Investment in Education Sector and Poverty Level (1980-2015): The Nigerian Situation

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Abstract
This study looked at the effect of government investment in education sector and poverty level in Nigeria. Data covering from 1980 to 2015 were sourced from CBN, World Bank, and UNESCO. The study employed statistical technique of vector autoregressive (VAR) analysis. Pre-estimation tests (i.e. unit root and co-integration test) and post-estimation test (i.e. granger causality test) were used to investigate the relationship between government investment on education and poverty rate in Nigeria. Four vector autoregressive equations where estimated as total government spending on education that was disaggregated into recurrent and capital expenditure; and educational outcome was also disaggregated into primary school and tertiary enrolment rate. The findings revealed that government recurrent expenditure on education did not improve primary school enrolment rate and reduce poverty rate in the country which is contrary to apriori expectations. Government capital expenditure on education improved primary school enrolment rate but not reduce poverty rate. Both government recurrent and capital expenditure on education combined significantly with tertiary enrolment rate to granger cause poverty rate in Nigeria between 1980 and 2015. Based on the findings, study therefore recommends, among others, the implementation of an expansionary fiscal policy on education financing to meet the United Nation's 26% benchmark and improve quality of education and enrolment rate capable of producing entrepreneurs in the society that are not "half-baked" graduates who only wait for blue collar jobs, recruitment of qualified curriculum developers, etc

Keywords: *Investment, Education, Poverty, VAR (Vector auto regression), Granger causality.*

Introduction

Education makes one useful to him/herself, the society and the world at large. One who is educated will be easy to lead but difficult to enslave. Education does more than imparting knowledge and skills. It transforms the human beings behavioural patterns (Ebong, 2006). It is a key development index and plays complementary role for overall individual, social and national development. It is a fact that education gives its receiver an avenue to contribute to the growth of the society. According to Orubite, Olele, Kemjika, Abraham and Adekola (2017: 181), "The common belief that education makes a man, draws him out from the Hobbesian 'state of nature' to civility, and develops his innate capacities for a productive life is at the basis of manpower planning".

It has been observed that the incidence of poverty in Nigeria is much higher in the rural setting than the urban setting. According to Amaghionyediwe and Osinubi (2004), the poor are those people who are not able to obtain an adequate income, find a suitable job, own property and maintain healthy living condition. They lack adequate level of education and cannot satisfy their basic needs, as such the poor are often illiterates. The causes of poverty had been variously identified in literature. For instance, the January 1964 report of the Council of Economic Adviser to United State of America's President identified some causative factors of poverty to include unemployment and under-employment, lack of productivity lack of education etc. Ekong (2003), Mboho and Lyang (2011), added illiteracy and inability to send children to school, high dropout rates, mutual derangement, prostitution, development of slum settlements in cities, low self-esteem, inability to participate meaningfully in social and political life.

The National Bureau of Statistics (2012) reported that poverty has risen in Nigeria with almost 100 million people living on less than $1 per day, despite the economic growth, it further stated that 60.9 percent of Nigerians live in absolute poverty. The most dynamic way of people out of these adverse poverty conditions is through education. Osowole and Bamiduro (2013) further argued that compared to the past period of about four decades, the Nigeria government had made public investment in education infrastructure, scholarship award, study grant, tuition payment and regular payment of teachers' salaries.

The Federal Government of Nigeria has spent the following billions of Naira on education in the following years from its successive budget - 1.5 in 1980, 2.29 in 1990, 12.73 in 1995, 67.57 in 2000, 94.42 in 2005, 172.99 in 2010, 350.57 in 2012 and 373.50 in 2014. Within these periods, poverty level has been on the increase. For instance, in 1980 it was 27.2% and increased to 46.3% in 1985, it reduced slightly to 43.9% in 1990. In 1995, it rose to 59%, while in 2000 it rose to 70% in 2005, it was 51.6% and 2010 – 2012 it increased to 60.9%, it reduced to 49.8 and 33.1 from 2013-2014 before increasing to 67.1, respectively. (CBN, 2016).

Although, Nigeria has not been able to meet the budgetary allocation of 26% on education set by UNESCO but the various administrations has tried in increasing the allocations of the sector. Thus, the basic questions bordering this research are: What is the relationship between government recurrent expenditure on education, poverty level in Nigeria and primary school enrolment? What is the relationship between government capital expenditure on education and poverty level and tertiary school enrolment in Nigeria? What is the relationship between government recurrent expenditure on education, poverty level in Nigeria and tertiary school enrolment? What is the relationship between government capital expenditure on education, poverty level in Nigeria and primary school enrolment? Therefore, this study is geared towards looking at the relationship between government investment in education sector and poverty level in Nigeria from 1980 to 2015.

This work is divided into five sections. Section one is the introductory aspect, section two is the literature review while section three deals with the method of study. Section four is data presentation/ interpretation of result and finally, section five is conclusion/ recommendations.

Literature Review

Theoretical Framework

- **The theory of Balanced Growth**

In the 2016 National Economic Summit that was held at Abuja, Nigeria, Odike, Akiri, and Job (2016: 3), stated that "The Balanced Growth theory was advocated by Rosentein Rodan, Arthur Lewis and Ragnar Nurkse in 1953. The doctrine has different interpretations by those authors.

To some (like Rodan and Nurkse), it means investing in a backward sector so as to bring it abreast of others."

They also argued that it implies investing simultaneously in all sectors or industries of the economy, and others believe in balanced development of manufacturing industries and agriculture (Jhingan, 2008). The theory therefore requires the balance of not only one sector, but balance between different consumer goods industries, and between consumer goods and capital goods industries. It equally implies balance between industry and agriculture and between the domestic and export sector. It also involves the balance between social and economic overheads and directly productive investments, and between vertical and horizontal linkages. Above all, the theory implies the balance between the needed manpower requirements and the products of grandaunts from our educational sector. In other words, the man power requirements that should eliminate/reduce poverty, reduce unemployment, increase economic growth and actualize sustainable development should be the focus of our educational sector. The researcher believes that it is in recognition of this fact that the Nigerian educational curriculum refocused on entrepreneurial education, as well as, the intensifying of information technology education. The question therefore is: what kind of entrepreneurial education do we need to transform our economy and eradicate poverty? The answer to this could be found in the Schumpeterian theory of Entrepreneur. This theory is found relevant for this study because it emphasis the need for government to focus on the education sector that reflects the demands of the industrial sector. The Nigerian government invests on other sectors, without a commensurate and adequate investment in the education sector too. This theory emphasizes the need for government to invest simultaneously on multiple sectors for the overall development of a nation and poverty eradication at large.

Empirical Literature Review

Obi and Obi (2014) studied the Impact of Education Expenditure on Economic Growth as a Means of Achieving the Desired Socio-economic Change needed in Nigeria. Time series data from 1981 to 2012 were employed. The Johansen's co-integration analysis and ordinary least square (OLS) econometric techniques were the statistical tool applied to analyze the relationship between Gross Domestic Product (GDP) and recurrent education expenditure. The result indicated a positive relationship between education expenditure and economic growth, but a long run relationship does not exist over the period under study. The study observed that this puzzle is attributable to labour market distortions, redundancy of the workforce, industrial dispute and job discontinuities as well as leakages in the Nigerian society such as brain drain, among others. It invariably concluded that educational sector in Nigeria has not performed as expected. The half-baked graduates, cultism and the high rate at which people drop-out of schools is alarming. The study therefore suggested total review and overhauling of the education system through efficient use of public resources, good governance, accountability and transparency.

