Regional Inequality of Educational Attainment in Nigeria

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Authors' contributions

This work was carried out in collaboration of all the authors. Authors HMU and RI design the study, performing the statistical analysis and writing the protocol and the Manuscript including managing the analyses of the study and the literature searches. Author RAH read and approved the final manuscript.

Original Research Article

ABSTRACT

Aims: This article measures educational inequalities between Northern and Southern regions of Nigeria and compare it with the educational distribution within regions.
Study Design: A cross sectional study.
Place and Duration of Study: Nigeria, 2012.
Methodology: Theil Index and Decomposition Analysis.
Results: Educational inequality is higher in the North than in the South as 17 out of 19 states of northern Nigeria have higher Theil index than the national Theil index. However, educational attainment and inequality are found to have a negative relationship.
Conclusion: Within regions inequality rather than between regions is the main source of education inequality in Nigeria. There is a negative relationship between educational attainment and inequality. It implies that states with higher educational attainment are more likely to achieve more equitable distributions of education.

Keywords: Education inequality; decomposition; Theil index; region.

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1. INTRODUCTION

The importance of education in both individual wellbeing and national economic life has been well recognised in the economic literature both old and new. At the individual level, education constitutes the foundation of one's professional career and also affects, among other things, life-time income, health, level of socialisation and his wellbeing over the whole life-cycle [1,2,3,4]. Similarly, education at the national level is vital for technology adoption, effective political participation and for hauling societies out of poverty which are very essential for a sustainable economic progress of a country [5,6,7]. Apart from the level of educational attainment, equity in access to education has also received the attention of researchers and policy makers. It is argued that unequal distribution of education among various groups within a country can prevent education from unfolding its welfare enhancing effects entirely and can lead to persistent income inequality among the populace [8,9].

The importance of education distribution in the development process has been emphasized in the literature. Along this line, Lopez, Thomas and Wang argued that the distributional dimension of education is very important for both productivity and also for welfare consideration [10]. In order to analyse effectively the actual role of education in development process of an economy, we need to look beyond averages and investigate both the absolute and the relative dispersion of education.

A measure of the education dispersion within a country appears very useful both for analytical purpose and for necessary policy actions. This is our major motivation on this paper. Nigeria provides us with a very interesting case of study especially when it comes to the dynamics of educational opportunities. First, its educational system has been drastically experiencing changes through various reforms policies. One of such changes occurred in the late eighties when the '6 3 3 4' system was introduced. In 1999 specifically, Universal Basic Education (UBE) program was launched with explicit commitment of the government in providing education for all. Although, some remarkable changes were recorded, there still remains room for improvement on many respects. Access to education, reception capacity in schools and universities and education quality remain the major drawbacks facing the system [11]. The Nigerian case is also relevant from an economic theory on inequalities. For over three decades now, Nigeria had considerable success in economic growth: its growth rate in the last decade averaged 7% annually. Despite this remarkable performance, the socio-economic indicators in Nigeria are among the worst in the world. The country actually is doing worse in terms of income inequality than most developing countries [12]. Additionally, it has been found that income inequality in Nigeria is very high- with a Gini coefficient that ranges between .46 to .60, despite the expansion of the economy in terms of government revenue and GDP growth [13].

Based on this backdrop, our aim in this paper is to measure the educational attainment and its distribution within and between regions in Nigeria. We use the concept of education Theil Index based on school attainment data from Nigeria. Education distribution could be used as one of the indicators of welfare, complementing average educational attainment, income per capita, and other indicators of welfare measures [14]. In addition, information on the distribution of educational attainment would be very important input in policy-making. Since the study will reveal which regions and states have the least equitable distributions of education, the results will be of help in making policy recommendations regarding where provision of educational services should be improved. Furthermore, the paper hopes to contribute to the growing literature on education inequality.

Following the introduction in the first Section, Section two highlights the basic works of the literature on the distribution of education. The methodology and the data used in the study are discussed in section three followed by findings in section four. The fifth section concludes the paper.

