SPATIAL DECOMPOSITION OF INCOME INEQUALITY IN RURAL NIGERIA

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ABSTRACT

The issue of inequality is especially important in Sub-Saharan Africa (SSA), where economic growth has been slow to change. Policies that result in macro-economic imbalances could result in soaring levels of inflation, with attendant consequences of redistribution of incomes from the poor and vulnerable to the asset-rich, thereby exacerbating inequality and poverty. This study assessed the level of spatial income inequality and identified the contribution of socio-economic and space to inequality in rural Nigeria. The 2003/04 National Living Standard Survey by the National Bureau of Statistics (NBS) was used for the study. Out of 19,158 households with consistent data, 14,512 were rural, and were used for the study. Information on socio-economic characteristics, capital assets and per capita expenditure were extracted from the data set. The data were analysed on Geopolitical Zones (GPZs) comprising Northcentral (NC), Northeast (NE), Northwest (NW), Southeast (SE), Southsouth (SS), and Southwest (SW) using descriptive statistics, Gini coefficient (GC), and Shapley Decomposition (SD) technique. The result showed that inequality for rural Nigeria was 0.4149; with NC being the highest (0.4438) and NW the lowest (0.3456). Also, inequality was higher within male-headed households (0.4094), non-farming households (0.4195) than female-headed (0.4082) and farming households (0.4002) respectively. Inequality values of households without social capital (0.4206) and without credit (0.4174) were higher than those with social capital (0.4090) and credit (0.4005). However, inequality was higher within households with access to electricity (0.4228) than those without (0.4071). The result reveals that with respect to household socio-economic characteristics inequality was highest in NC but highest in SE with respect to household assets. However, in both socio-economic and capital asset decomposition, SW had the lowest level of inequality. The Shapley decomposition shows that the major determinants of rural inequality are household size, gender, primary occupation, membership of local institution and geopolitical zone of residence. Among the GPZs, the NW had the highest contribution (3.9 per cent) to inequality than all other zones while SE had the least (0.4 per cent) relative to the SS. The study suggests that poverty reducing policy should be directed towards equalising of mean income across all the geopolitical zones.

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Background to the Study

In the recent times, there has been an upsurge of interest in the effects of regional economic change on poverty, inequality, social exclusion, population health, and other relevant social dimensions. The economics of inequality has reoccupied a central position on the academic research agenda. Apart from the relative poor performance of countries in terms of poverty and income distribution, the unresponsiveness of poverty and inequality in developing countries to policy prescriptions could help to explain this resurgence. Aigbokan, (2000) determined the between and within inequality in Nigeria. The broad conclusion was that growth accounted for a decline of 4.2 points while distribution accounted for an increase by 14.1 points in the observed decline in poverty. Spatial inequality within a number of developing countries is a major problem, yet it has attracted little attention at the policymaking level and Nigeria does not seem to be an exception. Alayande (2003) emphasised the importance of space in the contributions of various factors to income inequality in Nigeria. Sector of residence alone contributed 38 per cent to income inequality in Nigeria.

Regional economic change is an important part of the economic development process in all countries: rich, poor and middle income. Two factors make a reexamination of inequality issue necessary for Nigeria. First is the availability of a more recent data set in Nigeria. Second is the observed phenomenon of polarisation in income distribution since the study of Aigbokan (2000). Thus, in addition to decomposition of poverty and inequality into its source and spatial distribution components, it also becomes necessary to attempt to track the effect of macro-economic and micro-economic policy across the regions. The latter is more useful for purposes of informing policy making.

The unbalanced growth and economic reform have enlarged the differences in development levels among the six geographical regions. The spatial differences in mean income can only account for part of the spatial variation in poverty. It would be useful to explore how much of the variation is due to disparities in average income and whether the relative contribution of income gaps differs significantly across regions. Answers to these questions have important implications for the formulation of poverty reducing policies aimed at helping the lagging regions.

On the analytical front, studies have decomposed inequality using the conventional methods such as coefficient of variation, Gini coefficient and Theil indices (Canagarajah, *et.al* 1997; FOS, 1999; Aigbokan, 2000, NBS, 2005). The conventional methods are rather descriptive and not prescriptive. Aigbokhan (2000) considered inequality over time and across regions without investigating causal factors of regional inequality. Additionally, an attempt was made by Awoyemi (2004) using Shapley method to decompose income inequality using 1996 National Consumer Survey data, however he did not give consideration to rural areas. Oyekale *et al.*, (2006) used the Modurch and Sicular regression method with its identified flaws (Wan, 2001) to decompose income inequality in rural Nigeria. However, the residual explained about 80 per cent of inequality in rural areas which is not too good basis for policy formulation. Thus, there is paucity of information on the causal factors of spatial inequality in rural Nigeria (where the largest proportion of the poor reside) using Shapley decomposition method, the gap this study tries to fill. The main objective of this study is to analyse the distribution of spatial inequality in rural Nigeria.

