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Examining the Level of Polarization in Nigeria: A Der Decomposition Approach

Adejumo Oyeronke
Department of Agricultural Economics, University of Ibadan, Nigeria
Salman Kabir Kayode
Department of Agricultural Economics, University of Ibadan, Nigeria

Abstract:
Despite various studies on income inequality measures in Nigeria, studies on the patterns of income distribution such as the disappearance of the middle class and clustering of population groups at intervals i.e. polarization are limited. This study therefore examines the level of polarization in Nigeria along socioeconomic context using a DER decomposition approach. The study uses Harmonized Nigeria Living Standard Survey (HNLSS) 2009/2010 which was collected by National Bureau of Statistics. The DER analysis method was chosen because it does not assume a specific number of income groups or poles. The result of the DER analysis reveals the rural sector to be more polarized than the urban sector. Also, the Northern zones have a high level of polarization than the southern zones implying a high tendency for social conflicts outbreak. Decomposing the population based on gender shows that the male group contribute more (0.878) to polarization than the female (0.004) with a greater proportion of poor people amongst the male category. In addition a high proportion of poor people as shown by the deficit to surplus ratio were found amongst the rural sector (38.53), Northwest zone (54.40) and the non-educated members of the society (45.17). Therefore the need for educating and forming favorable polices towards the poor people in the society remains important in reducing social unrest, tension and conflicts as a result of income polarization

Keywords: income distribution, polarization, DER decomposition approach, Harmonized Nigeria Living Standard Survey

1. Introduction

Nigeria suffers from high unequal income distributions. According to Clarke (2003), the pattern of income distribution has been a concern to economists for a long time. Nigeria is the most populous country in Africa with an estimated 155 million people and among its most diverse with more than 250 district and linguistic groups (Lewis, 2011). Since gaining independence, Nigeria has reflected deep seated divisions, instability and recurring conflicts. The challenges in Nigeria can be seen along political, social and economic diversion (Lewis, 2011). Nigeria has also been noted as a deeply divided state in which major political issues are vigorously – some would say violently – contested along the lines of the complex ethnic, religious, and regional divisions in the country (Smyth et al., 2001). Moreover, accompanying the rapid economic growth between 1965 and 1975 was a serious income disparity which widened substantially (Matlon, 1979; Aigbokan, 1997). This demonstrates that though the economy may be performing strongly, the difference between the lower income households and the upper income households is growing, which is an indication that the rapid economic growth experienced has only resulted in further concentration of national income in the hands of few proportion of the population (Clarke et al, 2003). It also means that even though usual measures might suggest that inequality has been declining, distribution may become more polarized and thereby stimulates social tensions.

Despite various studies on income inequality measures in Nigeria (Babatunde 2008; Oluwatayo 2012; Oyekale 2005), studies on the patterns of income distribution such as the disappearance of the middle class and clustering of population groups at intervals are limited in Nigeria. The effect of changes in income distribution can be better understood by considering income polarization rather than income inequality. The disappearance of the middle class which defines polarization is not easily captured by standard measures of inequality. As proposed by Ravallion and Chen (1997), polarization and inequality can differ in a developing country environment. Conversely, polarization concept is different from inequality. Inequality measures the variance of an income distribution whereas polarization means clustering around local means.   A population displaying a high level of inequality with few persons getting most of the income is not a polarized society merely because most people are concentrated around the same pole in the income space. A society is deemed to be polarized when for a given distribution of characteristics; the population is clustered around a small number of distant points (Esteban, 2002). Income polarization can be described as the degree at which a population is clustered around a number of distant poles. A polarized society is likely to have a high rate of social conflicts. Esteban and Ray (1994) defined polarization as the sense of identification with a group who shares common features with it and alienation between the identified groups. Therefore a polarized society is one which could be divided into groups who share a

similar level of income and there is a distance between each group. Income polarization is usually connected with the division of a society into groups as a possible cause of social conflicts (Esteban and Ray 1999; Chakravarty, 2009). Furthermore, polarization usually causes a sharp division of a population, group or society into opposing factions. Polarization is associated with increased inequality (Aigbokan, 2000). Polarization has also been linked to the occurrence of social conflicts such as large-scale protests, strikes, demonstrations, or even revolts and armed unrests. Esteban and Ray 1999 stated that it is polarization and not inequality which is correlated with social conflicts; they showed that in the case of bipolarized society the potency of social conflicts increases with the magnitude of polarization.

