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Education and Nigeria Economic Growth Nexus: A VECM Approach

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Abstract:- This study used annual data from 1970 to 2019 to test hypotheses formed using econometric techniques about the relationship between education and economic growth in Nigeria. The implementation of cointegration analysis and vector error correction model captured long-run and short-run relationships among variables in this regard (VECM). Cointegration was performed using Johansen co-integration tests, with the outcome requiring VECM. To evaluate the study duration, ex-ante and ex-post forecasting using variance decomposition and impulse response were used. The study also used an F-/Wald test simulation to look at short run causality relationships between series using the VECM Granger causality method. Both real education expenditure and credit to the private sector have positive relationships with economic growth, according to the empirical findings. Both human capital and the secondary school enrolment ratio affect economic growth, according to the VECM Granger causality result. A closer examination of the impulse response mechanism reveals that human capital can have a positive long-term and short-term impact on economic growth. Furthermore, studies show that credit to the private sector has always played an important role in contributing to economic growth. Based on the results, the study suggests that government improve investment in infrastructure and projects that will help education grow.

Keywords:- *Education, Economic Growth; Cointegration Test; VECM, Nigeria.*

I. INTRODUCTION

In order to achieve economic growth and development, education is essential. It is known as an investment in human capital because of the benefits to a person over a lifetime of activities (Mohun, Dookhan & Fauzel, 2010). All growth and development achievements, from agricultural innovations to private sector growth, health advancement, and efficient public administration, are made possible by the human mind (King, 2011). To completely reap these benefits, countries must unleash the human mind's capacity, which can only be realized through education.

There are many points of view and schools of thought on the relationship between education and economic development, many of which are supported by empirical evidence from cross-national and country-specific studies. Nonetheless, the majority of them seem to believe that schooling is beneficial to all economies and should be vigorously pursued by all. At least four mechanisms by which education can influence economic growth are highlighted in the theoretical growth literature. To begin with, the real per capita GDP growth rate suggests that years of secondary and higher education lead positively to economic growth (Mohun et al, 2010).

Second, education will aid in the dissemination and transmission of knowledge necessary for comprehending new information and successfully implementing new technology developed by others (Benhabib & Spiegel, 1994). Third, education will increase the intrinsic human capital in the labor force, resulting in increased labor productivity and, as a result, transitional growth to a higher equilibrium level of production (Mankiw, Romer & Well, 1992). Fourth, education can boost the economy's innovation potential, and new information about new technology, goods, and processes that boosts growth (Romer, 1990).

Regardless of these theoretical predictions, empirical evidence on the effect of education on economic growth is at best shaky. This seems to be due in large part to measurement issues. Human capital was seen as an alternative driver of economic growth to technological change in models linking education and economic growth. However, in order to improve human resources, the country must increase its educational spending. The production level is a function of the stock of human capital, according to Uzawa (1965), which was later updated by Lucas (1988), and sustained growth in the long run is only possible if human capital grows without bond.

This is a departure from the conventional measure of educational achievement, which is the number of years spent in school. The word 'human capital,' as used by Uzawa-Lucas, seems to be closely linked to intelligence rather than skills gained through schooling. Economists often recognize that a year of schooling would not yield the same cognitive abilities in all places (Hanushek & Wobmann, 2010). According to Mohun et al. (2010), shifts in educational attainment have an effect on an economy's long-run growth rate.

Education investments are often widely debated as an externality of economic development, as they increase labor and capital productivity, resulting in increased profits. A state's education investments are non-random, according to Bils & Klenow (2000), as stated by Aghion, Boustan, Hoxby

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& Vandenbussche (2009). States that are wealthier, have a higher rate of growth, or have stronger institutions are more likely to increase their education spending. As a result, there's a good chance that associations between education spending and economic growth are due to reverse causality. Long-term growth effects are also important, as the more trained the population is, the more it is able to adopt technical innovations.

The purpose of this paper is to assess Nigeria's economic growth in relation to education from 1970 to 2019, as well as to contribute to the current literature by bringing new information on the relationship between education and economic growth, and to see whether enrolment sheds some light on the argument that education plays a central role in growth. Is it possible to give the potential position of the total number of years spent in secondary school a solid economic foundation? Does government spending on education, as it is commonly described and known, capture the growth effects of education? The rest of the paper is laid out as follows. A brief overview of the literature is presented in Section 2. The methodology used to explain the relationship between education and economic growth is described in Section 3. The findings are presented in Section 4 of the study. In section 5, we wrap up and make recommendations.

II. LITERATURE REVIEW

According to Pritchett (2001), the growth of least developed economies has been slowed by weak institutions and bad policies that steer skilled labor into relatively unproductive activities, thereby undermining the statistical relationship between education and growth in samples that involve less-developed economies. In their research, Krueger and Lindahl (2001) found that panel data exacerbates the issue of unobserved heterogeneity in educational quality. They demonstrate that increasing the stock of schooling improves short-run economic growth when data quality is taken into account.

Direct measures of labor-force quality derived from international mathematics and science test scores are strongly linked to development, according to Hanushek and Kimko (2000). Lin (2003) investigated the connection between economic development, education, and technological advancement. All of the variables are linked and positively correlated, as he has shown. Lin (2004) investigated the relationship between economic growth and higher education, which he discovered to be also positively correlated.

The relationship between education and economic growth was examined by Mankiw et al (1992) and Barro (1991). They looked at differences in school enrolment rates using a single cross-section in both developed and developing countries. Both studies found that education has a substantial positive effect on real GDP growth rates. Barro & Sala-i-Martin (1995) looked into the effects of government educational spending. Their results revealed a significant positive effect.

Their regressions estimate that the annual rate of return on public education is on the order of 20%, using instrumental variable methods to control for simultaneous causation. Self & Grabowski (2004) demonstrated that primary and secondary education are not only closely linked to the country's economic development, but also have a significant effect on it. Their research also discovered that all stages of education are interconnected. Nonetheless, the results revealed disparities in the effects of primary, secondary, and tertiary education on economic development, with tertiary education not appearing to have a causal effect. In their research on the causal relationship between Nigerian government budget allocation to the education sector and economic development, Ejiogu, Ihugba & Nwosu (2013) discovered a positive relationship between education expenditure and GDP, while gross fixed capital formation was negatively linked to GDP. Odior (2011) claims that a number of empirical studies have established a connection between government education spending and economic development.