Inequality Situation in Nigeria

Income inequality has received considerable attention given its implications for economic growth and development, as well as concerns about equity and relative poverty. The issue of inequality is especially important in Sub-Saharan Africa (SSA), where economic growth has been slow to change. There is increasing recognition that income inequality might hinder economic growth (Hussein, 2008). The critical role of rapid PCI growth in promoting poverty alleviation is now generally accepted. Indeed, cross-country studies carried out under the aegis of the World Bank have established the important role of rapid income per capita growth in bringing about poverty reduction. Unfortunately, in Nigeria, the growth rate of real GDP per capita has been very low, equaling an average of 1.45 per cent during the 1960 to 1997 period. Income per head was N567 in 1960 and only managed to equal N960 in 1997(Iyoha and Oriakhi, 2002). Thus, given that the growth rate of per capita GDP was much less than three per cent in Nigeria during the period, it is not surprising that both the number and share of people living in poverty have been increasing.

Gini coefficient was 0.37 in 1986, rising to 0.42 in 1992 (World Bank, 1996). Aigbokhan (2000) found that there was positive real growth throughout 1985 to 1992 period, yet poverty and inequality worsened. This suggests that the so-called "trickle down" phenomenon, underlying the view that growth improves poverty and inequality, is not supported by the data sets used. This was attributed to the nature of growth pursued and the macro-economic policies that underlaid it. It is reasonable to attribute inequalities in part to the past defective colonial economic policy which concentrated on socio-economic and other development programmes in the urban centres while the rural areas, where the majority of the Africans lived, were neglected.

Thus, the pivotal development advantages which the urban centres and city dwellers enjoyed in terms of education, employment opportunities and health facilities, to mention a few, set the skewed structure of development. In other words, the dichotomy between the urban and rural areas with respect to poverty distribution, income inequality, unemployment and level of education in part becomes explainable.

Theoretical Framework and Literature Review

Inequality is the dispersion of a distribution, be it income, consumption or some other welfare indicator or attribute of a population (Litchfield, 1999). Inequality, like poverty, can have many dimensions. Economists are concerned specifically with the economics or monetarily measurable dimension related to individual or household income and consumption. Other perspective can be linked to inequality in skills, education, opportunities, happiness, health, life expectancy, welfare, assets and social mobility.

There are two broad theories of income distribution as described by Ajakaiye and Adeyeye (2001) : the functional and the inter-personal or size distribution theories. The functional theory emphasises the input-output ratio. The theory relies on the market mechanism to distribute total output among factors of production, which are labour and capital. Redistribution of income in favour of returns to capital is considered expedient for economic growth and subsequent development. Increasing returns to labour tends to widen the domestic market by increasing aggregate demand. This has a negative effect as it widens the supply and demand gap resulting in increase in domestic prices of basic goods.

The inter-personal distribution theory emphasises factors responsible for the

variations in income among individuals or households. The theory assigns differences in income distribution to disparities in access to opportunities or capitals as well as disposable assets. This forms the basis for the evaluation of households in terms of the poor and non-poor. The theory gives insight into why some households or individuals earn adequate income while others do not. The theory is advanced from human capital school and demand and supply theories. The differences in the ability arising from differential education and training thus influence the probability of an individual's productivity and earning status in the labour market.

Furthermore, demand and supply theory emphasises that the distribution of income does not depend solely on the distribution of investment in education, but also on the structure of demand for labour (Sen, 1983). Ajakaiye and Adeyeye (2001) posited that uneven distribution of assets, access to public capital goods and human capital explained by varying degrees of skills largely influence the observed differences in income distribution among individuals and households.

From conceptual point of view, in a way, inequality is a logical outcome of the market economy, which is made up of structures and institutions such as businesses, formal and informal organisation and institutions, all of which are the main avenues of socio-economic integration. Within the context of the underlying concepts, income inequalities in Nigeria in part become explainable. First, it is reasonable to attribute inequalities to the past defective colonial economic policy. With regard to the concentration of socio-economic and other development programmes in the urban centres, where white administrators and their allies, the African elites live, while the rural areas, where the majority of the Africans live was neglected. Thus, the pivotal development advantages, which the urban centres and city dwellers enjoyed in terms of

education, employment opportunities and health facilities, to mention a few, set the skewed structure of development. In other words, the dichotomy between the urban and rural areas with respect to poverty distribution, income inequality, unemployment and level of education in part becomes explainable. Closely related to this is the growing awareness that geographic aspect of inequality and poverty is very important (Awoyemi, 2004).

