

Determinant of Educational Inequality among Ruural Households in Nigeria

Awoniyi Olabisi Alaba¹, Omonona B.T² and Falusi A.O²

¹Department of Agricultural Economics and Extension Bowen University, Iwo

²Department of Agricultural Economics, University of Ibadan, Ibadan, Oyo State

bisixcel@yahoo.com

Abstract: This study profiled the level of disparity in access to educational attainment among rural households in Nigeria and determining factors. The study used the National 2006 Core Welfare Indicator Survey data. Two-stage cluster sampling technique was employed in selection of 77,400 respondents of which 59,567 were rural. The data were analyzed using Generalized Entropy and Ordered Probit Regression. Result shows that educational attainment inequality among households with low educational attainment is 0.1635, across the mean 0.4093 and 0.6164 among households with high educational attainment. Increase in sanitation, asset base, house-ownership and condition indices increased probability of households having high educational attainment by 0.004, 0.003 and 0.029. In contrast, household size and age of household head reduced it by 0.002 and 0.001. Disparity in educational attainment exists among Nigerian households and it's more prominent in the North. Therefore, for the country to achieve Millennium Development Goal on Education there is the need to sensitize households in this region on importance of education in human capital development. Efforts should be ensured that household members live in a clean and conducive environment and household asset base should be enhanced since they increase the probability of households to have high educational attainment. Birth control measures should also be put in place since high household size reduces probability of having high educational attainment. This study was therefore able to profile educational inequality instead of measuring inequality among conventional monetary indicators. Furthermore, generalized entropy was used to measure inequality rather than the conventional gini index.

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1. Introduction

Although education is widely acknowledged as a critical tool for human capital development, the national literacy rate in Nigeria is low while there are acute shortages of infrastructure and facilities at all levels. The state of education in Nigeria remains poor with the country ranking 118th in educational attainment with a female to male ratio of 0.80 for literacy, 0.85 for primary school enrolment, 0.86 for secondary school enrolment and 0.55 for enrolment (Human Development Report, Nigeria, 2009).

Education is both a human right in itself and an indispensable means of realizing other human rights. Becker, 1981; argued that education remains the most effective way by which young people of poor backgrounds can rise in the economic hierarchy because human capital remains the main asset of 90% of the population. This also accounts for why income inequality is greater in countries where inequality in education is also high. Most studies on inequality (Olaniyan and Awoyemi 2006; Oyekale *et al*, 2006) have focused primarily on income or other monetary dimensions primarily because it is accepted that well-being depends on characteristics other than income. This is caused by the common misconception in literature that income inequality is closely related to

other forms of inequality and can thus be used as a proxy for the level and changes in overall inequality in any given society. But it has been recognized (Sahn and Younger 2007; Haddad *et al*. 2003; Appleton and Song 1999) that there is a low correlation between income and many other measures of living standards.

It is therefore imperative to empirically establish the extent to which households in the rural areas have access to education, level of inequality in their educational attainment and to determine the factors that cause the disparities in access to educational attainment among rural households in Nigeria. This will help to determine the Zone that has the highest educational inequality for intervention and suggest policies that will bring about equality in the educational attainment of households in rural Nigeria.

2. Methodology

2.1 Study area, sampling procedure and sample size

This study was carried out in Nigeria. Nigeria is located in the Sub-Sahara African nations and situated in the western part of Africa on the Gulf of Guinea and lies between 4°16'1 and 13°53'1 north

latitude and between 2°40' and 14°41' east longitude. 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 2005, forecast to rise to 2.2% in 2015, and attain the sixth most populous country rank by 2050. About 140 million people live in Nigeria in 2006 with population growth declining to 3.2 percent (FRN, 2007). Net enrolment in primary education is estimated at about 68% and secondary enrolment is also low at about 27% and the adult literacy rate (% of ages 15 years and above) is 72% (UNDP, 2009). The population is still predominantly rural, accounting for approximately 53% of the population dwellers and majority of them are into agriculture.

The survey used data collected by the Nigeria National Bureau of Statistics during the 2006 National Core Welfare Indicator Questionnaire Survey. A two-stage cluster sample design was adopted by the NBS in selecting respondents from each of the LGA. The first stage involves the Enumeration Areas (EAs), while Housing Units (HUs) constituted the second stage. In each LGA, a systematic selection of 10 EAs was made. Ten HUs were then systematically selected per EA and all households in the selected HUs were interviewed. The projected sample size was 100 HUs at the LGA level. Overall, 77,400 households were drawn at the national level. Sampling weights were constructed for each sample, thus making the data representative. The detailed EAs of the household's sampled are contained in Appendix 1. This study then stratified the data into rural and urban areas of the country. The whole data for the rural areas of the country which comprises of 59,567 households then served as the sample size for the study.