These studies back up the growth links that result from government spending on growth. Permani (2009) concluded in his thesis on East Asian development strategy that this area places a greater focus on education. In East Asia, his research discovered a positive relationship between education and economic development. Meanwhile, education and economic growth have a bidirectional causal relationship. Pradhan (2009) backed up this conclusion, demonstrating that schooling has a high economic value and should be considered a national asset. He proposed that this capital be invested, and that his nation, India, should capitalize on human capital growth in addition to physical capital development.

III. METHODOLOGY

3.1Data Source

The study relied on secondary data, the majority of which came from the World Bank. The study's scope spans the years 1970 to 2019. For time series processing, all data will be converted to a log-log equation. As a result, the coefficient can be thought of as an elasticity. Table 1 lists the variables as well as their sources.

Table 1: Measurement of Variables and Data Sources

S/No	Variables	Measurement	Sources of Data
1.	Economic growth (GDPPC)	GDP per capita (constant 2010 US $), it is a proxy for the level of economic growth.	https://data.worldbank.org/indicator
2.	Gross domestic investment(GDI)	This refers to government expenditure on machinery, plant, equipment purchases and land improvements (fences, drains, ditches, and so on). It also includes the construction of railways, roads, private residential dwellings, and industrial buildings.	https://data.worldbank.org/indicator
3.	Human capital (HCAP)	Average years of secondary schooling, representing the numbers of years in school	https://data.worldbank.org/indicator
4.	Total real education expenditure (REDXP)	Total government education expenditure (capital, current and transfers). It requires spending that is financed by foreign transfers to the government. Local, state, and federal governments are all included in total government spending (in billions).	https://data.worldbank.org
5.	Secondary school enrolment ratio (SSER)	The ratio of children of the official secondary school age who are enrolled in secondary school to the total population of the official secondary school age.	https://data.worldbank.org/indicator
6.	Credit to the private sector as a ratio of GDP (CPS)	It refers to financial services given to the private sector by financial companies in the form of loans, trade credits, non-equity debt purchases, and other accounts receivable, all of which create a claim for repayment.	https://data.worldbank.org/indicator

Source: Compilation of Researchers, 2021

3.2 Model Specification

In any economy, the amount of economic output is thought to be determined by factors of production. This can be described as follows:

$$Y = f(A, K, L) \quad (1)$$

Where K represents the amount of capital (Gross domestic investment) and L represents the amount of labor, and Y is proxied by Real GDP per capita to reflect economic growth (secondary school enrolment ratio). We consider a Cobb-Douglas type of production (although restrictive) based on the work of Rivera-Batiz (2004) and NZue (2011), as stated by Ajide (2014) which is specified as follows;

$$Y = AL^{\alpha}K^{\beta} \quad (2)$$

Where K and L have been defined previously, and A is a parameter that captures the effects of other production factors. A is a measure of Total Factor Productivity (TFP) in technical terms, but it is through it that the analysis hopes to capture the effects of total education spending and private sector credit on economic development. Changes in A are thought to capture technical changes in the past (Solow, 1956). However, it's possible that these aren't entirely due to technological advancements. Other factors such as war, natural disasters, and economic changes can also have an impact across A channels. As a result, we define an explicit model with some additional control variables, and thus we have:

$$GDPPC = f(GDI, REDXP, HCAP, SSER, CPS)$$

$f_1 > 0, f_2 > 0, f_3 > 0, f_4 > 0, f_5 > 0;$

This means that all the identified variables have positive relationship with economic growth.

Where:
GDPPC = Real GDP per capita;
GDI = Gross domestic investment;
REDXP = Real education expenditure;
HCAP = Human capital, proxied by number of years spent in secondary school;
SSER= Senior secondary enrolment ratio;
CPS = Credit to the private sector;

Equation 3 can be written in the econometric model and in their respective natural log form as thus;

$$LGDPPC_t = \beta_0 + \beta_1 LGDI_t + \beta_2 LREDXP_t + \beta_3 LHCAP_t + \beta_4 LSSER_t + \beta_5 LCPS_t + \varepsilon \quad (4)$$

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In the production function, LGDPPC is the natural log of Real GDP per capita; LGDI is the natural log of gross domestic investment; LREDXP is the natural log of real education expenditure; LHCAP is the natural log of human capital, proxied by number of years spent in secondary school; LSSER is the natural log of senior secondary enrolment ratio; LCPS is natural log of credit to the private sector; L is natural logarithm; β_0 is the intercept or autonomous parameter estimate; $\beta_1 \ldots\ldots \beta_5$ is the Parameter estimate associated with the determinants of economic growth in Nigeria and ε_t is the stochastic error term.

The estimation method is divided into five steps: first, unit root test; second, lag selection; third, cointegration test; fourth, estimation of the error correction model; fifth, Granger Causality; and sixth, VAR stability model. The following hypotheses are used to assess the causality and co-integration of GDPPC and LGDI, LREDXP, LHCAP, LSSER, and LCPS. I Whether GDPPC and the independent variables have a short-run relationship in Nigeria; (ii) Whether GDPPC and LGDI, LREDXP, LHCAP, LSSER, and LCPS have a long-run relationship in Nigeria.

IV. DATA PRESENTATION AND ANALYSIS

The analysis will be divided into two namely; descriptive statistics and empirical analysis.

4.1 Descriptive Statistics

Table 2. Descriptive Statistics Summary (1970-2019).

