



POLAC ECONOMIC REVIEW (PER)
DEPARTMENT OF ECONOMICS AND MANAGEMENT SCIENCE
NIGERIA POLICE ACADEMY, KANO



GOVERNMENT EXPENDITURE ON EDUCATION AND ECONOMIC GROWTH NEXUS IN NIGERIA: EVIDENCE FROM BOOTSTRAP ARDL TEST FOR COINTEGRATION

Naim Aliyu

Department of Economics, Federal University Dutsinma, Katsina, Nigeria

Habibu Zayyana

Department of Economics, Umaru Musa Yar'adua University Katsina, Nigeria

Abstract

This paper employs the newly developed bootstrap autoregressive distributed lag (BARDL) approach for cointegration in the presence of single structural break, to empirically examine the relationship between government expenditure on education and economic growth in Nigeria, using annual time series data covering the period of 1981 to 2020. The finding reveals the existence of long-run relationship between the variables, and government expenditure on education has positive and significant long term effect on economic growth in Nigeria. Based on this finding, the paper recommends that the government expenditure on education should be increase and equitably target all levels of education so as to improve human capital development that will lead to sustainable economic growth in Nigeria.

Keywords: Bootstrap ARDL, Economic growth, Government expenditure on education, Nigeria.

JEL Classification Codes: C22, H52, I25, O47.

1. Introduction

The process of economic growth and development needs the accumulation of human and physical capital through government expenditure in education, healthcare and other key infrastructures affecting growth. Financing these social services and physical infrastructures entails large amount of expenditure by the government in both the short and long terms (Abubakar & Yusuf, 2018). Expenditures in these areas reinforce and complement one another. To be productive, labour needs skills, physical capital, such as equipment, infrastructures and stable well governed economy. In turn, a skilled and educated labour can earn more and invest more in the formation of physical capital in the economy (Urama, Ogbonna & Obodoechi, 2018).

Using government expenditure on various sectors to boost economic growth has been a key option for many countries around the world since the 1930s. Keynes (1939) argued that government expenditure should be

increased when households and firms spending were inadequate to stimulate economic growth. He contended that the low economic growth during great depression resulted from inadequate aggregate demand measured as the sum of expenditure by households, firms and government. Hence, increasing government spending to education and other sectors may likely cause a rise in aggregate demand that can lead to increase in economic growth.

In Nigeria, despite several calls for the government to increase its expenditure to education sector, federal government proposed to give the sector its lowest allocation in 10 years, when measured as a percentage of the total proposed federal government expenditure in 2021 budget. Out of N13.08 trillion proposed budget for the year 2021, N742.5 billion was allocated to education sector (Budget office of the federation [BOF], 2020). This is just 5.7% of the total proposed expenditure and the lowest percentage allocation since 2011. This allocation is also far below the recommended

international benchmark by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2018) which recommended governments to dedicate at least 15% to 20% of their annual budget to education sector.

These financing challenges facing the education sector in Nigeria may affect the development of human capital (labour) which is the major factor of production that is responsible for economic growth and development. Hence, this paper examined the relationship between government expenditure on education and economic growth in Nigeria. Following the introduction, section two is the review of relevant literature on the relationship between government expenditure on education and economic growth. Section three focuses on Methodological approaches employed in estimations, while section four is the results and discussion. Section five concludes the paper and outlines recommendations.

2. Literature Review

Government expenditure on education and economic growth nexus has attracted the attention of researchers, who empirically tested the relationship using various econometrics techniques. For example, using Johansen and Juselius cointegration technique, Mallick and Dash (2015) examined the relationship between government expenditure on education and economic growth in India from the period 1951-2012. The results revealed the existence of long-run relationship between government expenditure on education and economic growth. Moreover, government expenditure on education has found to have positive and significant effect on economic growth in India. Similarly, Ozatac et al. (2018) also used Johansen and Juselius cointegration test to explore the long-run relationship between government expenditure on education and economic growth in France from 1970 to 2012. The findings suggest the existence of the long-run relationship between the variables and government expenditure on education influence France's economy positively.

In Africa, Owusu-Nantwi (2015) employed Vector error correction and Johansen's cointegration tests to investigate the long-run relationship between government

education expenditure and economic growth in Ghana from 1970-2012. The results revealed that there is cointegration (long-run) relationship between government education expenditure and economic growth, and education expenditure has positive and significant long-run effect on Ghana's economy. Similarly, Kouton (2018) used conventional ARDL bounds test to examine the relationship between education expenditure and economic growth in Côte d'Ivoire for the period of 1970 to 2015. The result found the evidence of the existence of long-run relationship among the variables. However, government education expenditure has found to have negative and significant long term effect on economic growth. The author attributed this negative effect of government education expenditure on economic growth to insufficient funding to educational sector in Côte d'Ivoire.

