South Africa using adult equivalence scale (AES). The AES employed is a technique designed to work through individual differences and to ultimately make a transformation from household level to individual level welfare (Streak, Yu and van der Berg, 2008). By using the approach child poverty line was drawn to be N10,588.12 and based on this we found out as contained in table 2 below that about 54.1% of the children understudy were poor while 45.9% were above the poverty line. This results in line with the findings of Adeoti and Popoola, 2012 where poverty incidence was found to be more than half in Rural Nigeria.

Table 2. Distribution of Child Poverty Status in Nigeria

Child Poverty Status	Frequency	Percentage (%)
Poor children	2938	54.1
Non poor children	2493	45.9
Total	5432	100.0

Authors' own editing, 2016

3.2 Spatial Analysis of Incidence of Child Poverty (Headcount) in Nigeria

The results of the spatial analysis of child poverty (headcount) in Nigeria was presented in table 2 decomposed by geopolitical zone. The North West region has the highest incidence of poverty in term of head count (P0=0.6925) closely followed by North East and the North Central with poverty headcount estimate of 0.6069 and 0.5598 respectively. The Shapely Decomposition analysis which presented the relative contribution of each of the GPZ as contained in table 3 showed the above zones contributed most to the overall poverty incidence by 29.5%, 22.6% and 21% respectively. This is inconsistent with the study of Obayelu, 2014 and Minot et al, 2003 that poverty is more prominent to regions that are prone to drought and extreme dryness in Nigeria and Vietnam. The Southern Nigeria which include South East, South West and South South has the lowest child poverty incidence in a descending order.

South West had the lowest incidence of poverty (P0 =0.2699) and the lowest relative contribution of 4.4 per cent to overall poverty. This shows that the proportion of the poor in North West is about thrice that of South West. The implication of this is that child poverty is more pronounced in the north than in the south which can be attributed to variation in socioeconomic, natural and human capital endowment.

Table3. Spatial Analysis of Incidence of Child Poverty (Headcount) in Nigeria

Geopolitical Zones(GPZ)	Estimates	Proportion	Absolute contribution	Relative contribution
North Central	0.559	0.189	0.106	0.210
North East	0.606	0.188	0.114	0.221
North West	0.692	0.215	0.149	0.295
South West	0.269	0.082	0.022	0.044
South East	0.280	0.162	0.045	0.089
South South	0.419	0.162	0.068	0.135

Authors' own editing, 2016

3.2 Spatial Analysis of Incidence of Child Poverty Depth (Gap) in Nigeria

The depth of child poverty across GPZ in Nigeria are presented in Table 4. The Northern regions also had the highest child poverty gap as expected with North West had poverty gap index of 0.2781 while the lowest was in the South West 0.0835. This implication of this result is that a child tagged poor in North West will need about three time resources of the poor child in the South West to be able live above the poverty line and or out of poverty. South West having the lowest proportion signifies that the zone is more economically and socially viable. This could be associated various development policies implemented by the past Western government in building human and social capital which include the foremost free education, free health care services, promotion of formulation of association by household head and wide awareness on proper parenting. The relative contribution revealed that South West contributed 3.4%, the lowest, while North Central contributed more than 30% to the overall child poverty depth in Nigeria. Overall, the Northern regions contributed about 76% while Southern Regions contributed the remaining percent to the child poverty depth in Nigeria.

Table 4. Spatial Analysis of Incidence of Child Poverty Depth (Gap) in Nigeria

Geopolitical Zones(GPZ)	Estimates	Proportion	Absolute contribution	Relative contribution
North Central	0.278	0.215	0.059	0.303
North East	0.241	0.188	0.045	0.229
North West	0.249	0.189	0.047	0.239
South West	0.084	0.082	0.007	0.034
South East	0.086	0.162	0.014	0.071
South South	0.150	0.162	0.024	0.123

Authors own editing, 2016

3.3 Spatial Analysis of Incidence of Child Poverty Severity (Gap) in Nigeria

Table 5 show the child poverty severity in Nigeria which revealed that North Central was ranked highest in the level of severity of child poverty in Nigeria among other GPZ. In term of child poverty severity, there is a deviation from what obtained in the case of poverty headcount and depth of poverty where North West was ranked highest. Despite that North West zone had the highest proportion of children that were poor, the severity and intensity of poverty, which explains the damage in terms of health, self-esteem, enlightenment among others, of children in the North Central zone was found to highest. Poverty is most threatening in the North Central zone. But the South West had the lowest poverty severity index of 0.0379. The highest relative contribution to the overall severity of child poverty in Nigeria was found to North Central contributing about 30.19% while the least contribution was from South West.