2.2 Analytical techniques

Generalized Entropy: this was used to analyze the educational inequality profile among rural households in Nigeria. The use of the GE class of measure allows the examination of the stability of the welfare rankings for different weightings (Justino, 2004). The value of GE ranges from 0 to 1, with zero representing an equal distribution and higher values representing higher levels of inequality.

For lower values of α , GE is more sensitive to changes in the lower tail of the distribution, and for higher values of α GE is more sensitive to changes that affect the upper tail. The commonest values of used are 0, 1 and 2: hence a value of $\alpha = 0$ gives more weight to distances between welfare attributes in the lower tail, $\alpha = 1$ applies equal weights across the distribution, while a value of $\alpha = 2$ gives proportionately more weight to gaps in the upper tail. Members of the GE class of measures have the

general formula as follows. The General equation for the GE is given as follows

$$GE_{(\alpha)} = \frac{1}{\alpha - \alpha^2} \left[\frac{1}{n} \sum_{i=1}^n \left(\frac{y_i}{Y} \right)^\alpha - 1 \right] \dots \dots \dots (1)$$

Following Litchfield 1999 the generalized entropy for educational inequality respectively will be derived using the equation below.

Ge(0) = Mean log deviation

$$\frac{1}{n} \sum_{i=1}^n \log \frac{y_i}{Y} \dots \dots \dots (2)$$

GE (1) = Theil Entropy index

$$\frac{1}{n} \sum_{i=1}^n \frac{y_i}{Y} \log \frac{y_i}{Y} \dots \dots \dots (3)$$

GE (2) = Coefficient of variation

$$CV = \frac{1}{Y} \left[\frac{1}{n} \sum_{i=1}^n (y_i - \bar{Y})^2 \right]^{\frac{1}{2}} \dots \dots \dots (4)$$

Where y_i is the per adult equivalent of household educational attainment of household i . \bar{Y} is the arithmetic mean of per adult equivalent educational attainment for each household, n is the number of units or individuals in the sample for the per adult equivalent educational attainment of household level of household i .

The per adult equivalent of household educational attainment of household i were categorized into low, medium (average) and high following Mahmud *et al* 2005.

Households with less than 0.33 were categorized as having low per adult equivalent household educational attainment.

Households with 0.34-0.66 were categorized as having average/medium per adult equivalent household educational attainment.

Households having per adult equivalent household educational attainment that is greater than 0.66 were categorized as high

The household educational attainment were derived using the ratio of observed years of formal education of household members to expected years of formal education of each household members by their age.

In order to identify the factors that determine household's access to education among rural households, Principal Component Analysis (PCA) and Ordered Probit Regression analysis was used

since the factors that determine the distribution of households educational attainment have an ordinal categorical nature. The PCA was used to form the index while the Ordered Probit Regression Analysis would be used to determine the factors that influence household's access to non-income welfare variables. The ordered probit regression model is given as

$$E = f(X_i) \dots\dots\dots(5)$$

Household's educational inequality is defined as the standardized distance from the mean of each household's educational attainment. β is a vector of unknown coefficients and X_i is the vector of characteristics of the i^{th} individual and are the independent variables.

The independent variables are defined as follows:

- X_1 = Age of household head (Actual age in years)
- X_2 = Gender of household head (1= male 0 = Female)
- X_3 = Household size (Actual number)
- X_4 = Marital status (1= Married, 0 = otherwise)
- X_5 = House ownership and condition index
- X_6 = Household wealth/ Asset base index
- X_7 = Sanitation/Health status index
- X_8 = South West (= 1, 0 = otherwise)*
- X_9 = South East (= 1, 0 = otherwise)
- X_{10} = South South (= 1, 0 = otherwise)
- X_{11} = North East (= 1, 0 = otherwise)
- X_{12} = North West (= 1, 0 = otherwise)
- X_{13} = North central (= 1, 0 = otherwise)

- This indicates that the South West Zone was chosen as the base. This is because empirical studies (Oyekale, *et al* 2006); have shown that the zone is one of the zones with the lowest incidence of poverty and inequality.