In his seminal article on economic growth and income inequality, Kuznets (1955) advanced the hypothesis that income inequality first increases and then decreases in relation to economic development, i.e., there is an inverted U-shaped relationship between income inequality and the level of economic development. According to the study by Jha (1996), which is based on a large, pooled cross-section and time-series data set from the World Bank, the hypothesis seems to hold even for a sample which included only developing countries, thus indicating that the inverted U-shaped relationship between development and inequality is not necessarily due to inter-group differences between developed and developing countries.

However, based on an empirical investigation of formalised models with six income inequality indices, Anand and Kanbur (1993) pointed out that a population shift from the low-mean income, low-inequality, and traditional (rural) sector to the high-mean income, high inequality, and modern (urban) sector, which is the basis for the Kuznets model together with a constant differential in sectoral mean incomes and constant sectoral inequalities, appeared to be, in fact, accompanied by changing sectoral mean income differential and sectoral inequalities. According to Oshima (1994), most Asian countries seem to follow the Kuznets curve in income inequality, but the peak appears to have been reached when the economy was

still predominantly agricultural with per capita incomes much lower than in the West.

Spatial inequality refers to uneven distribution of income or other variables across different spatial locations. Measuring spatial inequality usually involves calculating inter-personal inequality when each income recipient is assumed to receive the mean income of his/her location group (Kanbur *et al.*, 2004). It is a component of overall inequality between individuals. Spatial inequality is typically thought of as a construct arising out of variations in economic endowments, geography, and socio-political structure. It is typically proxied by the variation of mean income or consumption across economic space. In other words, spatial variations in income derive from the pure returns to location plus possibly returns to unobserved characteristics caused by the interaction between certain household variables and spatial variables. In particular, we investigate the importance of initial conditions with respect to different aspects of economic endowments, socio-economic structure, and levels of activity specialisation as well as the current level of integration with the wider economy in explaining spatial inequality (Duta and Nagarajan, 2005).

One strand of the literature originates in economic geography and explains the persistence of spatial inequality as arising out of market thickness so that variations in mean consumption levels can be explained by location (Fujita *et.al.*, 1999). This suggests that economic space will matter in determining the magnitude of spatial inequality (Davis and Weinstein 1999; Henderson *et.al.*, 2001). Spatial interactions between agents in differently endowed regions can contribute to persistent and even increasing spatial income inequality (Nazara, 2003). Mookherjee and Ray (2002) have shown that geography can influence the evolution of household welfare over time. That is, positive externalities associated with geography such as local public goods and endowments of private goods imply that a household (even if poor) associated with such externalities could be better off in the long run. Similarly, Balisacan and Fuwa (2003) have estimated the magnitude of inequality arising out of household-specific and location-specific factors. They have shown for example, that households located in areas with connectivity to urban areas are able to diversify their activities and consequently are able to insure themselves against shocks that might impinge on certain sectors.

Methodology

The Nature and Source of Data : The data used for this study were from a secondary source. The 2003/04 Nigeria Living Standard Survey (NLSS) data collected by the National Bureau of Statistics were used. The sample design was a two-stage stratified sampling. The first stage involved the selection of 120 Enumeration Areas (EAs) in each of the 36 states and 60 EAs at the Federal Capital Territory. The second stage was the random selection of 5 housing units from each of the selected EAs. A total of 21,900 households were randomly interviewed across the country with 19,158 households having consistent information (NBS, 2005). Out of this, 14512 were rural households used for the study. Information on socio-economic characteristics, capital assets and per capita expenditure were extracted from the data set. The data were analysed based on the six Geopolitical Zones (GPZs) [North-Central, North-East, North-West, South-East, South-South, and South-West]. The data set provides detailed records on household expenditure (a proxy for household income) and household characteristics.