Ernest (2014), investigated the "Likely Impact of Government Expenditure Policy on Education and Poverty Reduction in Nigeria". An integrated sequential dynamic computable general equilibrium (CGE) model was employed to simulate the potential impact of increase in government expenditure on education in Nigeria. The result revealed that it will be extremely difficult for Nigeria to achieve the MDG (millennium development goals) target, in terms of education and poverty reduction by the year 2015, because as the policy was measured in the analysis, it could not meet the goal. The MDG target for Nigeria in terms of poverty reduction is to reduce the percentage of population living in relative poverty from 54.4% in

2004 to 21.4% by 2015. The study concluded that increase in education investment portfolio will help the country to meet MDG target and reduce poverty level.

Oladeji and Abiola (2000) asserted in their findings that poverty alleviation in contemporary Nigeria requires both economic policy and educational reforms in order to enhance the human capital of the poor in particular, the priorities for educational reforms should be in the areas of basic education, vocational education and training. Their work considered "Poverty alleviation with economic growth" strategy as long term solution i.e the latter constitute an immediate and direct shot at the poverty itself. Bello and Rosian (2010) used a panel data analysis consisting of model; fixed-effect, random-effects and weighted least square and found that a unit increase in per capita GDP leads to 0.6 percent increase in poverty. A unit increase in MDG expenditure leads to 11 .56 units increase in relative poverty in the pooled model and this is significant at 95 percent level. Considering GDP and population as independent variables against rate of poverty as dependent variable; the R2 is 0.9 in the pooled model means the independent variables account for 90 percent total variation in the dependent variable (rate of poverty) in this case. They thereby concluded that economic growth and MDG spending has not substantially reduced poverty over the sample period.

Omojimite (2010) examined the "Role of Formal Education in Accelerating Growth using Data for the Period 1980-2005". Time series econometrics (co-integration and granger causality test) were applied to test the hypothesis of a growth strategy led by improvements in the education sector. The results show that there is co-integration between public expenditures on education, primary school enrolment and economic growth. The study also owed that public expenditures on education cause economic growth but the reverse is not the case. The paper therefore recommended improved funding for the education sector and a review of the primary school curricula to make it more relevant to the needs of the Nigerian society.

Method of Study

Model Specification

An economic model can be referred to as a simplification of the real world in which essential features of an economic relationship or set of relationship are explained using diagrams, words and often mathematics (Powell, Hausman and Newey, 1991).

The following data starting from 1980 to 2015 were used in this study:

i. Poverty Rate;
ii. Government Recurrent Expenditure on Education;
iii. Government Capital Social and Community Service on Education;
iv. Tertiary School Enrolment; and
v. Primary School Enrolment;

The functional, mathematical, and econometric specifications are provided as follows:

Functional Specification

i. POV = f (PSE, GREE) 3.1
ii. POV = f (PSE, GCSCSE) 3.2
iii. POV = f (TSE, GREE) 3.3
iv. POV = f (TSE, GCSCSE) 3.4

Where

i. POV = Poverty;
ii. GREE = Government Recurrent Expenditure on Education;
iii. GCSCSE = Government Capital Social and Community Service on Education;

iv. PSE = Primary School Enrolment; and
v. TSE = Tertiary Education Enrolment;

Vector Autoregressive (VAR) Econometric Specification
Poverty VAR Model 1

$$\text{lpov}_t = c_1 + \Sigma_{i=1}^{p} \pi_{11}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{12}^{j} \text{lpser}_{t-j} + \Sigma_{k=1}^{p} \pi_{13}^{k} \lg ree_{t-k} + \varepsilon_{1t}$$

$$\text{lpser}_t = c_1 + \Sigma_{i=1}^{p} \pi_{21}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{22}^{j} \text{lpser}_{t-j} + \Sigma_{k=1}^{p} \pi_{23}^{k} \lg ree_{t-k} + \varepsilon_{2t}$$

$$\lg ree_t = c_1 + \Sigma_{i=1}^{p} \pi_{31}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{32}^{j} \text{lpser}_{t-j} + \Sigma_{k=1}^{p} \pi_{33}^{k} \lg ree_{t-k} + \varepsilon_{3t}$$

Poverty VAR Model 2

$$\text{lpov}_t = c_1 + \Sigma_{i=1}^{p} \pi_{11}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{12}^{j} \text{lpser}_{t-j} + \Sigma_{k=1}^{p} \pi_{13}^{k} \text{lgcscse}_{t-k} + \varepsilon_{1t}$$

$$\text{lpser}_t = c_1 + \Sigma_{i=1}^{p} \pi_{21}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{22}^{j} \text{lpser}_{t-j} + \Sigma_{k=1}^{p} \pi_{23}^{k} \text{lgcscse}_{t-k} + \varepsilon_{2t}$$

$$\text{lgcscse}_t = c_1 + \Sigma_{i=1}^{p} \pi_{31}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{32}^{j} \text{lpser}_{t-j} + \Sigma_{k=1}^{p} \pi_{33}^{k} \text{lgcscse}_{t-k} + \varepsilon_{3t}$$

Poverty VAR Model 3

$$\text{lpov}_t = c_1 + \Sigma_{i=1}^{p} \pi_{11}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{12}^{j} \text{lter}_{t-j} + \Sigma_{k=1}^{p} \pi_{13}^{k} \lg ree_{t-k} + \varepsilon_{1t}$$

$$\text{lter}_t = c_1 + \Sigma_{i=1}^{p} \pi_{21}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{22}^{j} \text{lter}_{t-j} + \Sigma_{k=1}^{p} \pi_{23}^{k} \lg ree_{t-k} + \varepsilon_{2t}$$

$$\lg ree_t = c_1 + \Sigma_{i=1}^{p} \pi_{31}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{32}^{j} \text{lter}_{t-j} + \Sigma_{k=1}^{p} \pi_{33}^{k} \lg ree_{t-k} + \varepsilon_{3t}$$

Poverty VAR Model 4

$$\text{lpov}_t = c_1 + \Sigma_{i=1}^{p} \pi_{11}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{12}^{j} \text{lter}_{t-j} + \Sigma_{k=1}^{p} \pi_{13}^{k} \text{lgcscse}_{t-k} + \varepsilon_{1t}$$

$$\text{lter}_t = c_1 + \Sigma_{i=1}^{p} \pi_{21}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{22}^{j} \text{lter}_{t-j} + \Sigma_{k=1}^{p} \pi_{23}^{k} \text{lgcscse}_{t-k} + \varepsilon_{2t}$$

$$\text{lgcscse}_t = c_1 + \Sigma_{i=1}^{p} \pi_{31}^{i} lpov_{t-i} + \Sigma_{j=1}^{p} \pi_{32}^{j} \text{lter}_{t-j} + \Sigma_{k=1}^{p} \pi_{33}^{k} \text{lgcscse}_{t-k} + \varepsilon_{3t}$$

Data collection and source.
Annual time series data is mainly used for this study. The data was collected from secondary sources and the period covered is from 1980-2015. Some of the sources include World Bank Data, CBN Statistical Bulletin and Annual Report and Statement of Accounts and National Bureau of Statistics (NBS).