Indices were constructed in order to determine the house ownership and housing condition, household asset/wealth base and household sanitation/health condition. The house ownership and housing condition and asset/wealth variable index and sanitation/health index will be derived through the use of PCA. Weights are attached to the each of the variables/indicators of the house ownership and housing condition, asset base and sanitation/health arbitrarily but on the economic/useful life of the variables, on the basis of the most hygienically safe health/ sanitation indicators and durability of the components of the variables from the most economical, most durable and most effective and the most hygienically best to the least. The indicators that were used for computing the house ownership and housing condition index, household asset base/wealth

and sanitation/health index will be derived as explained below.

House ownership and condition index

The indicators that were used in determining the housing condition and ownership index and the weights attached to each of the indicators are given below:

- Ownership of building: (1= own, 0 = otherwise)
- Flooring materials: (4 = Tiles, 3= Concrete, 2= Planks, 1 = Mud earth/ Dirt/straw, 0 = bare)
- Roofing materials: (4= Roofing sheet, 3=cement, 2=Asbestos, 1=Mud, 0 = Bamboo/thatched)
- Wall materials: (4= Cement, 3= Stone 2= Mud/brick 1= Wood, 0= Iron sheet/cardboard)

Household wealth/ Asset base index

The household wealth/asset base index was constructed by representing the individual's possession and access to some given attributes of household's asset base

- Ownership of productive asset (Computer, Sewing machine, Generator, Land, Fridge, etc): (Each coded as 1= Yes and 0 = No)
- Ownership of Communication/information asset (Video, Television, Telephone, radio) (Each coded as 1= Yes and 0 = No)
- Household items (Gas cooker, Stove, Mattress, Electric fan, Electric iron, Furniture,) (Each coded as 1= Yes and 0 = No)
- Access to credit facilities (3= both formal and informal, 2= formal, 1= informal, 0 = none)
- Means of transportation (4= vehicle, 3= Motorcycle/bicycle, 2= Boat, 1=animal, 0 = none)
- Source of lighting: (1= Depends on PHCN and other sources, 0 = Depends only on PHCN)

Sanitation index

The indicators that were used in measuring the sanitation/health index and the weights attached to each of the indicators are given below:

- Type of toilet: (4= Flush to septic, 3= Flush to sewage, 2= Pit latrine, 1= Pail, 0= none)
- Source of water (4 = Pipe borne, 3= Bore hole, 2 = Well, 1 = River/Lake/Rain)
- Method of treating water before drinking (4 = Use of chemicals, 3= Boiling, 2= filtering/sedimentation, 1 = others, 0 = none)
- Method of waste disposal: (5= Private, 4 = Government, 3 = Dispose off within the compound, 2 = authorized heap, 1= unauthorized heap/river)
- Immunization: (1= Completed, 0= otherwise)
- Methods of preventing malaria (4= Drugs, net, insecticide and good drainage, 3 = Net, insecticide and good drainage, 2= Good drainage and herbs, 1= either of drugs, net, insecticide or herbs, 0 = none)

Type of fluid offered to children who have diarrhoea (4= ORT, 3= ORS, 2 = home salt and Sugar, 1= Water only, 0 = none).

3.0 Results

3.1 Distribution of household's level of educational attainment

The results of the distribution of household's level of educational attainment for the rural areas of the country is presented in table 1. The result shows that in the rural areas of the country, 71.6% have low (0 - 0.33) educational attainment with the North West Zone having the highest percentage (89.9%) of households with low educational attainment and the least percentage (2.8%) of households with high educational attainment, while the South South Zone has the least percentage (54.6%) of households with low educational attainment and also the highest percentage of households with high educational attainment (9.9%).

In summary, the Northern region generally have low level of educational attainment with the North West Zone having the highest population of households with low educational attainment while the Southern region of the country have enhanced access to formal education. The result conforms with the study of Mustapha (2006) on Ethnic structure, Inequality and Governance of the public sector which revealed that only 19.7% of candidates from the Northern part of the country gained admission into Universities in 2001 and further reveals that the Northern part of the country has the least number (33.1%) of the total post primary institutions in the country. In addition, Human Development Report, Nigeria 2009 also indicated that the adult literacy level in many Northern State falls below the national average with Lagos and Yobe State having the highest and least percentage respectively. This implies that there is the need for increase in investment in education in the Northern region especially in the North West Zone as this will help to improve their level of skill acquisition and technical Know-how. This would further help to develop their capability which would help them to be able to compete better with their other counterparts for economic activities that can increase their level of income in order to improve their standard of living (Table 1).