	LGDPPC	LGDI	LREDXP	LHCAP	LCPS	LSSER
Mean	4.19	27.37	3.68	6.32	2.12	3.10
Median	4.34	27.55	3.97	6.00	2.09	3.30
Maximum	5.82	30.50	5.67	7.00	2.98	4.00
Minimum	2.20	23.50	0.60	6.00	1.55	1.50
Std. Dev.	1.20	2.27	1.54	0.47	0.36	0.71
Skewness	-0.15	-0.08	-0.28	0.77	0.45	-1.06
Kurtosis	1.62	1.56	1.77	1.60	2.44	2.95
Jarque-Bera	4.17	4.39	3.80	9.07	2.31	9.45
Probability	0.12	0.11	0.15	0.01	0.32	0.01
Sum	209.39	1368.40	183.97	316.00	106.09	154.90

Source: Authors computation using Eviews 9, 2021.

Table 2 provides a summary of descriptive statistics, including sample means, medians, maximums, minimums, standard deviations, skewness, kurtosis, and p-values for the Jarque-Bera tests. All of the statistics, for example, normality in the form of platykurtic, display the features common to most time series. However, there are a few notable variations between the variables. To begin, the unconditional average of gross domestic investment is 27.37 percent, while the unconditional average of credit to the private sector is 2.12 percent. The standard deviation indicates how volatile the variables are. It shows the rate at which each variable deviates from its mean. According to the table above, gross domestic investment is the most volatile at 2.27 percent, while private sector credit is the least volatile at 0.36 percent. The skewness of the data is an indicator of how asymmetric it is.

4.2 Series Trend Analysis

Data in time series also shows rising or declining patterns, as well as fluctuations. As a result, trend analysis is needed before unit root testing in order to determine if the series has a unit root. With the exception of the inflation rate, the results of the graphical display in Figure 1A suggest that the series exhibit a random walk with drift and trend. The series in Figure 1B indicate a trend with a pattern of significant fluctuations, indicating that they are non-stationary.

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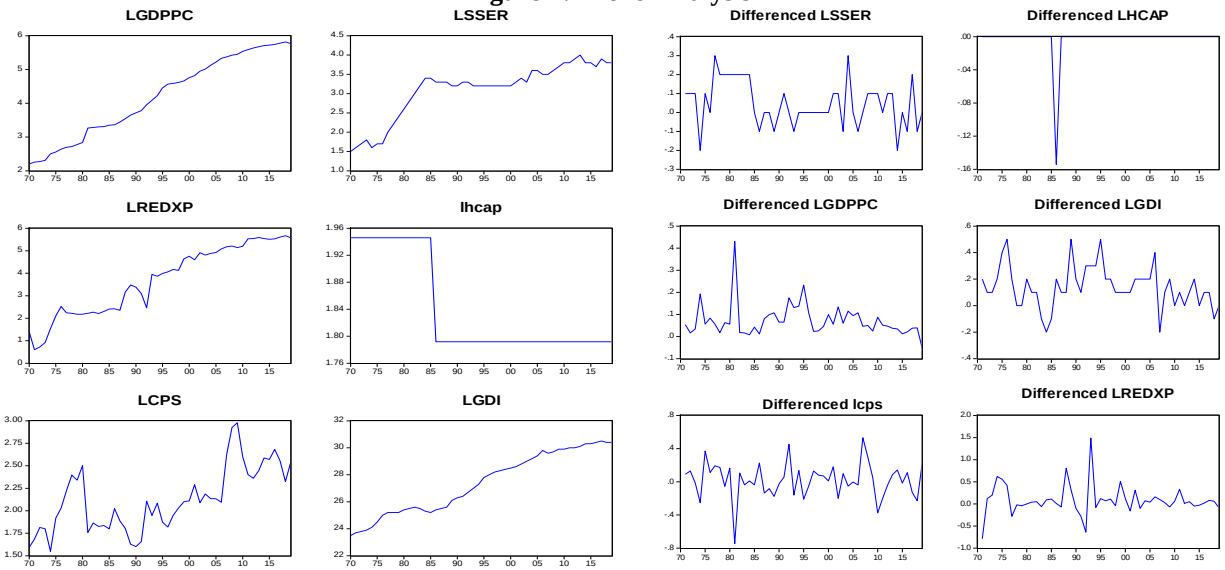
Figure 1: Trend Analysis



A: The Series In Their Raw (Undifferentiated) Form
Source: Researcher's Computation Using Eviews 9

B: Results Of The Series Trend Test After First Difference
Source: Researcher's Computation Using Eviews 9

4.3 Stationarity Test

4.3.1 Unit Root Tests

The unit root tests will be conducted using Ender's (2014) method. A pattern and intercept will be included in the ADF second level test, but none will be included in the ADF third level test. Finally, the data will be compared for the first time. The series was calculated using the methods of Dickey & Fuller (1979) and Davidson & Mackinnon (1993). Table 3 summarizes the results of the ADF tests at level, constant & trend, none, and first difference.

When evaluated at the level with a constant and constant & trend, all of the variables are non-stationary, as indicated by the asterisk. As a result, we conclude that the series for all variables are non-stationary, since data is stationary when ADF test statistics are less than critical values at the critical points $5\%(ADF\ test\ statistics < test\ critical\ value\ at\ 5\%)$. . The series for all the variables, however, are stationary at first difference, as shown by the asterisk, since data is stationary when ADF test statistics are less than the test critical values at first difference $5\%(ADF\ test\ statistics < test\ critical\ value\ at\ 5\%)$. All series are non-stationary at the level but stationary at the first difference, according to the ADF test. According to Wakyereza (2017), the choice of the lag period (p) affects ADF tests and causes power loss when estimating a broad sample. The ADF tests will be validated using the Phillips–Perron (PP) test.

Table 3: Unit Root Tests Result

Variables	ADF Test Statistic				PP Test Statistic			
	Constant	Constant & Trend	None	First Difference	Constant	Constant & Trend	None	First Difference
LGDPPC	-0.34	-0.85	0.89	-6.27*	-0.67	-1.04	0.72	-6.35*
LREDXP	-0.99	-3.33	1.24	-8.23*	-1.82	-1.40	2.88	-10.45*
LGDI	-1.17	-1.54	2.84	-4.65*	-1.25	-1.34	4.39	-4.62*
LCPS	-2.25	-3.02	0.28	-7.33*	-2.07	-3.11	1.06	-8.66*
LHCAP	-1.45	-1.59	-1.06	-6.93*	-1.45	-1.62	-1.06	-6.93*
LSSER	-1.16	-1.50	-0.13	-6.00*	-1.27	-1.50	-0.18	-5.96*

Notes (ADF): Test critical values at 5% (level: constant = -2.92, constant and trend = -3.50, none = -1.94, while at First difference = -2.92); P-value = Probability value, * denotes stationarity.
Notes (PP): Test critical values at 5% (level: constant = -2.92, constant and trend = -3.50, none = -1.94, while at First difference = -2.92); P-value= Probability value, * denotes stationarity.