Figure1: Map of Nigeria showing the six Geopolitical Zones
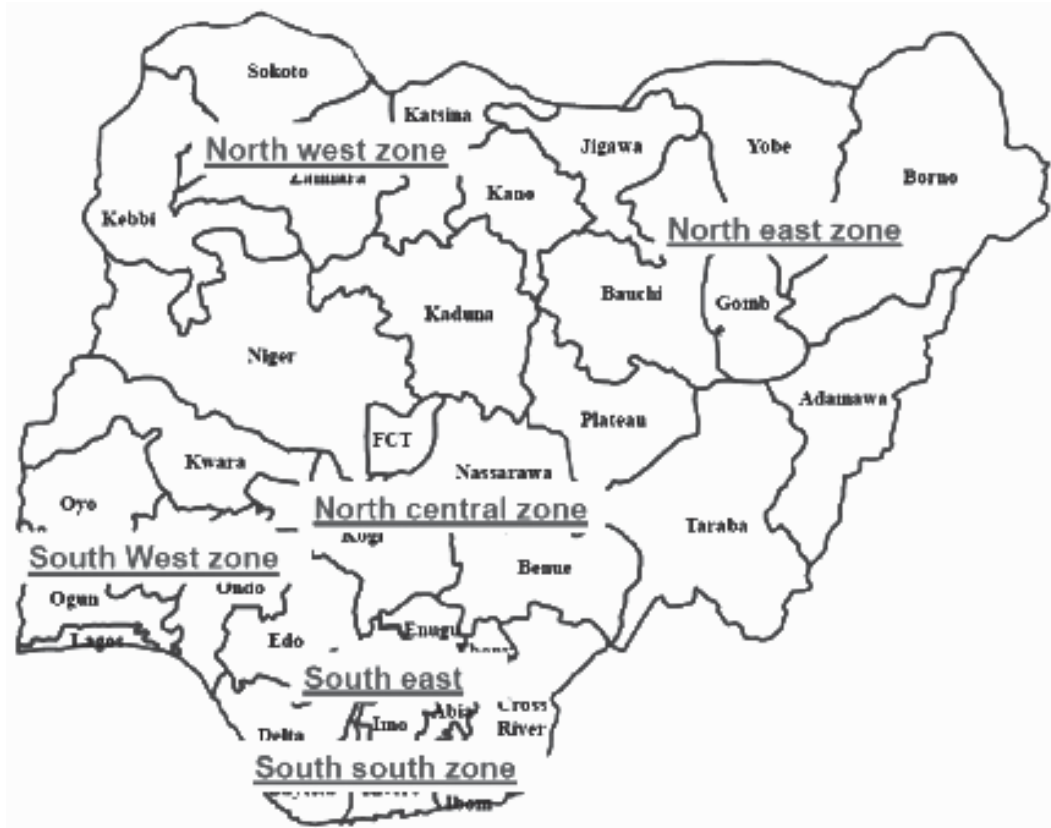
The analysis of spatial inequality typically begins with a measure of living standards or resources defined for a population of individuals or households. Household expenditure was adjusted for regional differences using the consumer price index at each region for the year under review.

Analytical Techniques : The Gini indices are used to derive the inequality index so that inter-regional inequality and sub-group inequality can be identified. The Gini coefficient (G) fulfills all the inequality axioms and can be decomposed into between group and within group. The decomposition can follow the four-step approach proposed by Yao (1999) and adapted by Wang *et al.*, (2006).

The Gini coefficient is given by :

$$G = 1 - \sum_{i=1}^{n} P_i (2Q_i - w_i)$$

$$Q = \sum_{k=1}^{i} w_i$$

cumulative income share up to i

Where G denotes the Gini coefficient for the population where each household is ranked by per capita income (m_i I = 1,2,…n)

in an ascending order. P_i and w_i are respectively, the population and income share of the ith household, n is the number of households.

Determinants of Spatial Inequality

For a given income generation function, alternative approaches can be used to decompose total income inequality (Wan 2002). This study will adopt the Shapley value framework of Shorrocks (1999). In the regression-based Wan (2002) noted that the constant term in the regression model is ignored in Fields and Yoo (2002) while Morduch and Sicular (2002) did not take up the issues of the constant term and error term of the regression model used. He believes that, ignoring the residual terms means throwing away useful information on non-included determinants of income or income distribution, which could distort decomposition results. Constant source of income is widely known to either lower the level of inequality when it is positive or raise the level of inequality when it is negative. In a regression equation, the presence of a constant is almost a rule rather than an exception. Another serious and unavoidable problem identified is the presence of the residual term ε, which is assumed away in conventional decomposition. Given the above-identified flaws, this study uses the simple, yet powerful procedure proposed by Shapley (1953) and Shorrocks, (1999).