Using panel data of 31 Sub-Saharan African (SSA) countries from 2009 to 2019 and applying Generalized Method of Moments (GMM) procedure, Farayibi and Folarin (2021) investigate the effects of government expenditure on education on increasing educational outcomes and economic growth in the region. The findings showed that government expenditure on education has positive effects on educational outcomes and economic growth of Sub-Saharan African (SSA) countries.

In the specific case of Nigeria, Ayeni and Omobude (2018) applied conventional ARDL bounds test to examine the relationship between government expenditure on education and economic growth in Nigeria from 1987 to 2016. The findings revealed that only recurrent expenditure on education has both positive and significant long-run effect, while capital expenditure on education has positive but insignificant effect on economic growth within the period of study. The authors attributed this insignificant effect of capital expenditure on education to inadequate funding to educational sector in Nigeria. Similarly, Urama et al. (2018) used Ordinary Least Square (OLS) technique to investigate the effect of capital and recurrent education expenditure on economic growth for the period, 1981 to 2016, so as to

ascertain which component contribute more to economic growth in Nigeria. The result revealed that the capital component of education expenditure has stronger impact on economic growth in Nigeria than its recurrent counterpart.

Omodero and Nwangwa (2020) used Johansen and Juselius cointegration technique to investigate the relationship between government education expenditure and economic growth in Nigeria from 2000 to 2018. The findings revealed that government education expenditure and economic growth are cointegrated, and government spending on education has positive and significant impact on economic growth in Nigeria. Similarly, Lawanson and Umar (2020) and applied Johansen and Juselius cointegration technique and error correlation model to test the hypothesis of education expenditure-led growth in Nigeria using annual data for the period 1980-2018. The results show that all levels of education expenditure contribute to economic growth positively. In a more recent study, Korikiye and Niyekpemi (2021) employed Ordinary Least Square (OLS) technique to examine the effect of government education expenditure on economic growth in Nigeria from 1981–2018. The findings revealed that government expenditure on education has statistically significant effect on economic growth in Nigeria.

The review of previous studies revealed that the results regarding the effects of government education expenditure on economic growth has been mixed. While some studies found empirical support for a positive and significant effect, others found the contrary results. We reason that model misspecification errors arising from failure to accommodate structural breaks and use more robust methodologies like Bootstrap Autoregressive Distributed Lag (ARDL) approach in the models estimated by previous studies could be the possible reasons for the mixed findings. Hence, in order to fill this literature gap, this paper considered structural breaks and employed the McNown et al (2018) bootstrap ARDL cointegration technique to explore the relationship

between government education expenditure and economic growth in Nigeria.

3. Methodology

To examine the relationship between government education expenditure and economic growth in Nigeria, this paper used annual time series data covering the period of 1981-2020. The data were sourced from World Development Indicators database of the World Bank (2021) and Central Bank of Nigeria Statistical Bulletin (2020). For econometric analysis, this study first applied the Augmented Dickey-Fuller (ADF), Philips-Perron (PP) and Zivot-Andrews (1992) unit root tests to check the stationarity properties and order of integration of the variables. Second, the paper used the bootstrap ARDL approach for cointegration to investigate the existence cointegration (long-run) relationships among the variables. Third, we estimated the short-run coefficients by using the error correction model (ECM). Finally, this paper employed several diagnostic tests to ensure the fitness and stability of the model.

3.1 Unit Root Tests

To test for unit root, this paper applied Augmented Dickey-Fuller (ADF), Philips-Perron (PP) and Zivot and Andrews (1992) unit root test which endogenously detect structural breaks. Zivot and Andrews developed three models in testing the unit root, namely, model A which allows for a break in intercept only, model B that allows for a break in trend only, and model C which allows for a break both in intercept and trend. Even though there is no consensus on which model is more suitable, model A and model C are generally preferred in practice. Sen (2003a) noticed that, applying Model A will leads to a substantial power loss if the break actually occurs in Model C. However, if break occurs in Model A but model C is used, the loss in power is minimal, suggesting that model C is superior to model A. Heeding the suggestion of Sen (2003a) this study employed model C by allowing single structural break in both the intercept and trend as specified in equation (1):

$$y_t = \mu + \delta y_{t-1} + \beta_t + \gamma DU_t(\lambda) + \theta DT_t(\lambda) + \sum_{j=1}^p \phi_j \Delta y_{t-j} + \varepsilon_t \quad (1)$$