4.3.2 Unit Root Test (PP) by Phillips–Perron

In comparison to the ADF test, the Philips-Peron (PP) test has an advantage. The benefits include the fact that PP tests do not require lag selection and are based on serially correlated regression error terms, while ADF tests do. In the errors term (u_t), the PP test corrects any heteroscedasticity and serial correlation. The null for PP, like the ADF test, is based on the assumption that the series are non-stationary (Wakyereza, 2017). The PP test's results are described in Table 3 above. According to the findings, the series are non-

stationary at the level but stationary at the first difference. The variables are shown in their differenced form in Figure 1B. The use of the VAR model for estimation is justified as a result of this result.

4.4 Lags Determination

Table 4 shows the results of lag-order selection. The SC, FPE, HQIC, LR, and AIC criteria all indicate a one-step lag order. The AIC value is the smallest. As a result, the analysis will continue with further lag checks (1).

Table 4: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-60.49518	NA	7.26e-07	2.891095	3.129613	2.980445
1	214.4262	466.1711*	2.27e-11*	-7.496792*	-5.827163*	-6.871339*
2	244.5615	43.23762	3.17e-11	-7.241806	-4.141066	-6.080250
3	276.9656	38.03952	4.62e-11	-7.085460	-2.553609	-5.387801
4	313.9957	33.81011	7.09e-11	-7.130247	-1.167286	-4.896486

Source: Researcher's calculations from Eviews 9, 2021. * indicates lag order selected by the criterion

4.5 Cointegration Test

All variables been integrated to order one $I(1)$, the next step is to perform cointegration test. Due to the fact that there are multivariate time series, the multivariate cointegration technique proposed by Johansen (1995) is applied to determine whether there are stable long-run relationship.

Table 5: Cointegration Results

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	136.7350	95.75366	0.0000	None	36.22711	40.07757	0.1275
At most 1 *	100.5079	69.81889	0.0000	At most 1	28.67187	33.87687	0.1842
At most 2 *	71.83603	47.85613	0.0001	At most 2	26.64523	27.58434	0.0656
At most 3 *	45.19079	29.79707	0.0004	At most 3 *	21.30505	21.13162	0.0473
At most 4 *	23.88574	15.49471	0.0022	At most 4 *	15.52748	14.26460	0.0314
At most 5 *	8.358269	3.841466	0.0038	At most 5 *	8.358269	3.841466	0.0038

Source: Researcher's calculations from Eviews 9, 2021.
* Denotes rejection of the null hypothesis at the 0.05 level.

Table 5 shows that all of the variables have a long-run economic relationship, as both the trace and Max-Eigen statistics suggested a 5 & 3 cointegrating equation among the variables for the Trace and Eigen statistics, respectively. The VECM model can now be calculated to detect the short-term and long-term dynamics of the variables used, based on the results in table 5.

4.6 Estimation with the Vector Error Correction Model (VECM)

Table 6: Result of Error Correction

	Coefficient	Std. Error	t-Statistic	Prob.
ECT	-0.092573	0.048308	-1.916315	0.0625
D(LGDPPC(-1))	0.170761	0.195317	0.874278	0.3872
D(LGDI(-1))	0.126785	0.076888	1.648953	0.1070
D(LREDXP(-1))	0.080576	0.042654	1.889054	0.0661
D(HCAP(-1))	0.015229	0.074745	0.203742	0.8396
D(LCPS(-1))	0.110635	0.064433	1.717042	0.0937
D(LSSER(-1))	0.120685	0.095472	1.264090	0.2135
C	0.027683	0.019300	1.434372	0.1592

Source: Researcher's calculations from Eviews 9, 2021.

The error correction in Table 6 is -0.092573. The negative term shows how the disequilibrium between the short and long run eventually vanishes (Ihugba, 2020). As a result, the short-run output values will gradually converge to the long-run direction, with an annual adjustment of 9%.

4.7 Simultaneous Equation Short-Run Simulation and Analysis

The results of the short-run test are presented below:

Table 7: Wald Tests and Short-run Test

Dependent Variable: DLGDPPC			
Variables	**Chi-square test**	**Prob.**	**Relationship**
D(LGDI(-1))	2.72	0.09	Short-run causality
D(LREDXP(-1))	3.57	0.05	Short-run causality
D(HCAP(-1))	0.04	0.84	No short-run causality
D(LCPS(-1))	2.95	0.08	Short-run causality
D(LSSER(-1))	1.60	0.21	No short-run causality
ALL	10.70	0.06	Short-run causality

Source: Researcher's calculations from Eviews 9, 2021.

According to the Chi-square joint statistics probability values, there is a short run relationship between the explanatory variables and the independent variable, as shown in table 7. Since the null hypotheses (H0): β5=0 would be rejected if the p-value of the chi-square test for gross domestic investment (LGDI), real education expenditure (LREDXP), and credit to the private sector (LCAP) is less than 0.05, LGDI, LREDXP, and LCPS variables trigger LGDPPC in the short run, while human capital proxied by number of years spent in secondary school (LHCAP) and secondary school enrolment ratio (LSSER) does not cause LGDPPC in the short-run The following move is to perform exante forecasting.

According to the findings in table 7, there exist a short run relationship between the explanatory variables and the independent variable, as indicated by the Chi-square joint statistics probability values. The p-value of chi-square test for gross domestic investment (LGDI); real education expenditure (LREDXP); and credit to private sector (LCAP) is less than 0.05, the null hypotheses (*H*0): β5=0 will be rejected, therefore LGDI, LREDXP & LCPS variables cause LGDPPC in the short run while human capital proxied by number of years spent in secondary school (LHCAP) and secondary school enrolment ratio (LSSER) does not cause LGDPPC in the short-run. Exante forecasting using impulse response and variance decomposition tests is the next step.