The only function that satisfies the Shapley's axioms given by the Shapely Value (Shapley, 1953; Young, 1985) is:

$$\phi_k^s(K,v) = \sum_{s=0}^{m-1} \sum_{\substack{S \subseteq K \\ k \subseteq S \\ |S| = s \\ |K| = m}} \frac{(s-1)!(m-s)!}{m!}[v(S) - v(S - \{k\})]$$

where by convention, 0! = 1 and $v(\phi) = 0^3$. The Shapley Value arises by imaging that players join the game in a random order. Player k receives the extra amount that he brings to the existing coalition of players S-{k}, that is, v(S)-v(S-{k}) – the marginal contribution of player k to the coalition S. This implies that when player k joins the forming grand coalition, he and the players who have already joined make up some coalition S, of size s, which contains player k.

The Shapley value of player k, $\phi_k^s(K,V)$ is the weighted average of the marginal contributions of this player over the set of coalitions $\{S : k \in S \subseteq K\}$. The weight associated with each coalition S is equal to the probability to obtain, in a random partitioning of K-{k} between sequence 1 and sequence 2, the set S-{k} in sequence 1 and the set K-S in sequence 2. Marginal contributions such as v(S)-v(S-{k}) occur for exactly those orderings in which k is preceded by the s-1 other players in S, and followed by the m-s players not in S. The number of orderings (or permutations) in which this happens is (s-1)!(m-s)!. The total number of possible orderings is given by m!, which is the number of permutations of m players taken m at a time. The weighting scheme is, therefore, given by (s-1)!(m-s)!/m!

Applying the Shapley value to inequality decomposition involves rather extensive computing. Suppose Y = $f(X_1,...,X_k)$ is a general income generation function. Usually Xs are different for different individuals. Replacing X_k by its sample mean would eliminate any

differences in X_k among individuals. It is easy to re-compute Y after this replacement. The resulting income, denoted by $Y_{k'}$ differs from individual to individual because Xs other than X_k differ for different individuals. However, the differences cannot be attributed to X_k any more. In other words, inequality in $Y_{k'}$ denoted by $I(Y_k)$ is due to differences in Xs excluding X_k. According to the most natural rule of Shorrocks (1999), the contribution of X_k to total inequality, $C_{k'}$ can be obtained as $I(Y) - I(Y_k)$ for k = 1, …, K. Shorrocks (1999) terms these contributions the first round effect, which is obtained when only one independent variable X_k is replaced by its sample mean. One can obtain a second round C_k by replacing two variables X_k and X_j with their sample means in computing Y_{kj}. The second round contribution can be written as $C_k = I(Y_j) - I(Y_{jk})$ for k, j = 1, …, K (k ′″j). By the same token, the third round contribution can be obtained as Ck = I(Yij) - I(Yijk) for k, j, i = 1, …,K (k ′″j ′″i). This process continues until all Xs are replaced by their sample means. At each round, it is possible to have multiple Ck, which are averaged first and then averaged across all rounds.

The method will also allow us to disentangle and quantify the contribution of inequality and expenditure levels on the regional variation on poverty in Nigeria. We shall characterise each geopolitical zone in terms of per capita expenditure and inequality and show how the deviations of zonal poverty levels from the national average can be exactly attributed to these two sources.

Results and Discussion

Result in Table 1 shows the distribution of rural household characteristics in percentages. Across all the geopolitical zones (GPZs), a larger percentage of the rural households were male-headed with the highest and lowest proportions in the north-west and the south-east zones representing 98.9 and 70.3 per cent, respectively. In all, 86.5 per cent of the rural households were male-headed. This indicates that men are the major breadwinners in the households.

About 73.4 per cent of households in rural Nigeria were engaged in farming activities as the major sources of income for the rural household heads. The incidence of farming activities being the major sources of income of the household head is greater than the overall average in the north-east and the north-western zones (zones characterised by sudan and sahel savannah) representing 86.9 and 89.8 per cent, respectively. However, in the south-south zone (characterised by mangrove and swamp water forest vegetation types), the main source of rural income is shifting from farming to non-farm activities. This might be due to the emergence of crude oil exploration industry in the area, which gives higher and quicker returns to labour. The massive land degradation caused by oil-spillage might also not be unconnected with high level of non-farm activities in the south-south zone. The low level of farm activities in the south-western Nigeria (rainforest zone) is also lower than the overall observation. This could be as a result of emergence of telecommunication micro-business and motorcycle transport business in the rural areas, which are characterised with less effort and quick returns to labour.

Formal education is a measure of human capital and it is expected to be positively correlated with increased information awareness and the probability that a farmer would adopt modern agricultural techniques. Formal education is also expected to increase the chances of a household head's employment in the formal non-farm sector, which has an implication for boosting household income. Thus, access to formal education is a major determinant of income inequality and poverty (Morduch and Sicular, 2002; Awoyemi, 2004). About three-fifths (61.4 per cent) of the rural household heads

had no access to formal education at one level or the other. This implies that majority of the rural household heads might be constrained to farming as the major source of income with attendant low income and high level of income inequality and incidence of poverty.