This difference in headcount, depth and severity of child poverty in Nigeria is an evidence of heterogeneity nature of poverty, income distribution and child related policies in Nigeria which could be attributed to geographical, political, environmental or economic differences.

Table 5. Spatial Analysis of Incidence of Child Poverty Severity (Gap) in Nigeria

Geopolitical Zones(GPZ)	Estimates	Proportion	Absolute contribution	Relative contribution
North Central	0.145	0.215	0.031	0.302
North East	0.123	0.188	0.023	0.224
North West	0.145	0.189	0.028	0.268
South West	0.038	0.082	0.003	0.030
South East	0.039	0.162	0.006	0.061
South South	0.073	0.163	0.012	0.115

Authors own editing, 2016

3.4 Spatial Determinants of Child Poverty in Nigeria

The model estimated in the study employed estimated location level child poverty rate using the adult equivalence scale. National level data was used for the analysis. Table 6 shows the result of the national model (spatial error model) with 20 explanatory variables. The spatial-lag estimation of child poverty in Nigeria is shown in Table 6. From the results presented in the table, the spatial autocorrelation coefficient (rho) was 0.211 which means that 10% decrease(increase) in child poverty rate of GPZs expected to bring about 2.1% decrease(increase) in the child poverty rate of the neighboring GPZ. The model also explains that 53.2% of the variation in child poverty rates is jointly explained by the dependent variables. Out of the 20 explanatory variables used in the model, only 13 was found significant at varying levels. Several variables returned the expected sign although the significant levels varied.

Literate household head – This variable was found to be significant and negative, implying that child poverty rate tend to be reduced with level of education of the parents or guidance, this was also reported by Adeoti and Poopola, 2012. This is also consistent with the findings of Bastos et al, (2009) that education increases the stock of human capital, which in turn increases labour productivity and wages of household heads who in turn effect enable them to be able to cater for all needs of their children.

Household size –The positive coefficient of household size agrees with Sowunmi(2016) that household with larger size tend to poorer, especially the children who are most vulnerable to poverty. Additional household member tend to increase competing needs of scare resources in the

household. The magnitude of this effect suggest increased awareness and sensitization on adoption of family planning methods.

Access to health facilities, sanitation and safe water sources - the coefficient of access to health facilities, sanitation and safe water sources are significant and negatively influenced child poverty incidence. These results showed that households having access to safe sanitation, safe water sources and health facilities are less likely to be poor children. These findings agree with (Sowunmi, 2016) that the slower growth in Nigeria; most especially the northern zone of may be as a result of lack of basic infrastructural facilities.

The result also shows that ***households' access to credit and membership of association*** have negative relationship with child poverty incidence. This finding agrees with (Mahbub, 2004) that social capital has a significant positive effect on the rate of per capita income growth which is a precursor to reduction in child poverty incidence.

Self & wage employed in agriculture -With respect to the occupation of household heads, the child poverty tend to increase with parents engaged in both self and wage agricultural employment. The positive relationship between employment in agriculture and child poverty rate is in line with the findings of Anyawu (2010), Adeoti and Poopola(2012) and Showunmi(2016). This imply that child poverty reduction in Nigeria goes beyond engagement in agriculture especially small scale, rather, increased productivity should be advocated for through improved technology and investment in human capital and infrastructure.

Good soil dummy – In order to attend to the sensitivity of child poverty to soil quality which is agro ecological factor or variable. It is expected that GPZ with good soils are likely to be have high agricultural potential, therefore, higher income potential outcomes. The result shows that locations with good soils are associated with less child poverty. This strong pointer to policy of proper soil management especially in rural areas with high dependence on agriculture.