4.8 Impulse Response Function

The effect of independent variable shocks on economic growth will be measured using the impulse response function. Table 8 shows the complex effects of a one-standard-deviation shock from the independent variables on LGDPPC in Nigeria over a 5-year span.

Table: 8: Impulse Response Analysis

Response of LGDPPC:						
Period	**LGDPPC**	**LGDI**	**LREDXP**	**HCAP**	**LCPS**	**LSSER**
SHORT-RUN	0.073	0.008	-0.006	0.000	0.008	0.009
MEDIUM-TERM	0.083	0.014	-0.013	0.000	0.024	0.010

Source: Researcher's calculations from Eviews 9, 2021.

Nigeria's economic growth forecast shows an optimistic trend with volatility due to shocks and innovations. Table 8 shows that economic growth own shock (LGDPPC), gross domestic investment (LGDI), and credit to the private sector (LCAP) will all contribute to increased economic growth, whereas real education expenditure (LREDXP) will contribute to decreased economic growth. A steady positive growth can be accounted for by human resources, as measured by the number of years spent in secondary school (LHCAP) and the secondary school enrolment ratio (LSSER). Figure 2 explains the outcome in more detail.

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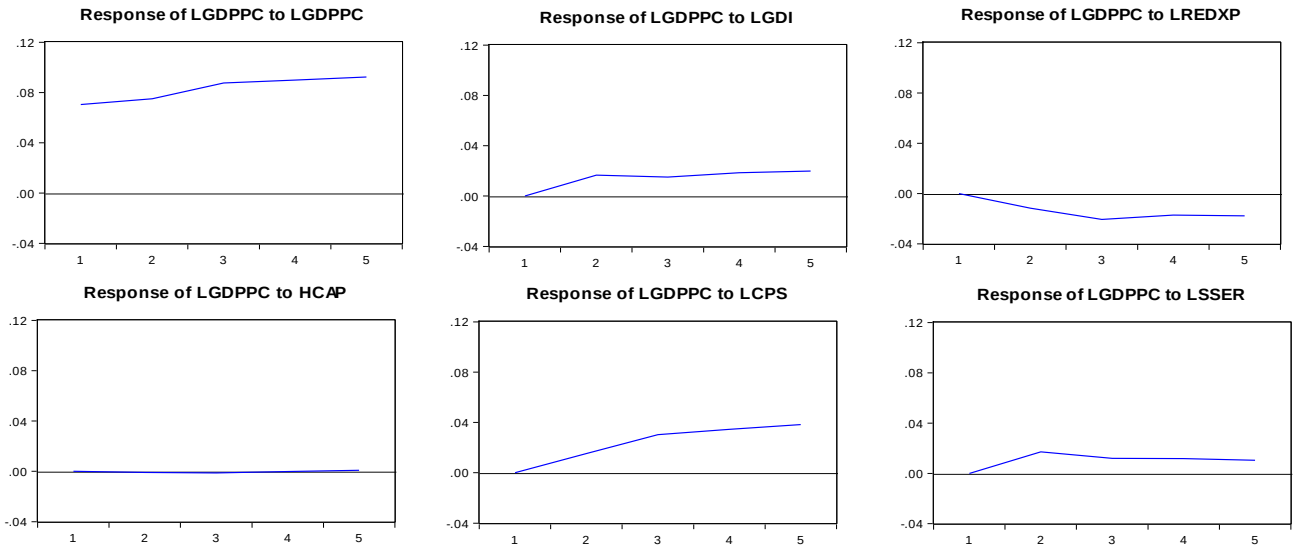

Figure 2: Impulse Response of LGDPPC to Dependent Variables

In the short term, a one standard deviation positive own shock will trigger a shift from 0.073 to 0.083, and in the long run, it will continue to rise to 0.083. Second, forecasts indicate that gross domestic investment (LGDI) has a positive effect on economic growth in the short run and strengthens in the long run. In the short run, a one positive standard deviation shock from gross domestic investment (LGDI) causes economic growth to increase by 0.008, according to the simulation. In the long run, the shocks will increase by 0.014, implying that growing domestic investment has a positive short- and long-term impact on economic growth. Third, projections show that real education expenditure (LREDXP) will be a source of concern for the country and will decline. LREDXP decreases by -0.006 in the short run and by -0.013 in the long run after a one standard deviation negative own shock. This suggests that rising real education spending would have a negative short- and long-run effect on Nigeria's economic growth. This is due to the high degree of corruption and the poor execution of the education budget.

Fourth, human resource developments, as measured by the number of years spent in secondary school (LHCAP), enable economic growth to remain positive over a five-year period. According to simulations, a one positive standard deviation shock to LHCAP would keep economic growth at 0.000 in the short run and at a steady positive pace of 0.000 in the long run. This means that the number of years spent in secondary school is essential for the country's economic growth over the five periods, but it does not lead to faster growth. This result can be due to the proportion of secondary school graduates who work after graduation. Fifth, forecasts show that credit to the private sector (LCAP) will be a source of concern for the nation, resulting in increased economic growth. LCAP increases by 0.008 in the short run and 0.024 in the long run after a one standard deviation positive shock. This means that growing credit to the private sector would have a long-term effect on Nigeria's economic growth. We can see that increasing the amount of credit available to the private sector has a positive impact on the economy of Nigeria. Sixth, both in the short and long run, the innovations to secondary school enrolment ratio (LSSER) accounts for optimistic variations in economic growth. According to the findings, a 0.009 economic growth in Nigeria is accounted for by one positive standard deviation shock to LSSER. As a result of a similar positive one standard deviation innovation, LSSER causes the Nigerian economy to grow by 1.010 in the long run.