Method of Data analysis
The econometric technique of vector autoregressive (VAR) analysis was adopted to estimate the relationship between the dependent and independent variables used in this study. Test of stationarity (i.e. unit root test), co-integration test, VAR model and granger causality were used to investigate the effect of government expenditure on education and poverty reduction in Nigeria.

Unit Root Test
The examination of time series properties of economic data is now a common practice and serves as a guide to subsequent multivariate modeling and inference. When we discover that the variables are integrated of order greater than or equal to one, then there is every possibility that these variables are co-integrated. We will employ the Augmented Dickey-fuller test (ADF) to test for the stationarity of our data at level and at difference. The model is stated below:
$y_{t} = \mu + P_{yt} - 1 + \varepsilon t$.....(3)
Where μ and P are parameters εt are assumed to be white noise, y is a stationary series.
If $-1<P<1$. If $P = 1$, y is a non-stationary series.

Co-integration Test
This study used the co-integration test to investigate if the variables included in the model have long run relationship. If the variables we were using in this research work are found to be co-integrated, it will prove statistical evidence for the existence of a long term relationship. We employed the maximum likelihood test procedure as established by Johansen and Juselius (1990).

Vector Autoregressive (VAR)
Mentioned in the preceding sub-section, the response of expenditure on education, which can lead to poverty reduction and other selected related variables of indicators is analysed through the use of an unrestricted multivariate VAR model. This model was first advocated by Sims (1980), and has today become popular among economists for studies like these as it is a relatively easy model to use when analysing multivariate time series (Luetkepohl, 2011). The variables treated in the VAR-model are all seen as endogenous, with no imposed structural relationships or restrictions. Through a multivariate framework, this model captures how changes in a particular variable are related to changes in its own lags, as well as to changes in other variables and their lags. Therefore, before implementing a VAR, the optimal lag length need to be determined.

Lag length selection
There are numerous methods that can be utilized to select the appropriate numbers of lags. Two approaches are of main focus here: firstly, the lag exclusion Wald test is employed, followed by the traditional lag order selection information criteria procedure. The Wald test works by testing the null hypothesis that the variables in the VAR are jointly zero at a given lag. Where the null hypothesis is rejected, the test indicates that the lag should be included.

Granger Causality Test

A Granger causality test is a formal way to assess whether one variable has a tendency to succeed another. X is said to granger cause Y if X is useful in forecasting Y. This implies that X granger causes Y, if historical values of X are able to increase the accuracy of the prediction of the present Y. Granger causality differs from normal causality in that if X is said to granger cause Y, this does not mean that X will lead to Y. Instead this implies that historically, when X occurs, Y has followed. Granger causality test uses an F-test to see whether lagged information on variable Y provides statistically significant information about variable X, or whether lagged information on variable X provides statistically significant information about variable Y.

Presentation and Interpretation of Result

This section is dedicated to the presentation and interpretation of results. Furthermore, the results for each model were presented and interpreted under the following headings:

a) Test of Stationarity;
b) Cointegration Test;
c) Vector Autoregressive Model Estimation and Testing; and
d) Granger Causality.

Poverty Model I

This model investigated the impact of government recurrent expenditure on education on poverty reduction in Nigeria. To achieve this, the study estimated a VAR model that includes government recurrent expenditure on education, primary school enrolment rate and poverty rate.

Stationarity Tests

Due to the problem of unit root that is evident in most time series, this research conducted unit root tests to ascertain the stationarity of time series collected and used in the investigation of the dynamic relationship between government recurrent expenditure on education, primary school enrolment rate and poverty reduction in Nigeria. Tables 4.1 and 4.2 shows the unit root tests (i.e. Augmented Dickey-Fuller and Phillips-Peron) results at levels and first difference respectively. The results in Table 4.1 confirms the expected unit root in the time series at levels. The ADF and PP test result shows that the null hypothesis of unit root cannot be rejected.

Table 4.1: ADF and PP Unit Root Test Results at Level

	ADF			PP		
Variables	Constant	Constant and Trend	None	Constant	Constant and Trend	None
LPOV	-2.39	-1.27	0.54	-2.83	-3.05	0.66
LGREE	-1.00	-2.97	0.54	-1.00	-3.60*	0.42
LPSER	-2.96	-2.88	-0.31	-2.23	-2.30	-0.07
	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95	5% Critical Value = -2.97	5% Critical Value = -3.56	5% Critical Value = -1.95

Source: Author's Computation using STATA

Table 4.2 shows the ADF and PP unit root test results after first differencing of the time series. The null hypothesis of unit root can be rejected. All the time series were stationary at 5% level of significance.
The unit root tests shows that all the time series had unit root at levels but became stationary after differencing once.

Table 4.2: Unit Root Test after First Difference

	ADF			PP		
Variables	Constant	Constant and Trend	None	Constant	Constant and Trend	None
LPOV	-7.96*	-8.44*	-8.00*	-7.96*	-8.44*	-8.00*
LGREE	-7.46*	-7.38*	-6.82*	-7.46*	-7.38*	-6.82*
LPSER	-7.46*	-7.38*	-6.82*	-7.46*	-7.38*	-6.82*
	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95

Source: Author's Computation using STATA 14

Cointegration Test

Table 4.3: Johansen Test for Cointegration

Null Hypothesis	Trace Stat.	5% Crit. Value	Max. Eigenvalue Stat.	5% Crit. Value
$r = 0$	20.18	29.68	9.97	20.97
$r \leq 1$	6.33	15.41	5.66	14.07
$r \leq 2$	1.85	3.76	2.90	3.76

Source: Author's Computation using STATA 14

Having established the stationarity of the selected time series at first differencing, it is therefore appropriate to determine the existence or none existence of a cointegrating vector among the series. Though there exists different cointegration tests, this study adopted the Johansen test as the preferred test. Johansen test, which has no cointegrating vector as its null hypothesis, provides two statistics (trace and maximum eigenvalue statistics) as the basis for drawing conclusion.

The Johansen test result presented in Table 4.3 shows that the null hypothesis of no cointegration vector cannot be rejected as both the trace and maximum eigenvalue statistics are less than the 5% critical values. This result implies that a long run relationship does not exist between government recurrent expenditure on education, primary school enrolment rate and poverty rate.
The cointegration results above makes the vector autoregressive (VAR) approach the most appropriate since we have a case of non-stationary time series at levels and no cointegrating vector.

Vector Autoregressive Model Estimation and Testing

Lag Selection Criteria

Table 4.4 Shows that lag-order selection criteria results. The result shows five (5) criterion statistics. Though the Akaike's information criterion and LR test are our primary concern, the

result shows that all the criteria suggested one lag. We therefore proceed by estimating VAR with one lag.