**Table1 : Distribution of Household Characteristics (in percentages)
Across Geopolitical Zones (GPZs)**

Characteristics	SS	SE	SW	NC	NE	NW	Total
Gender							
Female	22.9	29.7	23.6	10.4	4.5	1.1	13.5
Male	77.1	70.3	76.4	89.6	95.5	98.9	86.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Primary Occupation							
Farming	50.2	70.4	60.6	70.0	86.5	89.8	73.4
Non-farm	49.8	29.6	39.4	30.0	13.5	10.2	26.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Formal Education							
Had Access	66.7	56.0	45.9	40.3	22.4	14.2	38.6
No Access	33.3	44.0	54.1	59.7	77.6	85.8	61.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Social org.							
Members	65.3	63.5	57.9	63.9	49.1	39.7	55.6
Non-members	34.7	36.5	42.1	36.1	50.9	60.3	44.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : calculated by the author from NLSS, 2003/2004.

Figures in Table 2 reveal that at the lowest percentile (5 percentile) of income distribution, the north-central zone had the least (₦4492.7473) per capita expenditure while the south-west had the highest (₦10695.6183). Among the middle income earners (50 percentile) the north-east had the least per capita expenditure of ₦15920.9774 while the south-west had the highest (₦31325.7488). At the topmost percentile (95 percentile), the south-east had the highest income distribution (₦98616.7637), closely followed by the south-west (₦97117.3451); while the north-west had the least income distribution (₦ 45647.7249). This indicates that standard of living in the south-west is the best of all the zones while it is worst in the north-central.

Table 2 : Distribution of Zones by Income Percentiles

PERCENTILES

ZONES	5	10	25	50	75	90	95
South-south	8036.6873	10059.3500	15087.9611	25205.8254	41177.2939	63786.3523	85589.1392
South-east	10203.0871	13101.4712	20070.1380	31146.4307	47973.6526	73864.5342	98616.7637
South-west	10695.6183	13338.4618	20273.8164	31325.7488	48498.1948	71074.7269	97117.3451
North-central	4492.7473	6004.7288	10740.8030	18750.0559	30846.5391	48668.6706	66803.4273
North-east	6055.6385	7940.1411	11596.2173	17399.7711	26794.4253	40072.9777	51723.0845
North-west	5869.4356	7425.3629	10731.8076	15920.9774	23052.3776	34496.5334	45647.7249

Source: Author's Estimation from NLSS, 2003/2004.

Sub-group Decomposition of Inequality

The Gini coefficients of household characteristics such as gender, household size and primary occupation of household head are presented in Table 3. Overall, inequality among the female-headed households (0.4082) was similar to that of male-headed households (0.4094). This follows the findings of Akita *et al.*,1999. This implies that gender may not contribute much to overall inequality; but rather other characteristics associated with gender; such as access to capital and production assets and socio-economic characteristics (age of household head, household size, occupation, geographical location et cetera). Among the GPZs, inequality was highest in north-central among both male-headed (0.4395) and female-headed (0.4768) households. However, inequality was lowest in south-west (0.3116) and north-west (0.3438) among female-headed and male-headed households, respectively.

Table 3 : Gini Coefficient of Household Characteristics in Rural Nigeria

Household characteristics	Definitions	NC	NE	NW	SE	SS	SW	National
Gender	Female	0.4768	0.3395	0.3472	0.4133	0.3775	0.3116	0.4082
	Male	0.4395	0.3592	0.3438	0.3809	0.4062	0.3850	0.4094
Household Size	>15	0.1879	0.2212	0.2905	-	-	-	0.3200
Primary Occupation	Non-farm	0.4987	0.3782	0.3877	0.3867	0.3834	0.3822	0.4195
	Farming	0.4149	0.3466	0.3341	0.3910	0.407	0.3591	0.4002

Source: Author's Estimation from NLSS, 2003/2004.

Table 4 presents the spatial inequality decomposition by capital assets. Gini coefficient was slightly higher (0.4206) among rural household heads that were

non-members of any social organisation than those who belong to at least one social organisation (0.4090). Thus, building membership of local institution through social networks has the capacity to reduce inequality and thus improve household welfare in the rural areas. Non-members of social organisation in south-east had the highest (0.4466) level of inequality but lowest in south-west (0.3377). Among households with membership of social organisation, those in south-east had the highest (0.4406) followed by those in north-central (0.4090); while those in south-west had the least (0.3519). This implies that on the basis of social group decomposition, south-east had the highest incidence of inequality while south-west had the least.