4.9 Variance Decomposition

Variance decomposition is used to forecast the error variance effects for each endogenous variable in the system (Ebomuche & Ihugba, 2020). A simple linear equation, according to Wickremasinghe (2011), shows that every change in as a dependent variable y corresponds to a change in x variable at a time (t). The forecast in this study will be divided into three categories: short-term (two years), medium-term (five years), and long-term (ten years) based on the Monte Carlo method and Cholesky's ordering (ten years). Economic growth, gross domestic investment, real education expenditure, human resources, proxied by number of years spent in secondary school, and senior secondary enrolment ratio are the effects of variance decomposition forecast for endogenous variables.

Table 9: Variance Decomposition

PERIOD	LGDPPC	LGDI	LREDXP	HCAP	LCPS	LSSER
SHORT-RUN	95.919	1.210	0.600	0.004	1.009	1.258
MEDIUM-TERM	89.529	2.109	1.905	0.007	4.844	1.607
LONG-RUN	85.118	2.764	2.482	0.007	8.179	1.450

Source: Researcher's calculations from Eviews 9, 2021.

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In the short run, impulses, innovations, or shocks to economic growth account for 95.9percent of changes in economic growth. In the long run, however, the economic growths own shock swings continue to decline to 85.1 percent. In the short run, shocks to gross domestic investment account for 1.2 percent of economic growth fluctuations. In the long run, the fluctuations in economic growth due to gross domestic investment rise to 2.8 percent. Shocks to real education spending account for 0.6 percent, human resources, as measured by the number of years spent in secondary school, accounts for 0.04 percent, private sector credit accounts for 1.0 percent, and the senior secondary enrolment ratio accounts for 1.3 percent in the short run. Shocks to real education spending account for 2.5 percent, human resources, as measured by the number of years spent in secondary school, accounts for 0.007 percent, private sector credit accounts for 8.2 percent, and senior secondary enrolment ratio accounts for 1.5 percent in the long run. The most significant fluctuations in Nigeria's economic growth would be due to shocks to economic growth, followed by credit to the private sector.

4.10 Checking VAR Models

The model was estimated using VECM with one lag and VAR, with the endogenous variables transformed to first difference through the error correction term. Table 6 shows the error correction term, which indicates the long-run equilibrium, while Table 7 shows the short-run relationship. The VECM model will be validated for serial correlation and stability before the results are discussed.

4.10.1 Autocorrelation Residual LM Test

The LM test will be used to test for serial correlation in the autoregressive model-one $[AR(1)]$. Under the hypothesis that there is no serial correlation from lag one, the LM test statistic computes lag order using an auxiliary regression of the residuals of the predicted regression. The LM's findings are shown in the table below.

Table 10: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.003004	Prob. F(1,39)		0.9566
Obs*R-squared	0.003697	Prob. Chi-Square(1)		0.9515

Source: Researcher's calculations from Eviews 9, 2021.

Since their p-values are greater than the significance values of 0.05, the null hypothesis of no serial autocorrelation would be accepted for the Godfrey LM test for 1 lag, and 1 lag rejects the null hypothesis of serial autocorrelation. As a result, since the lag accepts the null hypothesis, we may infer that there is no serial autocorrelation.

4.10.2 Stability Test

The CUSUM test and the recursive coefficient stability test are used to determine stability. Figures 3 and 4 show the final performance. Both tests demonstrate that the systems equation is correct and that the findings are adequate for economic analysis. Since the CUSUM plot test statistics and the recursive coefficients are verified within 5% critical bounds of parameter stability, the findings suggest that there is no instability. As a result, we reject the null hypothesis and conclude that our parameters are stable and, thus, free of misspecification.