Table 4.4: Selection Order Criteria Result for the Poverty Model I

Lag	LR	FPE	AIC	HQIC	SBIC	P
0		.001341	1.8991	1.94465	2.03651	
1	110	.000076*	-.975925*	-.793731*	-.426274*	0.000
2	8.7898	.000103	-.688106	-.369267	.273783	0.457
3	6.2198	.000156	-.319976	.135509	1.05415	0.718
4	24.294*	.000139	-.516671	.075459	1.26969	0.004

Source: Author's Computation using STATA

Post Estimation Tests

It is important and necessary that we conduct some diagnostics or post estimation before adopting and discussing the result of the estimated VAR model and other associated statistics (i.e. granger causality). This is necessary to enable us figure out the adequacy of the model and other results. As long as a model passes the test, the model is considered adequate for adoption and discussion. The first test conducted is the Lagrange-multiplier (LM) test for autocorrelation in the residuals.

Autocorrelation Test

Table 4.5: Lagrange-Multiplier (LM) test for autocorrelation (VAR with one lag)

Lag	chi2	df	Prob>chi2
1	11.40	9	0.24952
2	2.34	9	0.98481
3	3.9489	9	0.91475
4	23.0763	9	0.00603

H0: no autocorrelation at lag order

Source: Author's Computation using STATA

The autocorrelation test is done using the Lagrange-Multiplier (LM) test of residuals. The LM test of autocorrelation result presented in Table 4.5 above shows that we can reject the null hypothesis of no autocorrelation in the residuals at all level of significance at three lags out of the four lag orders.

Normality Test

The text for the normality of the residuals was done through the Jarque-Bera test. Table 4.6 shows that we can reject the null hypothesis of normally distribution of residuals for one of the individual equations. Though this test failed, it is worthy of mention that this phenomenon is common and will not necessarily and crucially distort the final results.

Table 4.6: Jarque-Berra test for normality (VAR with one lag)

Equations	chi2	df	Prob>chi2
D_lpov	196.726	2	0.00000
D_lpser	1.189	2	0.55184
D_lgree	67.809	2	0.00000
ALL	265.725	6	0.00000

H0: residuals are normally distributed

Source: Author's Computation using STATA

VAR Model Estimation

Table 4.7 below shows the short run VAR result. The column labelled *Dlpov* is the estimated poverty rate model. The coefficient of lag 1 of *lpser* (primary school enrolment) has a positive sign as reported to be 0.06. The result shows that a 1% increase in one lag of primary school enrolment led to 0.06% increase in poverty rate during the study period. The p-value in parentheses shows that the coefficient of *lpser* is not statistically significant even at 10% level of significance. Moreover, the coefficient of *lgree* (government recurrent expenditure in education) has a positive sign as reported to be 0.03. The result shows that a 1% increase in one lag of *lgree* led to 0.03% increase in poverty rate during the study period. The p-value in parentheses shows that the coefficient of *lgree* is only statistically significant at 10% level of significance.

Moreover, table 4.7 also shows a column labelled *Dlpser* as the estimated primary school enrolment rate model. The coefficient of lag 1 of *lpov* (poverty rate) has a negative sign as reported to be -0.05. The result shows that a 1% increase in one lag of poverty rate led to 0.05% decrease in primary school enrolment rate during the study period. The p-value in parentheses shows that the coefficient of *lpov* is not statistically significant at even 10% level of significance. Moreover, the coefficient of *lgree* (government recurrent expenditure in education) has a positive sign as reported to be 0.003. The result shows that a 1% increase in one lag of *lgree* led to 0.003% increase in primary school enrolment rate during the study period. The p-value in parentheses shows that the coefficient of *lgree* is not statistically significant even at 10% level of significance.

Table 4.7: VAR Estimation Results

		Equations (N = 35)		
Elements (I.e. exogenous)		Dlpov	Dlpser	Dlgree
	L1	0.5055***	-0.0516	0.7792
Lpov		(0.00)	(0.27)	(0.22)
	L1	0.0597	0.7780***	-0.8344
Lpser		(0.86)	(0.00)	(0.60)
	L1	0.0279*	0.0025	0.8796***
Lgree		(0.08)	(0.62)	(0.00)

P-values in parentheses (*** significant at 1%; ** significant at 5%; and * significant at 10%)
Source: Author's Computation using STATA 14

Granger Causality Test

Table 4.8: Granger Causality Tests Based On VAR

Dependent Variables	**chi2Statistics (p-values)**			
	Dlpov	Dlpser	Dlgree	Joint Causality
Dlpov		.03234	3.1362*	3.1845
	-	(0.85)	(0.07)	[0.20]
Dlpser	1.2182	-	0.2433	1.4392
	[0.270]		[0.62]	[0.487]
Dlgree	1.4783	0.3261		1.7581
	[0.224]	[0.568]	-	[0.415]

P-values in parentheses (*** significant at 1%; ** significant at 5%; and * significant at 10%)
Source: Author's Computation using STATA

Table 4.8 above shows the granger causality test (using the chi2 statistics) result based on the *lpov* estimated VAR model. The table provided individual and joint granger causality test results and the following was observed:

(i) Individual Causality
(a) Poverty Rate Equation
The p-value of the chi2 statistics of *Dlpser* of 0.85 shows that *Dlper* is insignificant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that primary school enrolment rate does not granger causes poverty rate in Nigeria during the period of study. Moreover, the p-value of the chi2 statistics of *Dlgree* of 0.07 shows that *Dlgree* is only significant at 10%. Hence, the null hypothesis of no causality can be rejected as we conclude that government recurrent expenditure on education granger causes poverty rate in Nigeria during the period of study.

(b) Primary School Enrolment Rate
The p-value of the chi2 statistics of *Dlpov* of 0.27 shows that *Dlpov* is not significant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that poverty rate does not granger cause primary school enrolment rate in Nigeria during the period of study. Moreover, the p-value of the chi2 statistics of *Dlgree* of 0.62 shows that *Dlgree* is not significant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that government recurrent expenditure on education does not granger cause primary school enrolment rate in Nigeria during the period of study.

(ii) Joint Causality
The p-value of the chi2 statistics of joint causality of *Dlpser* and *Dlgree* in the estimated *lpov* model is 0.20. This result shows that *Dlpser* and *Dlgree* did not combine significantly to granger cause poverty rate in Nigeria during the period of study.

Poverty Model II
This model investigated the impact of government capital expenditure on education on poverty reduction in Nigeria. To achieve this, the study estimated a VAR model that includes government capital expenditure on education (using government capital expenditure on social and community services as a proxy), primary school enrolment rate and poverty rate.

Stationarity Tests
Tables 4.9 and 4.10 shows the unit root tests (i.e. Augmented Dickey-Fuller and Phillips-Perron) results at levels and first difference respectively for the time series used in the poverty model II. The results in table 4.9 confirm the expected unit root in the time series at levels. The ADF and PP test result shows that the null hypothesis of unit root cannot be rejected.

Table 4.9: ADF and PP Unit Root Test Results at Level

	ADF			PP		
Variables	Constant	Constant and Trend	None	Constant	Constant and Trend	None
LPOV	-2.39	-1.27	0.54	-2.83	-3.05	0.66
LGCSCSE	-0.50	-2.33	0.99	-0.52	-3.45	0.63
LPSER	-2.96	-2.88	-0.31	-2.23	-2.30	-0.07
	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95	5% Critical Value = -2.97	5% Critical Value = -3.56	5% Critical Value = -1.95

Source: Author's Computation using STATA

Table 4.10 shows the ADF and PP unit root test results after first differencing of the time series. The null hypothesis of unit root can be rejected. All the time series were stationary at 5% level of significance.
The unit root tests shows that all the time series had unit root at levels but became stationary after differencing once.