 Awoyemi et al 2009 observed that there is an increasing level of bipolarization in Nigeria as a result of some observed characteristics other than income. Increased bipolarization arises when individuals in the income distribution above and below the median income level move closer to each other at the polar ends (Chakravarty and Majumder, 2001). Using a more recent data survey, this paper intends to documents changes and trends in the level of polarization as a result of inter and intra group characteristics since the earlier work of Awoyemi et al. 2009.

2. Rationale of the Study

Issues relating to patterns of income distribution especially income inequality and polarization have always been a source of concern to policy makers (Bouassida et. al, 2010). Income redistribution as a means of achieving economic security cannot be overemphasized in a country like Nigeria with significant ethnic and other heterogeneous characteristics. This paper therefore, intends to proffer information on level of polarization and to also show contribution of various subpopulation groups such as geopolitical zones, gender, sector etc to polarization in Nigeria. This will assist policy makers and stakeholders in curbing social conflicts across the country and in formulating favourable policies targeted at households and individuals in the study area.

3. Literature Review

Empirical studies on polarization have been extensively done in developed countries (Gradin 2000, Brzeziński 2011, Zhang and Kanbur 2001) while little studies exist in less developed economies such as Nigeria. Azomahou et al 2012 studied income polarization in African economies using non parametric approach and also alienation- identification model developed by Duclos et al (2004) to analyze per capita distribution of GDP and also to determine different types of polarization in Africa countries respectively. The authors stated that the analysis of polarization has political and economic interest and understanding the economic reasons of a polarized system can facilitate the choice of the measures that policymakers can use to avoid social tensions. This statement is further corroborated by Ogunyemi et al 2011, in their work on 'income polarization and bipolarization across rural households' socio-economic features in Nigeria". They revealed that with appropriate policy, there will be more equitable distribution of income and possible social conflict and tension could be checked. Valuable information is thus provided for more precise rural targeting of income redistribution policy in Nigeria. Ogunyemi et al 2011 concluded that more attention should be given to male, non educated, single marital status and wage employed households heads in the design and implementation of income redistribution policies. Awoyemi et al 2009 employed the DER index to explain polarization in Nigeria. Their result shows a high level of identification component of polarization which invariably may signal emerging level of bi-polarization in the country. However with all these studies, there is still a gap in knowledge on contribution of socio economic characteristics to polarization. This paper intends to discuss changes in the level of polarization in Nigeria and also to ascertain the level of significance of polarization estimates along socio-economic scope.

4. Concepts and Methods

4.1. Measures of Income Polarization

Income polarization measurement is based on two approaches. Even though both approaches use income as the variable for alienation, they diverge in the nature of identification. The first approach captures formation of any arbitrary groupings or poles in a distribution.This approach can also be referred to as "polarization by characteristics". Groups are formed on the basis of discrete characteristics such as religion, ethnicity, level of education etc. Esteban and Ray (1991), Esteban and Ray (1994), Zhang and Kanbur (2001) and Duclos, Esteban and Ray (2004) belong to this first family of measures.

The second approach assumes the existence of two groups with the median income or value as a cut-off. Groups are identified based on level of income. It is also known as the bipolarization approach. Foster and Wolfson (1992), Wolfson (1994) and Wang and Tsui (2000) belong to this category. All measures of polarization have some basic characteristics. These include:

- The impact of single individuals on polarization measures is slight, since polarization explain the features and relative positions of social groups
- Among two or more groups, polarization increases when intragroup inequality is reduced and
- Polarization rises when distances between groups are increased

However, this study used Duclos, Esteban and Ray 2004 polarization measures to explain polarization in Nigeria. This polarization measurement index is desirable because it does not assume a specific number of income groups or poles. It is intended to capture the formation of arbitrary group. This study also adopted Araar 2008 DER decomposition approach to see the contribution of socio economic subgroups to polarization in the country.