2. NIGERIA EDUCATION SYSTEM IN NIGERIA: AN OVERVIEW

Education in Nigeria is based on the '9-3-4 system', a new system that replaced the former 6-3-3-4 system that implies a minimum of six years of primary education, three years each for lower and upper secondary education and four years for tertiary education. Now, under the new system, children attend six years of primary school and three years of junior secondary, thus nine years of free, compulsory and uninterrupted schooling and then followed by three years of senior secondary schooling and a minimum of four years for university education depending on the course one is pursuing. From 2006 onward, transition from primary to junior secondary education is automatic.

Funding Education in Nigeria is the shared responsibility of the federal, state and local governments. The Federal Ministry of Education plays a leading role in regulating the education sector, formulating policy and ensuring quality control. However, the federal government is more directly involved with tertiary education than it is with basic and secondary education, which is largely the responsibility of state (secondary) and local (Basic) governments. Education in Nigeria is mainly provided by the governments, though there are some community efforts especially on basic education through community schools. Private institutions also complement the process.

The government has continued to demonstrate its interest in reviving the education sector through reform programs that are yet to deliver the expected benefits. There are currently various government reforms and initiatives aimed at improving the Nigerian educational system. These include among others, the introduction of Universal Basic Education (UBE) Program, the upgrade of some polytechnics and colleges of education to the status of degree-awarding institutions, the introduction of 'Public Private Partnerships (PPP) as well as approval and accreditation of more private schools and universities across the country. Despite these attempts, the Nigerian education is engulfed with a number of problems, especially that of quality and access especially for children from poor socioeconomic background. A report by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) reveals that Nigeria is among the countries with high number of out of school children [15]. According to the report, one out of every five Nigerian children is out of school. This translates to having approximately 10.5 million children out of school. Similarly, the absorptive capacity of the tertiary institutions is by far lower than the demand. As a result, an increasing number of families and students are looking at alternative educational opportunities abroad.

2.1 Review of Related Literature

Inequality in terms of land ownership, household incomes, wealth or expenditures constitutes the bulk of the literature on inequality. The measurement of these inequities has usually been carried out using statistics such as the standard deviation (a standardized measure of the variance of a variable); the Generalized Entropy Family; and the Gini index. The last one has been the most widely used in the inequality literature. While, such indices

have been generated and made available for scholarly research, on the other hand, one could count a small literature on education inequality.

Some researchers used the standard deviation of years of education as the measure of human capital inequality [16]. The problem with the standard deviation, however, is that it is an absolute measure of dispersion, therefore it does not control for differences in the mean of the distribution. Hence, it cannot provide a consistent picture of the distribution of education, especially for countries with very low or high levels of average schooling [17].

Gini Index for education, using education attainment data, started with the work of Lopez, Thomas and Wang in 1998. Subsequently, as a measure of relative inequality, the education Gini Index became very popular in the literature and taken to be more consistent and robust measure of the distribution of education than Standard Deviation [18]. Accordingly, using attainment level from Barro and Lee data set of 2001, researchers [19] computed Gini coefficients for education of about 108 countries over five-year intervals from 1960 to 2000. In constructing the indicators of education inequality, they have distributed school attainment levels by quintiles and calculated the education Gini coefficient. Their findings reveal that, the variability of human capital inequality indicators is greater across countries than within each country.

Similarly, in order to identify the source of the overall country's inequality, some researchers decomposed the analysis into coastal and inland provinces, as well as rural and urban areas [20]. They used average years of schooling and percentage of graduates of junior secondary schools entering senior secondary schools as proxies for educational attainment. The results of their decomposition analysis suggest that the China's rural-urban gap is the major contributor to overall inequality in educational attainment in 2000. The problem with their second proxy is that, like enrolment ratios, it is not a clear reflector of the country's human capital stock. However, some studies provided a detailed description of the underlying methodology that involves deriving cumulative distribution functions for the level of educational attainment in a population, and then calculating the Gini ratios based on those distributions [21]. But Gini index doesn't have a decomposition property that allows for the analysis of a complex patterns and dynamics of inequality within and across geographical entities such as regions or countries [22]. A measure that has such an advantage is the Generalized Entropy (GE) Index.