Table 4.10: Unit Root Test after First Difference

	ADF			PP		
Variables	Constant	Constant and Trend	None	Constant	Constant and Trend	None
LPOV	-7.96*	-8.44*	-8.00*	-7.96*	-8.44*	-8.00*
LGCSCSE	-9.00*	-8.83*	-8.55*	-9.00*	-8.83*	-8.55*
LPSER	-7.46	-7.38	-6.82	-7.46	-7.38	-6.82
	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95

Source: Author's Computation using STATA 14
* implies significance at 5% level of significance.

Cointegration Test

Table 4.11: Johansen Test for Cointegration

Null Hypothesis	Trace Stat.	5% Crit. Value	Max. Eigenvalue Stat.	5% Crit. Value
$r = 0$	23.31	29.68	21.72*	20.97
$r \leq 1$	5.78	15.41	7.83	14.07
$r \leq 2$	1.36	3.76	2.38	3.76

Source: Author's Computation using STATA 14

The Johansen test result presented in Table 4.11 shows that the null hypothesis of no cointegration vector cannot be rejected as both the trace and maximum Eigenvalue statistics are mostly less than the 5% critical values and not fulfilling the condition of at least two cointegrating vectors. This result implies that a long run relationship does not exist between government capital expenditure on education, primary school enrolment rate and poverty rate.

The cointegration results above makes the vector autoregressive (VAR) approach the most appropriate since we have a case of non-stationary time series at levels and no cointegrating vector.

Vector Autoregressive Model Estimation and Testing

Lag Selection Criteria

Table 4.12 shows that lag-order selection criteria results. The result shows five (5) criterion statistics. Though the Akaike's information criterion and LR test are our primary concern, the result shows that three of the criteria suggested two lags. We therefore proceed by estimating VAR with two lag.

Table 4.12: Selection Order Criteria Result for Poverty Model II

Lag	LR	FPE	AIC	HQIC	SBIC	P
0		.000797	1.3788	1.42435	1.51622	
1	112.38	.000042	-1.57068	-1.38849	-1.02103*	0.000
2	29.27	.00003*	-1.92291*	-1.60408*	-.961025	0.001
3	10.37	.00004	-1.68462	-1.22913	-.310488	0.321
4	19.90*	.000041	-1.7439	-1.15177	.042461	0.019

Source: Author's Computation using STATA

Post Estimation Tests

Autocorrelation Test

Table 4.13: Lagrange-Multiplier (LM) test for autocorrelation (VAR with one lag)

Lag	chi2	df	Prob>chi2
1	34.47	9	0.00
2	19.18	9	0.02
3	7.75	9	0.56
4	15.27	9	0.08

H0: no autocorrelation at lag order

Source: Author's Computation using STATA

The autocorrelation test is done using the Lagrange-Multiplier (LM) test of residuals. The LM test of autocorrelation result presented in Table 4.13 above shows that we can reject the null hypothesis of no autocorrelation in the residuals at 5% level of significance at two lags out of the four lag orders.

Normality Test

The text for the normality of the residuals was done through the Jarque-Bera test. Table 4.14 shows that we can reject the null hypothesis of normally distribution of residuals for two of the individual equations. Though this test failed, it is worthy of mention that this phenomenon is common and will not necessarily and crucially distort the final results.

Table 4.14: Jarque-Berra test for normality (VAR with one lag)

Equations	chi2	df	Prob>chi2
D_lpov	68.54	2	0.00000
D_lpser	0.57	2	0.75238
D_ lgcscse	0.90	2	0.63711
ALL	70.01	6	0.00000

H0: residuals are normally distributed

Source: Author's Computation using STATA

VAR Model Estimation

Table 4.15 below shows the short run VAR result. The column labelled *Dlpov* is the estimated poverty rate model II. The coefficient of lag 2 of *lpser* (primary school enrolment) has a positive sign as reported to be 0.62. The result shows that a 1% increase in two lag of primary school enrolment led to 0.62% increase in poverty rate during the study period. The p-value in parentheses shows that the coefficient of *lpser* is not statistically significant at even 10% level of significance. Moreover, the coefficient of *lgcscse* (government capital expenditure in education) has a positive sign as reported to be 0.01. The result shows that a 1% increase in two lag of *lgcscse* led to 0.01% increase in poverty rate during the study period. The p-value in parentheses shows that the coefficient of *lgcscse* is also not statistically significant at even 10% level of significance.

Moreover, table 4.15 also shows a column labelled *Dlpser* as the estimated primary school enrolment rate model. The coefficient of lag 2 of *lpov* (poverty rate) has a negative sign as reported to be -0.16. The result shows that a 1% increase in two lag of poverty rate led to 0.16% decrease in primary school enrolment rate during the study period. The p-value in parentheses shows that the coefficient of *lpov* is statistically significant at 5% level of significance. Moreover, the coefficient of *lgcscse* (government capital expenditure on education) has a positive sign as reported to be 0.02. The result shows that a 1% increase in two lag of *lgcscse* led to 0.02% increase in primary school enrolment rate during the study period. The p-value in parentheses shows that the coefficient of *lgcscse* is statistically significant only at 10% level of significance.

Table 4.15: VAR Estimation Results for Poverty Model II

		Equations (N = 45)		
Elements (I.e. exogenous)		Dlpov	Dlpser	Dlgcscse
Lpov	L2	0.62*** (0.00)	-0.16 (0.04)	1.84*** (0.00)
Lpser	L2	0.02 (0.94)	0.45*** (0.00)	-1.20 (0.26)
Lgcscse	L2	0.01 (0.77)	0.02* (0.09)	0.74*** (0.00)

P-values in parentheses (*** significant at 1%; ** significant at 5%; and * significant at 10%)

Source: Author's Computation using STATA 14

Granger Causality Test

Table 4.16 above shows the granger causality test (using the chi2 statistics) result based on the *lpov* estimated VAR model. The table provided individual and joint granger causality test results and the following was observed:

(i) Individual Causality

(c) Poverty Rate Equation

The p-value of the chi2 statistics of *Dlpser* is 0.94. This shows that *Dlper* is not significant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that primary school enrolment rate does not granger causes poverty rate in Nigeria during the period of study. Moreover, the p-value of the chi2 statistics of *Dlgcscse* of 0.77 shows that *Dlgcscse* is not also significant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that government capital expenditure on education does not granger causes poverty rate in Nigeria during the period of study.

(d) Primary School Enrolment Rate

The p-value of the chi2 statistics of *Dlpov* is 0.04. This shows that *Dlpov* is significant at 5% level of significance. Hence, the null hypothesis of no causality can be rejected as we conclude that poverty rate granger causes primary school enrolment rate in Nigeria during the period of study. Moreover, the p-value of the chi2 statistics of *Dlgcscse* of 0.09 shows that *Dlgcscse* is significant only at 10%. Hence, the null hypothesis of no causality can be rejected as we conclude that government capital expenditure on education granger causes primary school enrolment rate in Nigeria during the period of study.

(ii) Joint Causality

The p-value of the chi2 statistics of joint causality of *Dlpser* and *Dlgcscse* in the estimated *lpov* model is 0.96. This result shows that *Dlpser* and *Dlgcscse* did not combine significantly to granger cause poverty rate in Nigeria during the period of study.