4.2 Duclos, Esteban and Ray (2004) Polarization Index

The Duclos, Esteban and Ray index (DER) is based on identification and alienation framework. Alienation is the feeling of dissimilarity and segregation, among individuals whose living standards are not the same. Duclus et al. (2004) presents a complete

form of measuring income polarization and defines a set of axioms polarization index must obey for continuous variables. They approximate the strength of group identification of a person via the value of the density function evaluated at the person's income. If f is such a density, the effective antagonism of an individual with income x towards an individual with income y is a nonnegative function of the identification $I = f (y)$ and of the alienation $a = x - y$.

Polarization is, therefore assumed to be proportional to the sum of all effective antagonisms. Axiomatically, the DER polarization measure is defined as

$$\text{DER} = p_a(F) = \iint f(x^{1+a})f(y) \mid x - y \mid dxdy \tag{1}$$

The parameter α shows the degree of aversion to polarization and laid in the interval 0.25 and 1. Increases in the value of 'α' indicate the importance of formation of income groups in a society.

The above equation can be rewritten as:

$$\text{DER} = p_a(f) = \int_y f(y)^a a(y)dF(y) \tag{2}$$

Where $a(y) = \mu + y(2F(y)-1) - 2\int_{-\infty}^{y} xdF(x)$ \hfill (3)

4.3. Decomposing the DER index by population subgroups

In a population, each group formation contributes to polarization. Decomposing population by groups reveals contribution of each group to the prevailing polarization level in a given population. The aim of group based decomposition is to access the proportion of overall polarization linked to within group polarization and between group polarization respectively (Bonnefond and Clément, 2012)

Following Araar 2008, the decomposition of the DER index is as follows

$$P = \sum_g \phi_g^{1+a} \psi_g^{1-a} R_g P_g + \overline{P} \tag{4}$$

Where ϕ_g is the population share and ψ_g is the income share of group 'g' respectively.

The first part of the equation is the within group component. Considering a population in which a(x) is the alienation component and π(x) is the local proportion of households belonging to group 'g' with income x, then

$$R_g = \frac{\int a_g(x)\pi_g f(x)^{1+a} dx}{\phi_g \int a_g(x) f(x)^{1+a} dx} \tag{5}$$

Araar (2008) further stated that if groups' income do not overlap, then $\pi_g(x) - 1$ and consequently $R_g - 1$. R_g depends on correlation between the density function of the group and that of the population.

$\overline{P}$ represents the between group component and can be defined as follows:

$$\overline{P} = \sum_g \phi_g^{1+a} a(\mu_g) \tag{6}$$

Where $\mu_g = \dfrac{\mu_g}{\mu}$ and $a(\mu_g) = \sum_h \phi_h \mid \mu_g - \mu_h \mid$

If we replace $a(x) = \delta(x) + \sigma(x)$ into equation (1), then

$$P = \int f(x)^{1+a}[\delta(x)+\sigma(x)]dx = D + S \tag{7}$$

With 'D' being the deprivation component and 'S' is the surplus component. The magnitude of relative deprivation is the difference between the desired situation and the actual situation of a person.(Runceman 1966). The deprivation component 'D' is given as

$$D = \int f(x)^{1+a}[\delta(x)+\sigma(x)]dx \tag{8}$$

If 'α' equals zero, then D=S. According to Araar 2008, Deprivation 'D' is greater than surplus 'S' due to the asymmetric distribution of income.

5. Data

This study used Harmonized Nigeria Living Standard Survey (HNLSS) 2009/2010 which was collected by National Bureau of Statistics. A two stage cluster sample design was employed. The first stage involves the selection of enumeration areas (EA) while the second stage constitutes selection of households or sampling units. The survey covered 36 states of the federation as well as the federal capital territory. The enumeration areas served as the sampling frame. Ten EA s were randomly selected in each LGA making a total of 7774 EAs from the 774 LGAs including the FCT. 10 household units were selected in each EA making a total

100 households per LGA and 77400 household in the federation (NBS, 2010). Per capita total household food and non-food consumption expenditure was used as the variable of interest as it captures standard of living.