Furthermore, ***the coefficient of the average annual rainfall*** is also negative and significant with different magnitudes in child poverty. Rain as a source of water is required for farming activities, household uses and replenishment of water in dams for irrigation of crops and fish-rearing during the dry season. Since agriculture is the main source of livelihood in rural areas in Nigeria, the importance of irrigation farming in Northern regions cannot be overemphasized because of the short rainy season.

Table 5. Spatial Determinants of Child Poverty Incidence in Nigeria

Variables	Coefficient	Standard Error	P-values
Geopolitical Zone(GPZ) dummy variables			
North Central	−0.147***	0.011	0.000
North East	0.065***	0.014	0.000
North West	0.109***	0.009	0.000
South West	0.233***	0.015	0.000
South East	0.139***	0.009	0.000
South South	0.095***	0.011	0.000
Demographic characteristics			
Female headed households	−0.003	0.001	0.147
Male headed households	0.001	0.002	0.211
Literate household head	−0.014***	0.026	0.000
Household size	0.033***	0.028	0.000
Infrastructural characteristics			
Access to electricity	0.013	0.065	0.056
Access to safe sanitation/waste management	−0.017**	0.077	0.023
Access to safe water source	−0.023***	0.035	0.000
Access to primary health care services	−0.026*	0.001	0.052
Sociopolitical and economic characteristics			
Membership of association of household heads	−0.032***	0.001	0.002
Access to credit facilities	−0.011**	0.005	0.028
House ownership	0.140	0.010	0.000
Self & wage employed in agriculture	1.394**	0.342	0.023
Agro-ecological and environmental characteristics			
Average annual rainfall	−1.037***	0.207	0.001
Good soil (dummy)	- 0.095*	0.051	0.067
Constant	0.860	0.031	0.000
Lag parameter (μ) = 0.211 Pseudo R^2 = 0.532 Akaike information criterion: 176.450 Log likelihood = −89.790 ****Significant at 1%level, ** Significant at 5%level, *Significant at 10%*			

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3.4 Spatial Determinants of Child Poverty by Geopolitical Zones (GPZS)

It is noteworthy to state that separate models were run for each of the six GPZs to capture the differences in spatial poverty determinants across these very diverse GPZs. All of the GPZs showed significant presence of spatial dependence, mainly of the spatial lag type. The results was presented in Table 7.

North Central – This GPZ is also called the middle belt zone and it consists of about 6 states namely Benue, Kogi, Kwara. Nasarawa, Niger, Plateau and Federal Capital Territory. The result of the spatial analysis of child poverty revealed that literate household head, access to safe water source, membership of association of household heads had negative relationship with child poverty in this GPZ while household size and average annual rainfall had positive relationship with child poverty in this region. The high poverty rate in this region can be attributed to geometric increase in household size without appropriate financial capacity.

North East – Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe are the 6 states made up North East GPZ, however, the significant factors that increases the child poverty rate in this region include male household heads and household size while other factors except good soil dummy may reduce the child poverty rate in this region and these factors include: Female headed households literate household head, access to electricity, access to safe sanitation/waste management, access to safe water source, access to primary health care services, membership of association of household heads, access to credit facilities, house ownership, self & wage employed in agriculture, average annual rainfall. It is noteworthy to state that the same pattern of determinants were found to influence child poverty incidence in North West but at different level of significant. This can be attributed to similarity in culture and tradition.

South West – This GPZ consist of 6 states which include Ekiti, Lagos, Ogun, Ondo, Osun and Oyo. It experiences a mainly tropical climate with variations due to altitude. The results revealed that among all the significant variables tend to reduce the child poverty rate in the geopolitical zone. South West zone has been identified to be with least child poverty rate in term of depth, severity and incidence. The variables include literate household head, access to credit facilities, all infrastructural factors, self & wage employed in agriculture, average annual rainfall and good soil. This analysis suggests that infrastructural development coupled with improvement of agricultural production are key to enhancing poverty reduction in the GPZ.

***South East* –** There are 5 states in this geopolitical zone which include Abia, Anambra, Ebonyi, Enugu, and Imo. The factors that increases child poverty in this GPZ are female headed households and household size. Households that headed by female in most cases do not have the financial capability to take care of their children and to afford basic needs of life. However, literate household head, access to electricity, access to safe sanitation/waste management, access to safe water source, access to primary health care services, good soil are identified factors that may reduce the poverty in the GPZ.