Table 4.16: Granger Causality Tests Based on VAR Poverty Model II

	chi2Statistics (p-values)			
Dependent Variables	Dlpov	Dlpser	Dlgcscse	Joint Causality
Dlpov		.0049	0.0831	0.0852
	-	(0.94)	(0.773)	[0.96]
Dlpser	4.1962**	-	2.9177*	4.2105
	[0.04]		[0.08]	[0.122]
Dlgcscse	10.692***	1.2599		12.471***
	[0.00]	[0.262]	-	[0.00]

P-values in parentheses (*** significant at 1%; ** significant at 5%; and * significant at 10%)

Source: Author's Computation using STATA

Poverty Model III

This model investigated the impact of government recurrent expenditure on education on poverty reduction in Nigeria. To achieve this, the study estimated a VAR model that includes government recurrent expenditure on education, tertiary enrolment rate and poverty rate.

Stationarity Tests

Tables 4.17 and 4.18 shows the unit root tests (i.e. Augmented Dickey-Fuller and Phillips-Perron) results at levels and first difference respectively for the time series used in the poverty model III. The results in table 4.17 confirm the expected unit root in the time series at levels. The ADF and PP test result shows that the null hypothesis of unit root cannot be rejected.

Table 4.17: ADF and PP Unit Root Test Results at Level

	ADF			PP		
Variables	Constant	Constant and Trend	None	Constant	Constant and Trend	None
LPOV	-2.39	-1.27	0.54	-2.83	-3.05	0.66
LGREE	-1.00	-2.97	0.54	-1.00	-3.60*	0.42
LTER	-0.97	-2.99	1.70	-1.58	-5.96*	1.39
	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95	5% Critical Value = -2.97	5% Critical Value = -3.56	5% Critical Value = -1.95

Source: Author's Computation using STATA
* implies significance at 5% level of significance.

Table 4.18 shows the ADF and PP unit root test results after first differencing of the time series. The null hypothesis of unit root can be rejected. All the time series were stationary at 5% level of significance.
The unit root tests shows that all the time series had unit root at levels but became stationary after differencing once.

Table 4.18: Unit Root Test after First Difference

	ADF			PP		
Variables	Constant	Constant and Trend	None	Constant	Constant and Trend	None
LPOV	-7.96*	-8.44*	-8.00*	-7.96*	-8.44*	-8.00*
LGREE	-7.46*	-7.38*	-6.82*	-7.46*	-7.38*	-6.82*
LTER	11.59*	11.38*	11.03*	11.59*	11.38*	11.03*
	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95

Source: Author's Computation using STATA 14
* implies significance at 5% level of significance.

Cointegration Test

Table 4.19: Johansen Test for Cointegration for Poverty Model III

Null Hypothesis	Trace Stat.	5% Crit. Value	Max. Eigenvalue Stat.	5% Crit. Value
$r = 0$	37.18*	29.68	16.65	20.97
$r \leq 1$	11.65	15.41	10.75	14.07
$r \leq 2$	1.73	3.76	0.93	3.76

Source: Author's Computation using STATA 14

The Johansen test result presented in Table 4.19 shows that the null hypothesis of no cointegration vector cannot be rejected as both the trace and maximum Eigenvalue statistics are mostly less than the 5% critical values and not fulfilling the condition of at least two cointegrating vectors. This result implies that a long run relationship does not exist between government recurrent expenditure on education, tertiary enrolment rate and poverty rate.

The cointegration results above makes the vector autoregressive (VAR) approach the most appropriate since we have a case of non-stationary time series at levels and no cointegrating vector.

Vector Autoregressive Model Estimation and Testing

Lag Selection Criteria

Table 4.20 shows that lag-order selection criteria results. The result shows five (5) criterion statistics. Though the Akaike's information criterion and LR test are our primary concern, the result shows that four of the criteria suggested four lags. We therefore proceed by estimating VAR with two lag.

Table 4.20: Selection Order Criteria Result for Poverty Model III

Lag	LR	FPE	AIC	HQIC	SBIC	P
0		.029775	4.99943	5.04225	5.14342	
1	80.30	.002982	2.69198	2.86324	3.26791*	0.000
2	12.51	.003765	2.89542	3.19512	3.9033	0186
3	19.87	.003786	2.82636	3.25449	4.26618	0.019
4	32.64*	.002557*	2.28417*	2.84074*	4.15594	0.000

Source: Author's Computation using STATA

Post Estimation Tests

Autocorrelation Test

Table 4.21: Lagrange-Multiplier (LM) test for autocorrelation (VAR with one lag)

Lag	chi2	Df	Prob>chi2
1	17.70	9	0.04
2	10.91	9	0.28
3	7.88	9	0.55
4	7.98	9	0.54

H0: no autocorrelation at lag order

Source: Author's Computation using STATA

The autocorrelation test is done using the Lagrange-Multiplier (LM) test of residuals. The LM test of autocorrelation result presented in table 4.21 above shows that we can reject the null hypothesis of no autocorrelation in the residuals at 5% level of significance at three lags out of the four lag orders.

Normality Test

The text for the normality of the residuals was done through the Jarque-Bera test. Table 4.22 shows that we can reject the null hypothesis of normally distribution of residuals for two of the individual equations. Though this test failed, it is worthy of mention that this phenomenon is common and will not necessarily and crucially distort the final results.

Table 4.22: Jarque-Berra test for normality (VAR with one lag)

Equations	chi2	Df	Prob>chi2
D_lpov	0.520	2	0.77090
D_lter	76.665	2	0.00000
D_lgree	1.028	2	0.59814
ALL	78.213	6	0.00000

H0: residuals are normally distributed

Source: Author's Computation using STATA

VAR Model Estimation

Table 4.23 below shows the short run VAR result. The column labelled *Dlpov* is the estimated poverty rate model III. The coefficient of lag 4 of *lter* (tertiary enrolment rate) has a positive sign as reported to be 0.62. The result shows that a 1% increase in four lag of tertiary enrolment rate led to 0.62% increase in poverty rate during the study period. The p-value in parentheses shows that the coefficient of *lter* is not statistically significant at even 10% level of significance. Moreover, the coefficient of *lgree* (government recurrent expenditure in education) has a positive sign as reported to be 0.03. The result shows that a 1% increase in four lag of *lgree* led to 0.03% increase in poverty rate during the study period. The p-value in parentheses shows that the coefficient of *lgcscse* is also not statistically significant at even 10% level of significance.

Moreover, table 4.23 also shows a column labelled *Dlter* as the estimated tertiary enrolment rate model. The coefficient of lag 4 of *lpov* (poverty rate) has a negative sign as reported to be -0.12. The result shows that a 1% increase in four lag of poverty rate led to 0.16% decrease in primary school enrolment rate during the study period. The p-value in parentheses shows that the coefficient of *lpov* is statistically significant at 5% level of significance. Moreover, the coefficient of *lgree* (government recurrent expenditure on education) has a positive sign as reported to be 0.02. The result shows that a 1% increase in four lag of *lgree* led to 0.39% increase in tertiary enrolment rate during the study period. The p-value in parentheses shows that the coefficient of *lgree* is statistically significant at 1% level of significance.