6. Results and Discussion

6.1. The DER Polarization Analysis

Table 1 gives the findings of the DER analysis of polarization using the identification and alienation structure. The alienation and identification degrees in the rural sector are 0.9455 and 3.0048 respectively and that of the urban sector is 0.8886 and 2.1776 respectively. Moreover the rural sector has a higher polarization index (1.9021) than the urban sector (1.0536). This shows that the rural sector is more polarized than the urban sector. The higher index of polarization in the rural sector can be attributed to the fact that the rural sector harbors a higher population than the urban sector in Nigeria (NBS 2006) and also to the fact that agriculture in Nigeria is rural based. For instance, the sector recorded highest contribution the country's GDP in year 2009 (NBS, 2010). It can also be observed that the level and trend of polarization in Nigeria across sectors has changed since the earlier work of Awoyemi et al (2009).

Similarly, across geopolitical zones, the Northern regions are more polarized than the southern regions. The Northeast zone alone has 2.9709 level of polarization index while the lowest polarization index is seen in the Southeast (0.7646). This could be due to the fact that the zones are more susceptible to social unrest as a result of conflicts and tension inherent in the area. Also, high polarization index in the Northeast implies high possibility of outbreak of social tension and demonstration as a result of income polarization. The Southwest also recorded the highest index of 1.4939 among southern regions. According to Ogunyemi et al, 2011 where alienation and identification are relatively higher, polarization is relatively higher which confirms that the two forces interact for effective antagonism, polarization. Furthermore table 1 reveals the male group to be more polarized than the female. This also means that outbreak of conflicts is more probable among the male gender.

Subgroups	Estimate	Alienation	Identification
SECTOR			
Rural	1.9021	0.9455	3.0048
Urban	1.0536	0.886	2.1776
Geopolitical Zones			
North central	2.0976	0.9454	3.1875
North East	2.9709	0.9637	3.6984
North West	2.0883	0.9499	2.7879
South East	0.7646	0.8233	1.5618
South South	0.9358	0.8613	1.5618
South West	1.4939	0.9231	2.9565
GENDER			
Male	1.7536	0.9409	2.9345
Female	0.7613	0.8280	1.5948
National	1.6223	0.9356	2.8057

Table 1: Duclos, Esteban and Ray (DER) analysis of Polarization (2004) (alpha=0.75)

6.2. The DER Decomposition Approach

The result of the DER decomposition by population subgroups are presented in tables 2, 3, 4 and 5. The aim of this approach is to show the contribution of each subgroup to polarization across the country. The decomposition of DER based on sector is presented in table 2. Relatively, the rural sector contributes more to polarization (0.643) than the urban sector (0.03). The within group contribution to polarization is given as 0.682 while between group disparities contribution to polarization is 0.318. Also, as shown by the deficit-surplus ratio, there are more poor people in the rural area than in the urban area. This conforms to several studies on prevalence of poverty in rural Nigeria. For example, IFAD 2012 stated that poverty is especially severe in rural areas where up to 80% of the population lives below the poverty line and social services and infrastructure are limited. Hence, poverty as a result of income inequality can lead to social unrest. Moreover, as shown in table 3, the Northwest geopolitical zone has the highest (0.084) contribution to polarization while Southwest has the lowest (0.005) contribution to polarization. Overall, there are more poor people in the North than the South. Northwest alone have 54.40 deficits to surplus ratio with Southeast recording the lowest. This indicates that poverty still remains endemic and persistent in Northern Nigeria. The within group relative contribution is given as 0.195 while the between group contribution to polarization is 0.805.

The decomposition by gender as shown in table 4 reveals the male group to contribute more (0.878) to polarization than the female (0.004) with a greater proportion of poor people (0.803) amongst the male category. This is most likely due to the nature of men as they are more prone to social pressure than the women. Moreover, the high ratio of deficit to surplus amongst men is consistent with evidence from previous studies that suggested that poverty is high among male headed households (Canagarajah et al, 1997; Aigbokhan 1997). Similarly, the high ratio of poor people among men could signify that women are more enterprising and industrious than men. However, this could be subjected to further investigation. The result on decomposition of DER index based on education is presented in table 5. The primary school educated group has the highest polarization index of 2.302 while the least index is seen in post secondary school group (0.795). The non-educated group contributes more to polarization in both

absolute and relative terms (0.36 and 0.22) than any other group. Moreover, a high deficit-surplus ratio of 45.17 is observed among the non-educated group. Lack of knowledge and education could be factors responsible for this high ratio. The high ratio also signifies a large number of poor people among this group. As stated by Ogwumike 2001, the lower the educational level, the higher the rate of poverty. Hence, educating this set of people will lessen poverty in Nigeria