3.2 Educational inequality profile among rural households in Nigeria

The result of the indices of the generalized entropy indicates that educational inequality among households with low educational attainment (Ge_0) is 0.1635. Across the Geo-political Zones, the result further reveals that educational inequality at the lower

tail is highest in the North East Zone with an index of 0.1676 among rural households in Nigeria. Educational inequality among households with low educational attainment is least in the South East Zone with an index of 0.1557.

Across the mean of the population household's educational attainment, educational inequality among rural households in Nigeria is 0.4093. It is highest in the North West with an index of 0.4305 and least among rural in the South South Zone of the country with an index of 0.2233

Level of dispersion among rural households with high level of educational attainment is 0.6164. Educational inequality among households with high access (Ge_2) to formal education is highest in the North Central Zone with an index of 0.7772. South South Zone has the lowest level of dispersion at the upper tail for rural households, farming households and non-farming households with indices of 0.1964.

The result of the educational inequality profile conforms to the outcome of the study of Alabi 2009 on Redistribution of Education and Distributive Effects of Education Spending in Nigeria. The result showed that the South West Zone dominates primary and secondary school enrolment, with the least school enrolment from North West part of Nigeria. Analysis of school enrolment on the basis of location further reveals that the most of the school-age children in urban areas are enrolled in the schools, with least enrolment from rural areas (Table 2).

3.3 Determinants of educational inequality

The result of the determinant of educational inequality for the rural households in the country is summarized in table 3. The results of the diagnostic statistics which are chi-square and log likelihood function were significant at 1% level and this indicates that the model has a good fit for the data. In rural areas of the country, the probability of household having high educational attainment are determined positively and significantly ($P < 0.01$) by household sanitation index, household asset base index, house ownership and housing condition and residence in the South East and South South Zone relative to South West Zone. While household size, household head being female, age of household head and residence in the Northern region relative to South West Zone has a significant ($P < 0.01$) but negative effect on the probability of rural households having high educational attainment. The outcome of the result conforms to the study of Justino *et al* 2004 on multidimensional inequality: an empirical application to Brazil where household size, gender of household heads, and age of household heads were the significant factors in determining the probability of households having high educational attainment which

were also significant in determining the probability of rural households in Nigeria.

The results of the marginal effect are as presented in tables 4 to 6. The result indicates that the probability that households in the rural areas of the country would have low level of educational attainment would increase by 0.0074 and 0.0027 if there is a percentage change in household size and age of household heads. A percentage increase in sanitation index of households, household asset base index as well as house ownership and housing condition index would decrease the probability of households having low educational attainment by 0.0159, 0.0086 and 0.0934 respectively. The result of the marginal effect further shows that 1% change in household size, household sanitation index and

household asset base index would increase the probability of rural households to have average level of educational attainment by 0.0022, 0.0182 and 0.0341, while 1% change in the age of household heads would decrease their probability of having average educational attainment by 0.0011. The probability of rural households having high level of educational attainment would increase by 0.0049, 0.0027 and 0.0291 if household sanitation index, household asset base index and house ownership and condition are increased by 1% while household size and age of household head would decrease the probability of having high level of educational attainment by 0.0023 and 0.0009 if they are increased by 1% (Table 3, Table 4, Table 5, Table 6).

Table 1: Distribution of by Households Educational Attainment

Geo-political Zones	Low(0-0.33)	Average(0.34- 0.67)	High(>0.67)
North West	89.9	7.3	2.8
North Central	71.5	20.6	7.9
North East	85.1	11.2	3.7
South East	63.9	29.7	6.4
South West	64.8	26.2	9.0
South South	54.6	35.5	9.9
Total	71.6	21.8	6.6

Table 2: Educational Inequality Profile among Rural Households in Nigeria

Geo-political Zones	Ge ₀	Ge ₁	Ge ₂
North West	0.1660	0.4305	0.7772
North Central	0.1637	0.3849	0.7400
North East	0.1676	0.2611	0.4495
South East	0.1557	0.2334	0.2678
South West	0.1639	0.2263	0.2818
South South	0.1630	0.2233	0.1964
Total	0.1635	0.4093	0.6164