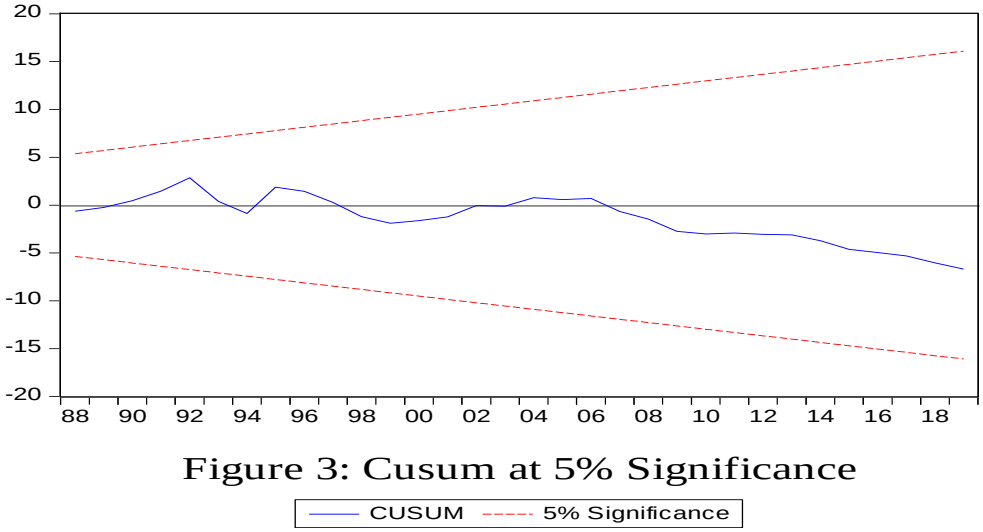

Figure 3: Cusum at 5% Significance

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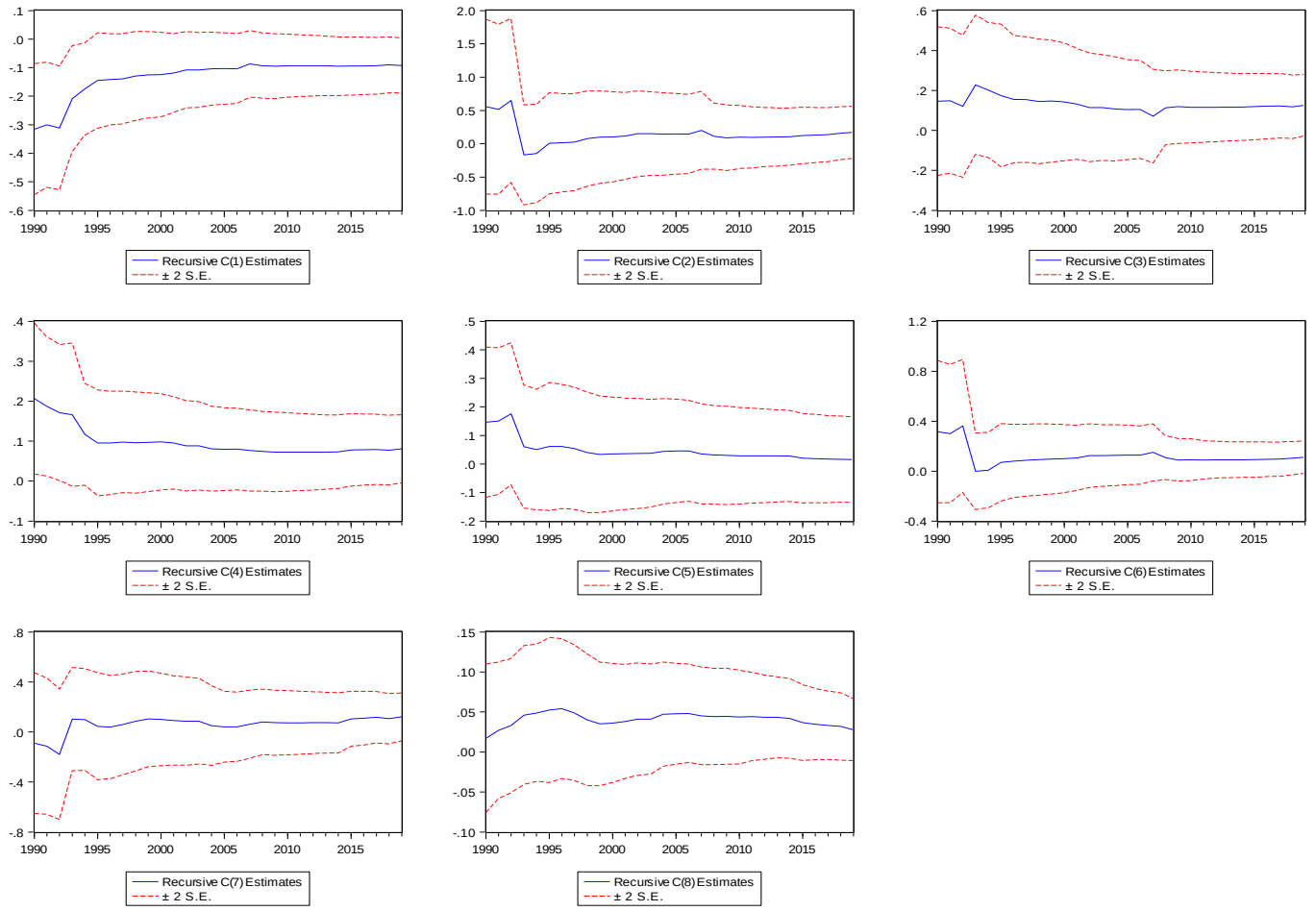

Figure 4: Recursive coefficients test

4.11 Discussion of Findings

As a result of the above, the observed positive relationship between economic growth L(GDPPC) and real education expenditure (LREDXP) means that when LREDXP increases by some amount, LGDPPC will increase by the same amount, as will credit to the private sector (LCPS). This is correct since government policies are supposed to have a direct impact on economic growth in theory. Monetary and fiscal policies, in particular, play an important role in a country's economic growth. The expenditure result is in agreement with Ejiogu, et al (2013).

The target variables (Human capital proxied by secondary school enrolment ratio (LSSER) and human capital proxied by number of years spent in secondary school (LHCAP)) are well signed but not important. In Nigeria, a 1% rise in human resources leads to a 2percentage increase in economic growth. The positive relationship is linked to macroeconomic evidence on the level impact that is consistent with microeconomic estimates of private rates of return to education, as well as substantial long-term growth effects of a more trained workforce. This finding supports Hanushek and Kimko's (2000) hypothesis that direct measures of labour-force efficiency are strongly linked to development. The lack of importance of this indicator can be linked to the country's unemployment rate. A substantial number of Master's degree and, to a lesser extent, PhD certificate holders are unemployed, let alone secondary school leavers. Furthermore, during the study period, the amount of money provided to the private sector as a loan as a percentage of GDP was about 9 percent.

The results on the secondary school enrolment ratio (LSSER) are positive for Nigeria. This is because, despite being negligible, the coefficients are positive, implying that a one-unit rise in LSSER boosts economic growth by 12 percent. This research agrees with Mankiw et al. (1992) and Barro (1991), whose results were both significant and positive. The low correlation can be due to the low ratio of secondary school students to those who are not in school. According to the World Bank (2019), the proportion of secondary school-aged children in school during the study period (1970-2019) was 26.9%, indicating that 73.1 percent of children were not in school. Gross domestic investment was also found to be positively linked to LGDPPC, as it should be theoretically. Furthermore, the positive magnitude is considerable. The country's insignificant condition is concerning, as LGDI is expected to contribute to economic growth. However, the status of Nigeria's infrastructure spending is consistent with the results. The condition of our highways, power supply, rail, and other facilities, as well as the amount of money budgeted for capital expenditure, has never exceeded 50% in the last 40 years. This has had a major impact on the country's production costs.

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Finally, the independent variables' long-run causality to economic growth indicates that there is causality. This is due to the fact that the error correction term coefficient (ECT) of 0.092573 is negative and significant, indicating long-run causality between the dependent variables and Nigerian economic growth. Table 7 shows that, with the exception of human capital, which is proxied by the number of years spent in secondary school (LHCAP) and the secondary school enrolment ratio, the F-/Wald test statistics suggest a short-run causality from independent variables to economic growth (LSSER).

V. CONCLUSION

Finally, the study's goal in estimating the economic growth equation was to look at the short- and long-term relationships between education variables and other explanatory variables in the systems equation and Nigeria's economic growth using annual data from the era (1970-2019). This was accomplished by first determining whether or not cointegrating vectors exist, as well as whether or not the cointegrating series have a long-run relationship. Vectors do cointegrate, according to the results using the trace test statistic and the Max-Eigen test statistic. The long-run relationship between series was interpreted using normalised cointegrating coefficients. According to the findings, a long-run relationship exists among series.