Table 4.23: VAR Estimation Results for Poverty Model III

		Equations (N = 45)		
Elements (I.e. exogenous)		Dlpov	Dlter	Dlgree
Lpov	L4	0.16 (0.42)	0.19 (0.79)	2.44** (0.04)
Lter	L4	0.62 (0.22)	-0.12 (0.48)	0.35 (0.23)
Lgree	L4	0.03 (0.23)	0.39*** (0.00)	0.49*** (0.00)

P-values in parentheses (*** significant at 1%; ** significant at 5%; and * significant at 10%)
Source: Author's Computation using STATA 14

Granger Causality Test

Table 4.24 below shows the granger causality test (using the chi2 statistics) result based on the *lpov* estimated VAR model. The table provided individual and joint granger causality test results and the following was observed:

(i) Individual Causality

(a) Poverty Rate Equation

The p-value of the chi2 statistics of *Dlter* is 0.22. This shows that *Dlter* is not significant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that tertiary enrolment rate does not granger causes poverty rate in Nigeria during the period of study. Moreover, the p-value of the chi2 statistics of *Dlgree* is 0.23. This shows that *Dlgree* is not also significant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that government recurrent expenditure on education does not granger causes poverty rate in Nigeria during the period of study.

(b) Tertiary Enrolment Rate

The p-value of the chi2 statistics of *Dlpov* is 0.79. This shows that *Dlpov* is not significant even at 10% level of significance. Hence, the null hypothesis of no causality cannot be rejected as we conclude that poverty rate does not granger causes tertiary enrolment rate in Nigeria during the period of study. Moreover, the p-value of the chi2 statistics of *Dlgree* is 0.00. This shows that *Dlgree* is significant at 1%. Hence, the null hypothesis of no causality can be rejected as we conclude that government recurrent expenditure on education granger causes tertiary enrolment rate in Nigeria during the period of study.

(ii) Joint Causality

The p-value of the chi2 statistics of joint causality of *Dlter* and *Dlgree* in the estimated *lpov* model is 0.06. This result shows that *Dlter* and *Dlgree* combined significantly to granger cause poverty rate in Nigeria during the period of study.

Table 4.24: Granger Causality Tests Based on Poverty VAR Model III

	chi2Statistics (p-values)			
Dependent Variables	Dlpov	Dlter	Dlgree	Joint Causality
Dlpov		1.5293	1.4180	5.4955*
	-	(0.22)	(0.23)	[0.06]
Dlter	0.0744	-	18.4220***	34.3440***
	[0.79]		[0.00]	[0.00]
Dlgree	4.157**	1.4215		7.13**
	[0.00]	[0.23]	-	[0.03]

P-values in parentheses (*** significant at 1%; ** significant at 5%; and * significant at 10%)

Source: Author's Computation using STATA

Poverty Model IV

This model investigated the impact of government capital expenditure on education on poverty reduction in Nigeria. To achieve this, the study estimated a VAR model that includes government capital expenditure on education, tertiary enrolment rate and poverty rate.

Stationarity Tests

Tables 4.25 and 4.26 shows the unit root tests (i.e. Augmented Dickey-Fuller and Phillips-Perron) results at levels and first difference respectively for the time series used in the poverty model IV. The results in table 4.25 confirm the expected unit root in the time series at levels. The ADF and PP test result shows that the null hypothesis of unit root cannot be rejected.

Table 4.25: ADF and PP Unit Root Test Results at Level

	ADF			PP		
Variables	Constant	Constant and Trend	None	Constant	Constant and Trend	None
LPOV	-2.39	-1.27	0.54	-2.83	-3.05	0.66
LGCSCSE	-0.50	-2.33	0.99	-0.52	-3.45	0.63
LTER	-0.97	-2.99	1.70	-1.58	-5.96*	1.39
	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95	5% Critical Value = -2.97	5% Critical Value = -3.56	5% Critical Value = -1.95

Source: Author's Computation using STATA
* implies significance at 5% level of significance.

Table 4.26 shows the ADF and PP unit root test results after first differencing of the time series. The null hypothesis of unit root can be rejected. All the time series were stationary at 5% level of significance.
The unit root tests shows that all the time series had unit root at levels but became stationary after differencing once.

Table 4.26: Unit Root Test after First Difference

	ADF			PP		
Variables	Constant	Constant and Trend	None	Constant	Constant and Trend	None
LPOV	-7.96*	-8.44*	-8.00*	-7.96*	-8.44*	-8.00*
LGCSCSE	-9.00*	-8.83*	-8.55*	-9.00*	-8.83*	-8.55*
LTER	11.59*	11.38*	11.03*	11.59*	11.38*	11.03*
	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95	5% Critical Value = -2.98	5% Critical Value = -3.56	5% Critical Value = -1.95

Source: Author's Computation using STATA 14
* implies significance at 5% level of significance.

Cointegration Test

Table 4.27: Johansen Test for Cointegration for Poverty Model IV

Null Hypothesis	Trace Stat.	5% Crit. Value	Max. Eigenvalue Stat.	5% Crit. Value
$r = 0$	38.95*	29.68	20.84	20.97
$r \leq 1$	14.11	15.41	13.94	14.07
$r \leq 2$	1.08	3.76	0.08	3.76

Source: Author's Computation using STATA 14

The Johansen test result presented in Table 4.27 shows that the null hypothesis of no cointegration vector cannot be rejected as both the trace and maximum Eigenvalue statistics are mostly less than the 5% critical values and not fulfilling the condition of at least two cointegrating vectors. This result implies that a long run relationship does not exist between government capital expenditure on education, tertiary enrolment rate and poverty rate.

The cointegration results above makes the vector autoregressive (VAR) approach the most appropriate since we have a case of non-stationary time series at levels and no cointegrating vector.

Vector Autoregressive Model Estimation and Testing

Lag Selection Criteria

Table 4.28 shows that lag-order selection criteria results. The result shows five (5) criterion statistics. Though the Akaike's information criterion and LR test are our primary concern, the result shows that four of the criteria suggested four lags. We therefore proceed by estimating VAR with two lag.

Table 4.28: Selection Order Criteria Result for Poverty Model IV

Lag	LR	FPE	AIC	HQIC	SBIC	P
0		.014781	4.29915	4.34196	4.44313	
1	81.74	.001404	1.93861	2.10987	2.51454*	0.000
2	23.84	.001165	1.72222	2.02192	2.7301	0.005
3	19.95	.001168	1.65012	2.07826	3.08994	0.018
4	32.99*	.000778*	1.09482*	1.6514*	2.96659	0.000

Source: Author's Computation using STATA

Post Estimation Tests

Autocorrelation Test

Table 4.29: Lagrange-Multiplier (LM) test for autocorrelation (VAR with four lag)

Lag	chi2	Df	Prob>chi2
1	17.90	9	0.04
2	10.91	9	0.28
3	7.95	9	0.59
4	8.02	9	0.65

H0: no autocorrelation at lag order

Source: Author's Computation using STATA

The autocorrelation test is done using the Lagrange-Multiplier (LM) test of residuals. The LM test of autocorrelation result presented in table 4.29 above shows that we can reject the null hypothesis of no autocorrelation in the residuals at 5% level of significance at three lags out of the four lag orders.