A Generalized Entropy Index (Theil Index) was also employed to measure world education inequality in science and numerical skills [23]. They decomposed global inequality into within and between-country components. They used scores on math and science achievement tests of school children (13-14 years old) collected by the 1999 round of Trends in International Mathematics and Science Study (TIMSS) to generate the GE indices. They found that within-country inequality contributes more than half of the global achievement inequality for math and science. Similarly, another study employed the Generalised Entropy Index in the regions of the European Union and explored both the distributions of income and education within and between regions [24]. Their findings suggest that while income inequality is mostly between-regions, the education inequality is mostly within-region.

However, majority of the studies that employed either the Generalized Entropy Index or Gini index in measuring human capital (education) inequality were based on enrolment or education financing data but not attainment data that can reflect the real education stock available in the country. Enrolment and finances represent only the inputs but not output which supposed to be the basis of the measurement. Measuring the distribution of education

based on Micro data that provides education attainment for individuals in a country or region will be more promising and feasible than relying on enrolment rate or education finances as did by most previous studies.

3. DATA AND METHOD

The study makes use of micro data drawn from the Living Standard Measurement Survey (LSMS) of 2010 on Nigerian. The survey was conducted jointly by the World Bank and Nigeria Bureau of Statistics (NBS). The survey provides rich data on households' economic and demographic characteristics including educational attainment of about five thousand households across the country. To obtain our educational stock variable from the data we propose to assign some values (years of schooling) to each and every level of education attained by individuals, with each value somewhat reflecting the level of formal schooling involved and its contribution to the total educational stock. This is somewhat similar to the International Standard Classification of Education (ISCED) developed by UNESCO but with some modifications to capture partial completion of a particular level of education (for example a person having primary 4 only, or JSS 3). In this case, no schooling is given a value of zero. In Nigeria, the duration of primary education is six years same as secondary education; therefore complete primary will have six years of schooling and lower if otherwise. In such a case, the years of schooling will depend on the level one stops (e.g. primary 2 will have the value of 2; primary 3 will have the value of 3 and so on), for those who completed the lower secondary such as JSS 3 only, will have nine years of schooling, complete secondary education will take twelve years of schooling, and post-secondary (i.e. sub degree qualifications such as diploma) will have fourteen years of schooling. Degree certificates and equivalents attract sixteen years of schooling; Masters and PhD could take 18 and 21 years of schooling respectively. The detail classification is shown in Table-1 below.

Table 1. **Reclassification of years of schooling based on official ISCED classification**

Isced classifications		Nigerian classifications		Values
Level	Stage of education	Level	Stage of education	
1	Primary	1	Primary (P1-P6)	6
2	Lower secondaryor second stage of basic education	2	Lower secondary (JS1-JS3)	9
3	Upper secondary	3	Upper Secondary (SS1-SS3)	12
4	Post-secondary (non-tertiary)	4	Sub-degree	14
5	Sub-Degree (e.g. Diploma)	5	First degree	16
6	Degree	6	masters	18
		7	PhD	21

In order to minimize the measurement error while calculating the measures of educational stocks, we put some effort in selecting the most suitable observations, by trimming the sample over a dimension in the considered dataset. Here, we exclude all individuals aged less than 18 years at the time of the survey. The rationale behind this choice is to exclude school age children who did not complete their study at the time of the survey; otherwise, this is could be a source of great disturbances, since demographic trends could heavily affect the results as far as the share of young individuals still enrolled in formal schooling lowers the level of education and increases its dispersion. Thus, we choose18 years as a threshold age of an individual to be considered in the sample, as this is the standard definition of the beginning of an adult life commonly observed in the African countries.

3.1 Measuring Educational Distribution

As mentioned earlier, Theil Index is employed to measure the educational distribution across regions and states in Nigeria. Theil Index is a member of a Generalized Entropy (GE) family of inequality measures, it has the advantage of being additively decomposable; a desirable quality for both arithmetic and analytical reasons. In studies of regional inequality, the decomposition property has been exploited to investigate the extent to which a country's inequality can be attributed to inequality between or within regional groupings [25,26]. Substantively, the ability to measure the contribution to country inequality that is attributable to inequality between and within different partitions of the observational units can provide a deeper understanding of a country's inequality. In distribution analysis, Theil Index has been a popular choice. It is given as:

$$T = \sum_{i=1}^{n} y_i log\left(\frac{y_i}{x_i}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1)$$

