PAK Publishing Group
Growing Knowledge for Future

Proceedings Book of ICEFMO, 2013, Malaysia
Handbook on the Economic, Finance and Management Outlooks
ISBN: 978-969-9347-14-6

Measuring the Regional Variations in Educational Attainment and Inequality in Nigeria

Habibu Mohammed Umar
Department of Economics School of Economics, Finance and Banking, College of Business, University Utara Malaysia
E.mail: makarahuta@yahoo.com

Russayani Ismail
Department of Economics School of Economics, Finance and Banking, College of Business, Universiti Utara Malaysia

Roslan Abdul-Hakim
Department of Economics School of Economics, Finance and Banking, College of Business, Universiti Utara Malaysia

Abstract

This article measures educational inequality between northern and southern regions in Nigeria and compare it with the educational distribution within regions using Theil index and decomposition analysis. The main finding of the article is that disparity in access to education within regions rather than between North and southern regions is the major cause of educational inequality in Nigeria. The result also shows that educational attainment and inequality are negatively related. 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.
Key-words: Education inequality, educational attainment, Theil Index, Region, States.

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 (Becker, 2009). At 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 (Boarini & Strauss, 2010; Ciccone, Cingano, & Cipollone, 2006; Oreopoulos & Salvanes, 2011). 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 (Lloyd & Hewett, 2009; Ping, 2005; Ramos, Surinach, & Artis, 2010). 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 (Duman, 2008; Lopez-Bazo & Motellon, 2011).

The importance of education distribution in the development process has been emphasized in the literature. Lopez, Thomas and Wang (1999) argued that the distributional dimension of education is very important for both productivity and also for welfare consideration. 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 and to the best of our knowledge no such studies seem to have been made for Nigeria. 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 (Hagen-Zanker & Holmes, 2012). 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 (Oshewolo, 2010). In addition, Bakare, (2012) shows that income inequality in Nigeria is 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.

The whole issues mentioned above motivated us to analyse the roots or causes for such phenomena to occur by focusing on educational attainment and its distribution. 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 (Thomas, Wang, & Fan, 2002). 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. Review of 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 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.

Birdsall and Londono (1997), analysed a sample of 43 countries and uses the standard deviation of years of education as the measure of human capital inequality. 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 (Crespo-Cuaresma, Samir & Sauer, 2012).

According to Crespo-Cuaresma, Samir and Sauer, (2012), Lopez, Vinod, and Yan, (1998) were the first to derive education Gini coefficients for 12 countries from attainment data. Subsequently, as a measure of relative inequality, the Education Gini Coefficient is seen as a more consistent and robust measure of the distribution of education. Thereafter, using attainment level from Barro and Lee of 2001, Castello & Domenech, (2002) 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, Qian and Smyth (2008) applied Gini coefficient to estimate China's education inequality. To identify the source of the overall country's inequality, they decomposed the analysis in to coastal and inland provinces, as well as rural and urban areas. 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, Brendler, (2008) using a sample of five countries, 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. 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 (Conceicao & Ferreira, 2000). A measure that has such an advantage is the Generalized Entropy (GE) Index.

Sahn and Younger (2005) employed Generalized Entropy index (Theil index) to measure world education inequality in science and numerical skills. 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. In the same vein, Rodríguez-Pose and Tselios, (2009) 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. 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 coefficient 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 so also secondary education,

therefore complete primary could 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), complete lower secondary such as JSS 3 only could have nine years of schooling, complete secondary education could take twelve years of schooling, and post-secondary (i.e. sub degree qualifications such as diploma) could 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 table below illustrates more.

Table-1. Official ISCED classification and the authors' equivalent simplified version

Isced Classifications		**Nigerian Classifications**		
Level	**Stage of education**	**Level**	**Stage of education**	**Values**
1	Primary	1	Primary (P1-P6)	6
2	Lower secondary or 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)			
5	Sub-Degree (e.g. Diploma)	4	Sub-degree	14
6	Degree	5	First degree	16
		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 family of inequality measures it has the advantage of being additively decomposable (Meschi & Scervini, 2010). This is a desirable quality for both analytical and arithmetic 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 (Rey, 2004)). 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:

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

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 Karahasan & Uyar, (2009).

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

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).

3.2. Empirical Results

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 for the two main regions- Northern Region and Southern Region - which are, mainly, of interest to this study. We proceed at the state and geopolitical levels in order to analyse differences across the regions. Table 2 shows the average educational attainments and Theil Index coefficients for the regions and the whole country. It can be seen that the Northern Region has an average educational attainment (AvgEduaAtt) 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 education attainment tends to have more equal distribution of education.

Table-2. Average Educational Attainment and Inequality at Regional Level

Region	AvgEduaAtt	Theil
North	3.504533	0.404619
South	7.108975	0.16989
Country	5.080182	0.2797

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 an average of only 1.30. Interestingly, the former belongs to the southern region while the latter is a northern state. 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 3.

Table-3. Average 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

Furthermore, 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 4.