Normality Test

The text for the normality of the residuals was done through the Jarque-Bera test. Table 4.30 shows that we can reject the null hypothesis of normally distribution of residuals for two of the individual equations. Though this test failed, it is worthy of mention that this phenomenon is common and will not necessarily and crucially distort the final results.

Table 4.22: Jarque-Berra test for normality (VAR with one lag)

Equations	chi2	Df	Prob>chi2
D_lpov	0.898	2	0.63818
D_lter	113.015	2	0.00000
D_lgcscse	0.037	2	0.98168
ALL	113.950	6	0.00000

H0: residuals are normally distributed

Source: Author's Computation using STATA

VAR Model Estimation

Table 4.31 below shows the short run VAR result. The column labelled *Dlpov* is the estimated poverty rate model IV. The coefficient of lag 4 of *lter* (tertiary enrolment rate) has a positive sign as reported to be 0.06. The result shows that a 1% increase in four lag of tertiary enrolment rate led to 0.06% increase in poverty rate during the study period. The p-value in parentheses shows that the coefficient of *lter* is not statistically significant at even 10% level of significance. Moreover, the coefficient of *lgcscse* (government capital expenditure on education) has a positive sign as reported to be 0.04. The result shows that a 1% increase in four lag of *lgcscse* led to 0.04% increase in poverty rate during the study period. The p-value in parentheses shows that the coefficient of *lgcscse* is also not statistically significant at even 10% level of significance.

Moreover, table 4.24 also shows a column labelled *Dlter* as the estimated tertiary enrolment rate model. The coefficient of lag 4 of *lpov* (poverty rate) has a positive sign as reported to be 1.38. The result shows that a 1% increase in four lag of poverty rate led to 1.38% increase in tertiary enrolment rate during the study period. The p-value in parentheses shows that the coefficient of *lpov* is statistically significant at 5% level of significance. Moreover, the coefficient of *lgcscse* (government capital expenditure on education) has a negative sign as reported to be -0.04. The result shows that a 1% increase in four lag of *lgcscse* led to 0.04% decrease in tertiary enrolment rate during the study period. The p-value in parentheses shows that the coefficient of *lgcscse* is statistically significant at 5% level of significance.

Table 4.31: VAR Estimation Results for Poverty Model IV

		Equations (N = 45)		
Elements (I.e. exogenous)		Dlpov	Dlter	Dlgcscse
		0.23	1.38**	2.58***
Lpov	L4	(0.18)	(0.04)	(0.00)
		0.06	-0.04	0.48**
Lter	L4	(0.26)	(0.87)	(0.05)
		0.04	0.30**	0.42***
Lgcscse	L4	(0.26)	(0.02)	(0.01)

P-values in parentheses (*** significant at 1%; ** significant at 5%; and * significant at 10%)

Source: Author's Computation using STATA 14

Granger Causality Test

Table 4.32 below shows the granger causality test (using the chi2 statistics) result based on the *lpov* estimated VAR model IV. The table provided individual and joint granger causality test results and the following was observed:

(i) Individual Causality

(a) Poverty Rate Equation

The p-value of the chi2 statistics of *Dlter* is 0.26. This shows that *Dlter* is not significant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that tertiary enrolment rate does not granger causes poverty rate in Nigeria during the period of study. Moreover, the p-value of the chi2 statistics of *Dlgcscse* is 0.26. This shows that *Dlgcscse* is not also significant even at 10%. Hence, the null hypothesis of no causality cannot be rejected as we conclude that government capital expenditure on education does not granger causes poverty rate in Nigeria during the period of study.

(b) Tertiary Enrolment Rate

The p-value of the chi2 statistics of *Dlpov* is 0.04. This shows that *Dlpov* is significant even at 5% level of significance. Hence, the null hypothesis of no causality can be rejected as we conclude that poverty rate granger causes tertiary enrolment rate in Nigeria during the period of study. Moreover, the p-value of the chi2 statistics of *Dlgcscse* is 0.02. This shows that *Dlgcscse* is significant at 5%. Hence, the null hypothesis of no causality can be rejected as we conclude that government capital expenditure on education granger causes tertiary enrolment rate in Nigeria during the period of study.

(ii) Joint Causality

The p-value of the chi2 statistics of joint causality of *Dlter* and *Dlgcscse* in the estimated *lpov* model is 0.07. This result shows that *Dlter* and *Dlgcscse* combined significantly to granger cause poverty rate in Nigeria during the period of study.

Table 4.32: Granger Causality Tests Based on Poverty VAR Model IV

	chi2Statistics (p-values)			
Dependent Variables	Dlpov	Dlter	Dlgcscse	Joint Causality
Dlpov		1.261	1.274	5.33*
	-	(0.26)	(0.26)	[0.07]
Dlter	4.05**	-	5.3891**	16.74***
	[0.04]		[0.02]	[0.00]
Dlgcscse	10.44**	3.89**		22.32***
	[0.00]	[0.05]	-	[0.00]

P-values in parentheses (*** significant at 1%; ** significant at 5%; and * significant at 10%)

Source: Author's Computation using STATA

Conclusion and Recommendation

Conclusion

This work investigated of the dynamic relationship between government investment on education and poverty level in Nigeria from 1980 to 2015. The study employed unrestricted vector autoregressive (VAR) approach and granger causality, test to establish the dynamic linkage relationship between government investment on education, educational outcome, and

poverty rate in Nigeria. Based the findings, the study concluded that government recurrent spending in the education sector did not impact on poverty rate through primary school enrolment rate. Government recurrent expenditure on education directly impacted on poverty rate without increasing primary school enrolment rate. Conclusively, government recurrent spending on education has not succeeded in reducing poverty rate in Nigeria; as result shows that despite increase in government recurrent expenditure on education, poverty rate is still increasing. Government recurrent expenditure on education was also ineffective in increasing primary school enrolment rate and reducing poverty. Again, this study also discovered that government capital expenditure on education, though couldn't reduce poverty, increased primary school enrolment rate during the period covered by the study. Increase in primary school enrolment rate was not sufficient for poverty reduction. Moreover, government recurrent expenditure on education directly impacted on increase in tertiary enrolment rate but not reduction in poverty rate. Relationship exists between government recurrent expenditure on education, tertiary enrolment rate, and poverty rate. Lastly, this study concludes that government capital expenditure increased tertiary enrolment rate but did not reduce poverty rate. Government capital expenditure on education and tertiary enrolment rate has contributed to poverty rate in Nigeria during the study period.

Recommendations

i. Expansionary Fiscal Policy in Educational spending: It is not over statement to say that government spending on the educational sector has proven to be inadequate in reducing poverty through channels such as high school enrolment rate and capacity building. Hence, this study recommends an expansionary fiscal policy on education financing to meet the United Nation's 26% benchmark.

ii. Institutional Improvement Policies: Poor performance of a nation's educational sector are more often caused by the weak institutions for managing resources, structures of ownership and control, notably state-owned or state controlled monopolies. High-quality institutions that promote development are at the heart of good governance, including a regulatory apparatus in curbing fraud and promoting commitment on the part of teachers and administrators of schools. A strategic thinking regarding economic development is that the quality of institutions is the deep fundamental factor that determines which countries experience good performance and which do not.

iii. Recruitment of qualified curriculum developers: Qualified manpower should be employed to draw a functional and meaningful curriculum that will make school leavers to be more employable.

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