Equation (1) is the traditional Theil Index symbolised as T. The subscripts *i* and n represent individual and country's population respectively. *Y* stands for the relative share of education indicator in a geographical area (i.e. country), while *x* represents the relative share of population. The "education share" of each individual is just that individual's education divided by the country's total educational attainment. The "population share" is now just one (a single individual) divided by the country's population. It makes more sense to speak about population shares when considering groups rather than individuals as the unit of analysis. The objective is to measure the extent to which the education distribution differs from the population distribution. When we consider individuals, the population distribution is simple; each person will count as one. Therefore, we have equality when the distribution of education is such that each person has the same level, a level that has to be equal to the country's education divided by the country's population. This is the only condition under which the Theil Index for a country could be zero depicting perfect equality.

However, when a geographical area is considered (e.g. region or state) as the unit of analysis, then the subscript *i* in equation (2) below will represent a state or a region of a country and *n* represents total number of regions or states in an economy and this allows for the between regions and within regions analyses of inequality. Equation (2) allows the decomposition of the education inequality in to within and between regions inequalities in the country. Both the equations are adapted from [27].

$$T' = \sum_{i=1}^{n} y_i log\left(\frac{y_i}{x_i}\right) + \sum_{k=1}^{m} Y_k T_k \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (2)$$

In the above equation (2) Y_k is the education share of region *k* in the economy, while T_k represents Theil index accounting for the inequality within region *k*. The first term in the right hand side of equation (2) is the between regions' component of inequality (i.e. interregional inequality), while the second term is the within regions component of inequality (intraregional inequality).

4. RESULTS AND DISCUSSION

Our data analysis reveals the following. First, huge educational gaps exist within as well as across regions. Secondly, lower educational inequality has been found to be associated with higher educational attainment level. Thirdly, Northern Region has higher educational

inequality than the Southern Region. And finally, educational inequality is more pronounced in rural areas than in the urban centres. In order to depict the vast information contained in our education dataset, we firstly present results at the state and geopolitical levels. Then we proceed for the two main regions- Northern Region and Southern Region - which are, mainly, the focus of this study.

At the states and geopolitical zones levels, the data also shows the same pattern. Lagos state has the highest level of average attainment level of 9.14 as against the country's average of 5.08. The state with lowest educational attainment is Zamfara, with average of only 1.30 (Appendix 1 for more details on states and their Geo-regional affiliations). Interestingly, the former belongs to the southern region while the latter is of the northern region. It happens that out of the 19 northern states only two states (i.e. Kwara state and Kogi state) have average attainment above the national average while all the southern states are above the national average. When it comes to education inequality, Lagos state has the lowest with a Theil Index of 0.08 and Zamfara state has the highest Theil Index of 0.72 showing the highest level of education inequality. The same goes with the geopolitical zones as it can be seen on Table 2.

Table 2. Educational attainment and inequality across geopolitical zones

Zone	AvgEduaAtt	Theil
South-South	7.400276	0.15564
South-East	6.671605	0.17707
South-West	7.217691	0.17756
North-Central	4.776783	0.3025
North-East	3.341355	0.42063
North-West	2.607022	0.49392
Country	5.080182	0.2797

Source: Authors' calculations using World Bank LSMS Data (2010)

Table 3 shows the average educational attainments and Theil Index coefficients for the regions and sectors in the country. It can be seen that the Northern Region has an Average Educational Attainment (Avg Edua Att) below the country's average, while the Southern region has an average attainment above the country's average. In terms of educational distribution, the inequality index (Theil Index), which measures the education inequality, is lower for the Southern Region compared to the North. This result partly implies that region with higher educational attainment tends to have more equal distribution of education. However, we extend our analysis to rural-urban distribution of education. The data shows that the distribution of education is very unequal in the rural sector both at regional and country levels. The level of inequalities can be seen clearly as illustrated on Table 3.

Table 3. Education attainment &inequality by sector and across regions in Nigeria

Sector	Rural	Urban	All
North	0.445	0.266	0.405 **(3.505)***
South	0.184	0.144	0.170 **(7.109)***
COUNTRY	0.327 (4.22)*	0.185 (7.17)*	0.280 (5.080)*

*Average educational Attainment by sectors & Regions in parentheses
Source: Authors' calculations using World Bank LSMS Data (2010)

However, using equation (2), we decomposed the index in to within and between regions as well as the sectors (i. e Rural and Urban sectors) of the economy. This is to see the extent to which the regional gap contributed to overall inequality in the country. Table 4 presents the results.