Table-4. Education Distribution by Sector and Across Regions in Nigeria

Sector	Rural	Urban	All
North	0.445	0.266	0.404619
South	0.184	0.144	0.16989
Country	0.32702	0.18532	0.2797

However, using equation (2), we decomposed the index in to within and between regions as well as the sectors of the economy. This is to see the extent to which the regional gap contributed to overall inequality in the country. Table 5 presents the results.

Table- 5. Decomposition 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

Table 5 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

The magnitude of regional differences in educational attainment, suggests that in terms of education access and equity, the northern region is still lagging behind, and this poses a serious challenge to the governments in the Northern region especially on their efforts towards education. 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 association means 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.

References

Bakare, A. (2012). Measuring the Income Inequality in Nigeria: the Lorenz Curve and Gini Co-efficient Approach. American Journal of Economics, 2(1), 47-52.

Becker, G. S. (2009). Human capital: A theoretical and empirical analysis, with special reference to education: University of Chicago Press.

Boarini, R., & Strauss, H. (2010). What is the private return to tertiary education? New evidence from 21 OECD countries. OECD Journal: Economic Studies, 2010.
Ciccone, A., Cingano, F., & Cipollone, P. (2006). The private and social return to schooling in Italy. Bank of Italy Economic Research Paper(569).
Conceicao, P., & Ferreira, P. (2000). The young person's guide to the Theil index: Suggesting intuitive interpretations and exploring analytical applications.
Duman, A. (2008). Education and Income Inequality in Turkey: Does Schooling Matter? Financial Theory and Practice, 32(3), 369-385.
Hagen-Zanker, J., & Holmes, R. (2012). Social protection in Nigeria: synthesis report.
Karahasan, B. C., & Uyar, E. (2009). Spatial Distribution of Education and Regional Inequalities in Turkey.
Kuo, C.-C., & Yang, C.-H. (2008). Knowledge capital and spillover on regional economic growth: Evidence from China. China economic review, 19(4), 594-604.
Lopez-Bazo, E., & Motellon, E. (2011). Human capital and regional wage gaps.
Lloyd, C. B., & Hewett, P. (2009). Educational inequalities in the midst of persistent poverty: diversity across Africa in educational outcomes. Journal of International Development, 21(8), 1137-1151.
Oreopoulos, P., & Salvanes, K. G. (2011). Priceless: The nonpecuniary benefits of schooling. The Journal of Economic Perspectives, 25(1), 159-184.
Oshewolo, S. (2010). Galloping poverty in Nigeria: an appraisal of the government's interventionist policies. Journal of Sustainable Development in Africa, 12(6), 264-274.
Ping, H. (2005). How does education at all levels influence productivity growth? Evidence from the Chinese provinces.
Ramos, R., Surinach, J., & Artis, M. (2010). Human capital spillovers, productivity and regional convergence in Spain. Papers in Regional Science, 89(2), 435-447.
Thomas, V., Wang, Y., & Fan, X. (2002). A new dataset on inequality in education: Gini and Theil indices of schooling for 140 countries, 1960-2000. *World Bank. Washington, DC. Processed*.
World Bank Living Standard Measurement Study Data Base, Retrieved on February 6TH 2013 from http://con.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/0

APPENDIX

Educational Attainment and Theil Index by States in Nigeria

State	AvgEduAtt	Theil Index
Taraba	4.467826	0.299788
Abuja*	7.470899	0.165941
Ebonyi	5.70604	0.169763
Ekiti	7.291139	0.13347
Imo	7.534943	0.115545
Lagos	9.141768	0.080952
Katsina	2.704492	0.495535
Sokoto	1.925	0.63419
Kogi	5.642857	0.209564
Yobe	2.545699	0.549738
Bayelsa	6.795276	0.141954
Enugu	5.578838	0.185256
Adamawa	4.109312	0.353858
Kebbi	2.477064	0.52693
Bauchi	2.420388	0.481905
Rivers	8.347503	0.100836
Oyo	6.34104	0.211188
Borno	3.180851	0.432288

Nasarawa	3.238979	0.421388
Kano	2.621719	0.462826
Anambra	6.546599	0.127528
Benue	4.672156	0.259316
Ondo	6.695255	0.132516
Ogun	7.209719	0.124797
Cross River	6.36128	0.131634
Jigawa	2.411765	0.486736
Niger	4.138047	0.354745
Akwa Ibom	7.455844	0.102288
Zamfara	1.277186	0.716752
Edo	6.68	0.129879
Kaduna	4.115616	0.299623
Gombe	4.686813	0.251071
Osun	6.854232	0.154872
Delta	7.810565	0.104247
Abia	8.212963	0.145184
Plateau	4.7248	0.24454
Kwara	5.370672	0.273693

*Federal Capital

Correlation between Average Educational Attainment and Theil Index in Nigeria

. Correlate avgeduatt theilindex (obs=37)

	avgedu~t	**theili~x**
avgeduatt	1.0000	
theilindex	-0.9502	1.0000