Group g	øg	Ψg	Pg	Rg	D	S	D/S	AC*	RC**
Rural	0.755	0.799	1.902	0.948	1.265	0.033	38.53	1.043	0.643
Urban	0.245	0.201	1.054	1.050	0.313	0.011	28.69	0.063	0.039
Within group								1.106	0.682
Between group								0.516	0.318
Total								1.622	1.000

Table 2: Decomposition of DER index based on sector (α=0.75)

Group g	øg	Ψg	Pg	Rg	D	S	D/S	AC*	RC**
North Central	0.170	0.188	2.098	0.904	0.290	0.008	38.11	0.056	0.035
North East	0.167	0.228	2.971	0.808	0.306	0.009	35.62	0.072	0.045
North West	0.279	0.264	2.088	0.848	0.503	0.009	54.40	0.136	0.084
South East	0.117	0.062	0.765	0.989	0.148	0.005	27.59	0.009	0.005
South South	0.133	0.089	0.936	0.997	0.170	0.005	27.55	0.015	0.009
South West	0.133	0.169	1.494	1.005	0.162	0.007	23.87	0.028	0.017
Within group								0.317	0.195
Between group								1.305	0.805
National								1.622	1.000

Table 3: Decomposition of DER index based on Geopolitical zone (α=0.75)

Group g	øg	Ψg	Pg	Rg	D	S	D/S	AC*	RC**
Male	0.904	0.947	1.754	0.982	1.461	0.039	37.19	1.424	0.878
Female	0.096	0.053	0.761	1.020	0.117	0.004	26.26	0.006	0.004
Within group								1.430	0.882
Between group								0.192	0.118
Total								1.622	1.000

Table 4: Decomposition of DER index based on Gender (α=0.75)

Group g	øg	Ψg	Pg	Rg	D	S	D/S	AC*	RC**
No education	0.480	0.421	1.789	0.903	0.836	0.018	45.17	0.360	0.222
Primary school	0.238	0.385	2.302	0.989	0.363	0.013	27.80	0.146	0.090
Secondary school	0.161	0.124	1.130	1.023	0.224	0.007	30.54	0.028	0.017
Post secondary school	0.121	0.070	0.795	1.063	0.156	0.005	32.03	0.011	0.007
Within group								0.545	0.336
Between group								1.077	0.664
Total								1.622	1.000

Table 5: Decomposition of DER index based on Education (α=0.75)

Where $Øg$ = population share of group g, $Ψg$ = income share, Pg = polarization of group g, Rg = Residual part of the decomposition, D = Deficit, S = Surplus, D/S = Deficit- surplus ratio, AC* = Absolute contribution and RC** = Relative contribution

7. Conclusion

Income redistribution as a tool of attaining economic security is important in Nigeria, a country characterized by ethnic and socio-cultural diversities. Studies on polarization which has been defined as the disappearance of the middle class and clustering of population groups at intervals are limited in Nigeria. The aim of this paper is to illustrate changes in the level and trend of polarization along socioeconomic context using the DER decomposition approach. The DER polarization analysis reveals the rural area to be more polarized than the urban sector. This implies a significant change in the trend of polarization as against the work Awoyemi et al, 2009 who observed the urban sector to be more polarized than the rural sector. Similarly the male category is more polarized than the female indicating that the male group are formidable and can cause social unrest. By using the DER decomposition approach based on geopolitical zones, it was observed that the deficit to surplus ratio is high across the Northern region implying a large proportion of poor people in the North than in the South. The Northwest region contributes more (0.084) to polarization than any other group. In addition, the decomposition by educational level present the non- educated group contributing the highest to polarization. Also a large number of poor people are found among this group. Therefore educating this large group will reduce poverty and social unrest as they can easily be manipulated to stir up conflicts due to lack of knowledge and education. Lastly, formulating policies targeted at poor people will largely reduce social conflicts and cause fewer disparities across zones and ethnic groups.

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