Generally, the result shows that inequality was highest (0.4326) among households with elementary education and lowest (0.3897) among those with other forms of education (such as koranic education, non-formal education). Across all educational strata, inequality was highest in south-east and lowest in south-west. Among the GPZs inequality was highest (0.5571) in south-east among households whose heads had primary education and least (0.2722) in south-west among households whose heads had elementary education.

Inequality was higher (0.4174) among rural households without access to credit facility and lower (0.4005) among those with access to credit. This implies that access to credit reduces inequality. Among households without access to credit, inequality was highest (0.4456) among those in south-east and lowest (0.3425) among those in south-west. However, among households with access to credit, inequality was also highest (0.4318) among those in south-east but lowest (0.3162) among those in north-west.

The result further shows that gini coefficient was higher (0.4228) among rural households that had access to electricity than those without access to electricity representing (0.4071). This implies that some households with access to electricity could have diversified their source of income from agriculture to electric powered non-farm activities. However, their counterparts without access to electricity would have remained in subsistence agriculture, which is neither capital intensive nor market-oriented. Among households with access to electricity, inequality was highest in south-east (0.4983) and lowest in south-south (0.3514). However, among those without access to electricity, inequality was highest in south-east (0.4247) and lowest in south-west (0.3388). The result also shows that inequality is slightly higher among households without access to credit than those with access to credit.

The result reveals that with respect to household socio-economic characteristics inequality was highest in north-central but highest in south-east with respect to household assets. However, in both socio-economic and capital asset decomposition, south-west had the lowest level of inequality. Thus, sub-group decomposition of gini reveals that inequality was highest in rural north-central among the northern zones and south-east among the southern zones.

Spatial Analysis

The results of Gini estimate in all the states and zones are presented in Table 5. Disparity in income distribution at the national level is estimated at 0.4149. Rural inequality was highest in the north-central with the Gini coefficient of 0.4438 but lowest in the north-west with the Gini coefficient of 0.3456. Also, income inequality in the south-east was close to that observed in the south-south representing 0.3939 and 0.3999, respectively. All the states in the north-east and north-west zones had Gini estimates lower than the

Table 4 : Gini Coefficient of Capital Assets among Household Characteristics In Rural Nigeria

Capital assets	Definitions	NC	NE	NW	SE	SS	SW	National
Membership of local institution	Non-members	0.3822	0.4248	0.3789	0.4466	0.3637	0.3377	0.4206
	Members	0.4090	0.3745	0.3623	0.4406	0.3535	0.3519	0.4090
Education	No formal education	0.4045	0.4156	0.3536	0.4161	0.3399	0.3256	0.4089
	Elementary	0.3285	0.4756	0.3711	0.4179	0.3341	0.2722	0.4326
	Primary	0.3896	0.3875	0.3483	0.5571	0.3690	0.3028	0.4178
	Secondary	0.3911	0.3667	0.3523	0.4521	0.3743	0.3600	0.3975
	Tertiary	0.4019	0.3923	0.4303	0.4322	0.3228	0.3896	0.4189
	Others	0.4215	0.3881	0.3765	0.4078	0.3840	0.3413	0.3897
Access to credit	No access	0.4023	0.3967	0.3805	0.4456	0.3643	0.3425	0.4174
	Have access	0.3824	0.3713	0.3162	0.4318	0.3285	0.3543	0.4005
Access to electricity	No access	0.3977	0.4063	0.3462	0.4247	0.3593	0.3388	0.4071
	Have access	0.4074	0.3603	0.4299	0.4983	0.3514	0.3618	0.4228

Source: Author's Estimation from NLSS, 2003/2004.

national estimate. Thus, income inequality is higher in the southern zones than in the northern regions.

Five states had their Gini coefficient higher than that of the national estimate. These are Kwara, Kogi, Benue, Lagos, Cross River and Imo representing 0.4910, 0.4643, 0.4602, 0.4577, 0.4397 and 0.4370, respectively. However, Imo had the highest relative contribution of 0.0022 while the south-west contributes least to national income inequality. Although income disparity within Kwara was highest, its contribution to national

Table 5 : Spatial Profile of Gini in Rural Nigeria

States	Gini (Rural)	Absolute Contribution	Relative Contribution
(1)	(2)	(3)	(4)
South-south	**0.3999**	**0.0123**	**0.0297**
AkwaIbom	0.3936	0.0005	0.0012
Bayelsa	0.3612	0.0006	0.0014
CrossRiver	0.4397	0.0005	0.0011
Delta	0.3527	0.0002	0.0004

(Contd.)