South South – There are 6 states in this geopolitical zone and these include Akwa Ibom, Cross River, Bayelsa, Rivers, Delta and Edo. Here, it is only household size among other significant factors that may lead to increase in child poverty in the GPZ. Similar findings for South East, variables that significant reduce child poverty include literate household head, access to electricity, access to safe sanitation/waste management, access to safe water source, access to primary health care services and good soil. This results portrays the need to build human capital, infrastructure and improve agricultural production.

Table 6. Spatial Analysis of Determinants of Child Poverty in Nigeria by GPZs

Variable	North Central	North East	North West	South West	South East	South South
Demographic characteristics						
Female headed households	NS	*** (-)	**(-)	NS	*** (+)	NS
Male headed households	NS	*** (+)	* (+)	NS	NS	NS
Literate household head	*** (-)	*** (-)	*** (-)	*** (-)	*** (-)	*** (-)
Household size	*** (+)	*** (+)	** (+)	NS	*** (+)	*** (+)
Infrastructural characteristics						
Access to electricity	NS	*** (-)	* (-)	* (-)	*** (-)	*** (-)
Access to safe sanitation/waste management	NS	*** (-)	*** (-)	*** (-)	*** (-)	*** (-)
Access to safe water source	*** (-)	*** (-)	*** (-)	*** (-)	*** (-)	*** (-)
Access to primary health care services	NS	*** (-)	** (-)	NS		*** (-)
Sociopolitical and economic characteristics						
Membership of association of household heads	** (-)	*** (-)	*** (-)	NS	*** (-)	NS
Access to credit facilities	NS	*** (-)	** (-)	*** (-)	*** (-)	NS
House ownership	NS	*** (-)	*** (-)	NS	NS	NS
Self & wage employed in agriculture	NS	*** (-)	* (-)	*** (-)	NS	NS
Agro-ecological and environmental characteristics						
Average annual rainfall	* (+)	*** (-)	*** (-)	*** (-)	NS	NS
Good soil (dummy)	NS	NS	NS	*** (-)	*** (-)	*** (-)

****Significant at 1%level, ** Significant at 5%level, *Significant at 10% ; NS = not significant; +, positive effect; −, negative effect.*

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4.0 CONCLUSION AND RECOMMENDATION

This paper assessed the spatial analysis of the structural determinants of child poverty in Nigeria using spatial error model and Shapely decomposition method. The study confirmed that geographic units that constitute a country were not independents of one another and not isolated but these geographic units interacted significantly with one another. The study confirmed a spillover of child poverty from one GPZ to another in momentous proportion. The decomposition of child poverty by these geographic units, GPZs, revealed that relative contribution of each of the GPZ to the overall child poverty incidence in Nigeria. Northern regions was found to contribute significantly to the overall national child poverty incidence then Southern regions in term of headcount, depth and severity of child poverty. The geographic dimension of child poverty across all GPZs was affirmed in this study, therefore, policy measures that region-specific should be recommended in any anticipated social protection programmes in Nigeria.

Wage and Self employed in agriculture and household size have positive influence on child poverty incidence while annual rainfall, literate adult and households' access to basic infrastructure have negative influence on child poverty incidence in child poverty. Based on the findings of this study, it is recommended that possible spillover of poverty from neighbouring geographical area should be incorporated while designing child poverty reduction programmes and social protection programmes for young ones. The need for increased productivity of farmers through adoption and availability of modern farm inputs rather than increase in the number of farmers is recommended by the study. This will not only bring about genuine contribution of agriculture to country's GDP but also the increase. General increase in the accessibility of populace to basic infrastructure (safe water, public electricity and health) and education by government, most especially in the Northern regions is important in order to achieve a sustainable child poverty reduction in Nigeria. Eradicating childhood poverty specifically should be considered from several dimensions as child poverty is a multidimensional phenomenon.

Finally, the local and state governments of GPZs with highest proportion of child poverty incidence should not only focus on the formation of economic/capital assets but on an expanded set of strategies targeted at human, social and physical assets coupled with agro ecological and political factors.

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