Table 3: Determinant of Educational Inequality among rural households in Nigeria

Variables	Coefficient	Standard Error	P> Z
Household size	-0.0251	0.0020	0.000***
Gender	-0.1136	0.0200	0.000***
Age	-0.0093	0.0004	0.000***
Marital Status	0.2112	0.1560	0.000***
Sanitation	0.0537	0.0055	0.000***
Asset base	0.0293	0.0054	0.000***
Housing condition	0.3165	0.0060	0.000***
North West	-1.1890	0.0207	0.000***
North East	-0.8188	0.0218	0.000***
North Central	-0.3276	0.1955	0.000***
South East	0.0740	0.0205	0.000***
South South	0.1167	0.0188	0.000***

Table 4: Marginal effect of Ordered Probit for Low Educational Attainment among Rural Households in Nigeria

Variables	Coefficient	Standard Error	P>/Z/
Household size	0.0074	0.0006	0.000
Gender	-0.0347	0.0063	0.000
Age	0.0027	0.0001	0.000
Marital Status	0.0596	0.0042	0.000
Sanitation	-0.0159	0.0010	0.000
Asset base	-0.0086	0.0010	0.000
Housing	-0.0934	0.0017	0.000
North West	0.2702	0.0035	0.000
North East	0.1839	0.0035	0.000
North Central	0.0879	0.0047	0.000
South East	-0.0213	0.0058	0.000
South South	-0.0355	0.0059	0.000

Table 5: Marginal Effect of Ordered Probit for Average Educational Attainment among Households in rural Nigeria

Variables	Coefficient	Standard Error	P>/Z/
Household size	-0.0051	0.0004	0.000
Gender	-0.0236	0.0042	0.000
Age	-0.0019	0.0001	0.000
Marital Status	0.0423	0.0031	0.000
Sanitation	0.0110	0.0011	0.000
Asset base	0.0060	0.0011	0.000
Housing	0.0649	0.0013	0.000
North West	-0.1997	0.0029	0.000
North East	-0.1399	0.0030	0.000
North Central	-0.0637	0.0036	0.000
South East	0.0150	0.0041	0.000
South South	0.0242	0.0039	0.000

Table 6: Marginal Effect of Ordered Probit for High Educational Attainment among Rural Households

Variables	Coefficient	Standard Error	P>/Z/
Household size	-0.0023	0.0005	0.000
Gender	-0.0112	0.0039	0.000
Age	-0.0009	0.0010	0.000
Marital Status	0.0017	0.0041	0.000
Sanitation	0.0049	0.0014	0.000
Asset base	0.0027	0.0013	0.232
Housing	0.0291	0.0016	0.000
North West	-0.0775	0.0058	0.000
North East	-0.0480	0.0076	0.000
North Central	-0.0251	0.0049	0.349
South East	0.0065	0.0060	0.000
South South	0.0115	0.0038	0.821

4.0 Conclusions

The level of dispersion in the state of household educational attainment was profiled and the factors that determine the level of access to household educational attainment among households in Rural Nigeria were identified. The Study employed the use of generalized entropy to profile the state of dispersion in household educational attainment while the factors that determine the level of household educational attainment were identified using ordered probit regression analysis. The result of the generalized entropy revealed that educational inequalities among households with low educational attainment, across the mean of the population and among households with high educational attainment are. Furthermore, the result showed that households in the Northern region have the higher educational inequality across the three generalized entropy indices. Factors that determines the probability of households having high educational attainment are determined positively and significantly ($P < 0.01$) by household sanitation index, household asset base index, house ownership and housing condition and residence in the South East and South South Zone relative to South West Zone. While household size, household head being female, age of household head and residence in the Northern region relative to South West Zone has a significant ($P < 0.01$) but negative effect on the probability of households having high educational attainment in the rural area of the country

Therefore in order for the country to achieve the Millennium Development Goal there is the need for households especially in the North where educational attainment is low and level of disparity in educational attainment is high, to be enlightened on the importance of education in human capital development. In addition households, government and other stakeholders in the educational sector should increase their commitment in terms of expenditure in the educational sector in order to increase access to education among rural households in Nigeria.

Corresponding author:

Awoniyi Olabisi P.O.Box 20533, U.I Post Office,
Ibadan, Oyo State Nigeria.

E-mail account: bisixel@yahoo.com

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