Table 4. Decomposition analysis of the Theil index by regions and sectors in Nigeria

	Theil Index	% Between	%Within
Regions	0.350	25.5	74.5
Sectors	0.330	18.7	81.3

Source: Authors' calculations using World Bank LSMS Data (2010)

Table 4 shows that the contribution of the Theil index from within regions to total inequality is higher than between regions. This suggest that the within region inequality is the main source of regional inequality in terms of education. Similarly, the contribution of inequality from within the sectors to overall inequality is higher than between sectors.

4. CONCLUSION

We estimated the extent of education inequality in Nigeria. Both within and between regions as well as sectors inequalities were investigated using Theil Index. We accomplished this task with a recent data set from the World Bank Living Standard Measurement Survey (LSMS) on Nigeria. Our empirical results are robust to alternative estimation methods of inequality commonly available in the literature (e. g Gini Index).

The magnitude of regional differences in the educational attainment and distribution suggests that in terms of access to and equity of education in Nigeria, the northern region is still lagging behind and this poses a serious challenge to the governments in the Northern region especially on education. The existing inequality between the South and North in terms of education may not be unconnected with the Historical and cultural factors that are quite distinctive with each region. Historically, western education came through the Southern region which is a coastal area and later on extended to the hinterland (i.e Northern part), for many, this lag could account for educational gap between the regions. However, culture might have also played a role. Long before the coming of Europeans to the area called Nigeria today, Islam has arrived the Northern part through North Africa; this made western education very unpopular to the Northern people at the beginning as the people then equated western education with Christianity. For this, governments need to intensify campaign for education in those areas where attainment is lower.

However, within regions and sectors inequality is found to be the main source of education inequality in the country as it is shown in Table 4. This underscored the problem of access to education in the country. Increasing equal access to education for all citizens will help in no small measure towards improving educational equality in the country. The data also suggest that the average educational attainment and its distribution (Theil index) are negatively related. The correlation test of the two variables shows a significant and negative coefficient of -0.95. This high negative relationship implies that states with higher average years of attainment are more likely to achieve more equitable distributions of education and this has a strong policy implication which suggests that expanding the provision of education should be a prime objective since doing so will improve a State's level of educational attainment and at the same time its distribution. Consequently, doing so can meet the twin goals of equity and efficiency at once.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX 1

Educational attainment and Theil index by States in Nigeria

N0.	States	Average educational attainment (years)	Theil index
1	Taraba	4.468	0.299
2	Yobe	2.546	0.549
3	Adamawa	4.109	0.354
4	Bauchi	2.420	0.482
5	Gombe	4.687	0.251
6	Borno	3.181	0.432
7	Kaduna	4.116	0.299
8	Kano	2.622	0.463
9	Katsina	2.704	0.496
10	Sokoto	1.925	0.634
11	Jigawa	2.412	0.487
12	Zamfara	1.277	0.717
13	Kebbi	2.477	0.527
14	Plateau	4.725	0.245
15	Kwara	5.371	0.274
16	Fct Abuja	7.471	0.166
17	Kogi	5.643	0.209
18	Niger	4.138	0.355
19	Benue	4.672	0.259
20	Nasarawa	3.239	0.421
21	Delta	7.812	0.104
22	Edo	6.680	0.129
23	Akwalbom	7.456	0.102
24	Rivers	8.348	0.101
25	Cross River	6.361	0.132
26	Bayelsa	6.795	0.142
27	Oyo	6.341	0.211
28	Ondo	6.695	0.133
29	Ogun	7.209	0.125
30	Osun	6.854	0.155
31	Lagos	9.142	0.081
32	Ekiti	7.291	0.133
33	Ebonyi	5.706	0.169
34	Imo	7.535	0.116
35	Enugu	5.579	0.185
36	Anambra	6.547	0.128
37	Abia	8.213	0.145

Source: Authors' calculations using World Bank LSMS Data (2010)