Second, the researchers looked at whether there was a short-run relationship between the series. A cointegration analysis was used in the first part to describe the long and short run relationships between the episodes. According to the results, series are cointegrated in the same order (1), implying that the variables studied have a long–run relationship. The long-run relationship explained by the normalised coefficients of the cointegration simulation was validated using the VECM systems model. Even, if there is a short-term relationship between variables.

A VECM simultaneous systems model with six endogenous variables was developed to meet the study's objectives. The long-run relationship is indicated by an error correction term section after simulating the aforementioned VECM system model, while the short-run relationship is indicated by the second part. The VECM systems model was validated for stability and the absence of serial correlation before the findings were interpreted. The results show that the VECM model can be used to analyze policy. The error correction term coefficient results show a long-run relationship between economic growth (dependent variable) and the independent variables of real education expenditure, gross domestic investment, and human capital, as measured by the number of years spent in secondary school, senior secondary enrolment ratio, and credit to the private sector. The $t-statistic$ value of 1.91 implies that the explanatory variables have a long-run relationship in absolute terms.

RECOMMENDATION

1. Since there is a causal effect of real education expenditure on economic growth, the government should increase the education sector's budget to allow it to increase human capital, which would in turn increase productivity, because education is a productivity-enhancing tool rather than just a tool people use to signal their level of capacity to employers.
2. Government should increase investment on infrastructure and projects that would facilitate the growth of education.
3. The government should also look into other factors that affect secondary school enrolment in Nigeria, such as a lack of interest in schooling, negative attitudes toward education among both parents and children, and expand their enlightenment program on the benefits of education to reach those children who are least likely to receive secondary education due to a lack of interest in scholastic pursuits.
4. Finally, it is suggested that credit to the private sector be expanded because it is beneficial to investors. It boosts economic growth when it rises.

REFERENCES

[1]. Aghion, P., Boustan, L., Hoxby, C. & Vandenbussche, J. (2009). The causal impact of education on economic growth: Evidence from U.S. Available @ scholar.harvard.edu/files/aghion/files/causal_impact_of_education.pdf.
[2]. Ajide, B.K (2014). Determinants of economic growth in Nigeria. *CBN Journal of Applied Statistics* Vol. 5 No.2, December.
[3]. Barro, R. J. & Sala-i-Martin, X. (1991). Convergence across states and regions. *Brookings Papers on Economic Activity*, 22, 107-182.
[4]. Benhabib, J. & Spiegel, M. (1994). "The Role of human capital in economic development: Evidence from aggregate cross-country data." *Journal of Monetary Economics*, 34, 143-174
[5]. Dickey, D. A. & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit. *Journal of the American Statistical Association*, 77, Pp. 427-431.
[6]. Ebomuche, N.C & Ihugba, O.A. (2020). Monetary policy and livestock growth nexus in Nigeria: A vecm approach. *Nigerian Defence Academy Journal of Economics and Finance,* Vol 4(2) 136-149.
[7]. Ejiogu, U., Ihugba, O. & Nwosu, C. (2013). Causal relationship between Nigeria government budget allocation to the education sector and economic growth. *Discourse Journal of Educational Research*. Vol. 1(8): 54-64.
[8]. Enders, W. (2014). Applied econometric time series: Wiley series in probability and mathematical statistics. 4th Edition.

[9]. Hanushek, E. & Wobmann, L. (2010). Education and economic growth. Retrieved from http://hanushek.stanford.edu/sites/default/files/publications/Hanushek%2BWoessmann%202010%20IntEncEduc%202.pdf @ 3.09 26/5/2020.
[10]. Ihugba, OA (2020). Population growth in Nigeria: implications for primary school enrolment, *Journal of School of Arts and Social Sciences*. Vol 8(1) September, 229-250.
[11]. Johansen, S. (1995). Likelihood-based inference in cointegrated vector autoregressive models. *Oxford University Press*: oxford.
[12]. King, E. (2011). Education is fundamental to development and growth. Available @ https://blogs.worldbank.org/education/education-is-fundamental-to-development-and-growth.
[13]. Krueger, A. & Lindahl, M. (2001). Education for growth: Why and for whom? *Journal of Economic Literature*, 39, 1101-1136.
[14]. Lin, T. C. (2003). Education, technical progress, and economic growth: The case of Taiwan. *Economics of Education Review*, 22(2): 213–220.
[15]. Lin, T. C. (2004). The role of higher education in economic development: An empirical study of Taiwan case. *Journal of Asian Economics*, 15(2): 355–371.
[16]. Lucas, R. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22, 3-42.
[17]. Mankiw, G., Romer, D., & Weil, D. (1992). A contribution to the empirics of economic growth." *Quarterly Journal of Economics*, 107, 407-438.
[18]. Mohun, P. Dookhan, K & Fauzel, S. (2010). The impact of education on economic growth: the case of Mauritius. *International Business & Economics Research Journal*, Volume 9, Number 8, August.
[19]. Odior, E.S.O. (2011). Government spending on education, economic growth and long waves in a CGE micro simulation analysis: The case of Nigeria. *Brit J. Econ, Fin. Manage. Sci*. 74 September, Vol. 1 (2).
[20]. Permani R (2009). The role of education in economic growth in East Asia: A Survey, *Asian-Pacific Economic Literature* 23(1): 1-20.
[21]. Pradhan, R. P. (2009). Education and economic growth in India: Using error-correction modelling. *Int. Res J. Fin. Econ*. 25:139-147.
[22]. Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, Vol. 98, No. 5, pp. S71-S102.
[23]. Solow, R.M. (1956). A contribution to the theory of economic Growth. The *Quarterly Journal of Economics*, Vol. 70, No. 1. February.
[24]. Wakyereza, R. K. (2017). The impact of foreign direct investment on economic growth, employment and poverty reduction in Uganda. Victoria University. Available @ http://vuir.vu.edu.au/33620/1/WAKYEREZA%20Ronald%20-%20thesis.pdf.