Table 5 : *(Contd.)*

(1)	(2)	(3)	(4)
Edo	0.3806	0.0002	0.0005
Rivers	0.3927	0.0002	0.0004
South-east	**0.3939**	**0.0148**	**0.0357**
Abia	0.3626	0.0004	0.0010
Anambra	0.3497	0.0006	0.0014
ESbonyi	0.3637	0.0004	0.0011
Enugu	0.3706	0.0005	0.0013
Imo	0.4370	0.0009	0.0022
South-west	**0.3694**	**0.0035**	**0.0083**
Ekiti	0.3441	0.0001	0.0002
Lagos	0.4577	0.0000	0.0000
Ogun	0.3960	0.0001	0.0003
Ondo	0.3642	0.0003	0.0007
Osun	0.3665	0.0001	0.0003
Oyo	0.3066	0.0001	0.0002
North-central	**0.4438**	**0.0144**	**0.0347**
Benue	0.4602	0.0005	0.0013
Kogi	0.4643	0.0003	0.0006
Kwara	0.4910	0.0001	0.0002
Nassarawa	0.3566	0.0004	0.0009
Niger	0.3506	0.0003	0.0008
Plateau	0.3799	0.0004	0.0009
FCT	0.3735	0.0001	0.0001
North-east	**0.3599**	**0.0099**	**0.0240**
Adamawa	0.3632	0.0003	0.0007
Bauchi	0.3078	0.0002	0.0006
Borno	0.3150	0.0001	0.0003
Gombe	0.3405	0.0002	0.0005
Taraba	0.3747	0.0005	0.0012
Yobe	0.3495	0.0002	0.0006
North-west	**0.3456**	**0.0110**	**0.0264**
Jigawa	0.3286	0.0002	0.0005
Kaduna	0.3228	0.0002	0.0005
Kano	0.3475	0.0002	0.0004
Katsina	0.3542	0.0003	0.0007
Kebbi	0.2867	0.0002	0.0005
Sokoto	0.3104	0.0001	0.0004
Zamfara	0.3091	0.0002	0.0006
Inter-State	0.4041	0.4041	0.9741
National	0.4149		

Source: Author's Estimation from NLSS, 2003/2004.

income inequality was among the least. Furthermore, the absolute and relative contributions to national income inequality were highest in south-east zone but lowest in south-west zone. Thus, high inequality in income distribution in a state or zone does not necessarily translate to high absolute or relative contribution to national inequality.

The result on Table 6 shows that the major determinants of rural inequality are household size, gender, primary occupation, membership of local institution and geopolitical zone of residence. This shows that

policy thrust to reduce inequality should emphasise birth control. Among the household capital assets, membership of local institution had the highest relative contribution of 4.4 per cent to rural inequality while access to formal education had the least contribution of 1.2 per cent to inequality in rural Nigeria. Also, spatial inequality is evident. Among the GPZs, the north-west had the highest contribution (3.9 per cent) to inequality than all other zones while south-east had the least (0.4 per cent) relative to the south-south. This accounts for differences in geographical endowments, zonal income distribution policies and political administrations.

Table 6 : Shapley Decomposition of Inequality in Rural Nigeria

Variables	Absolute contribution	Relative contribution
Gender	0.0123	0.0616
Household size	0.1721	0.8654
Occupation	0.0135	0.0677
Credit	0.0050	0.0249
Education	-0.0231	-0.1161
Membership of local institution	0.0087	0.0437
Electricity	0.0006	0.0159
North-central	0.0032	0.0159
North-east	0.0035	0.0178
North-west	0.0077	0.0385
South-east	-0.0009	-0.0043
South-west	-0.0036	-0.0179
Total	0.1989	1.0000

Source : Author's Estimation from NLSS, 2003/2004.

Conclusion and Recommendation

The result of the analysis shows that at the lowest percentile (5 percentile) of income distribution, the north-central zone had the least (₦4492.7473) mean per capita expenditure while the south-west had the

highest (₦10695.6183). The overall national Gini coefficient was 0.4149. Rural inequality was highest in the north-central with the Gini coefficient of 0.4438 but lowest in the north-west with the Gini coefficient of 0.3456. Thus, income inequality seems to be higher in the southern zones (where there is more

access to capital assets) than in the northern zones.

Thus, income re-distributive policy should be directed towards increased access to capital assets with attendant capacity to increase the level of household income and reduces income inequality in the northern zones.

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