In equation (1), y_t is the data generating process (DGP); p is the number of lags determined for each possible breakpoint; DU_t is a dummy variable that captures shift in the intercept and DT_t another dummy

that represent a shift in the trend occurring at time of break (λ); γ and θ are coefficients of the dummy variables; λ is location of the breakpoint and ε_t is the shock. These dummy variables are defined as follows:

$$DU_t(\lambda) = \begin{cases} 1 & \text{if } t > T\lambda \\ 0 & \text{otherwise} \end{cases} \quad \text{and} \quad DT_t(\lambda) = \begin{cases} t - T\lambda & \text{if } t > T\lambda \\ 0 & \text{otherwise} \end{cases}$$

3.2 Bootstrap ARDL Approach for Cointegration Test

To examine the existence of cointegration (long-run) relationship between government education expenditure and economic growth in Nigeria, this study employed the bootstrap ARDL approach for cointegration developed by McNown, Sam and Goh (2018) and modified by Sam, McNown and Goh (2019). The superiority of this method over the conventional ARDL approach of Pesaran, Shin and Smith (2001) is that, through additional test on the

lagged levels of the independent variable, this method overcomes the reliance on the assumption of an I(1) dependent variable and prevent the wrong inference on cointegration status (Sam et al., 2019).

Following Goh, Sam and McNown (2017), the model for this study can be mathematically specified using bootstrap ARDL approach for cointegration as follows:

$$\begin{aligned} \Delta \ln GDP_t = & \varphi_0 + \varphi_1 \ln GDP_{t-1} + \varphi_2 \ln GEE_{t-1} + \varphi_3 DUM_{t-1} + \sum_{i=1}^p \delta_1 \Delta \ln GDP_{t-i} \\ & + \sum_{j=0}^q \delta_2 \Delta \ln GEE_{t-i} + \sum_{k=0}^r \delta_3 DUM_{t-i} + \varepsilon_t \end{aligned} \quad (2)$$

In equation (2), i, j , and k denote the optimum lags ($i = 1, 2, \dots, p$; $j = 0, 1, 2, \dots, q$; $k = 0, 1, 2, \dots, r$ and t represents time); Economic growth proxied by Gross Domestic Product (GDP_t) is the dependent variable; Government Expenditure on Education (GEE_t) is the major explanatory variable; DUM_{ti} is a dummy variable that represents the break year based on Zivot and Andrews

(1992) unit root test; φ_0 is an intercept (constant); φ_1, φ_2 and φ_3 represent the long-run coefficients of the variables; δ_1, δ_2 and δ_3 are the short-run coefficients of variables; lastly, ε_t shows the error-term with zero mean and finite variance (σ^2). An error correction form of this model (ECM) is presented in equation (3):

$$\Delta \ln GDP_t = \varphi_0 + \sum_{i=1}^p \delta_1 \Delta \ln GDP_{t-i} + \sum_{j=0}^q \delta_2 \Delta \ln GEE_{t-i} + \sum_{k=0}^r \delta_3 DUM_{ti} + ECT_{t-1} + \varepsilon_t \quad (3)$$

Cointegration among the variables in model (2) requires the rejection of all three of the following null hypotheses:

1. F-test on the coefficients on the lagged level of all variables (denoted as F_1): $H_0: \varphi_1 = \varphi_2 = \varphi_3 = 0$; Against $H_1 = \varphi_1 = \varphi_2 = \varphi_3 \neq 0$
2. t-test on the coefficients on the lagged level of the dependent variable: (denoted as t): $H_0: \varphi_1 = 0$; Against $H_1 = \varphi_1 \neq 0$
3. F-test on the coefficients on the lagged levels of the independent variables: (denoted as F_2): $H_0 = \varphi_2 = \varphi_3 = 0$; Against $H_1 = \varphi_2 = \varphi_3 \neq 0$.

Two degenerated cases may arise. Degenerated case 1 occurs when F_1 are significant, but F_2 was insignificant. In this case, the joint significant is solely due to the lag of dependent variable; the independent variables are not part of the long run cointegration relationship. On the other hand, degenerated case 2 occurs when F_1 and F_2 are significant but t is insignificant. Degenerate cases as pointed out by Pessaran et al. (2001) imply non-cointegration by its incomplete structure of error correction term to adjust the system back to equilibrium.

To conduct the test on the lagged levels of the independent variables, McNown et al. (2018) applied a bootstrap procedure to generate its critical values. However, this involves programming and computation that are not convenient or user friendly to many

researchers. Based on theorems that establish the limiting distributions of this test statistic, Sam et al. (2019) provides tables of critical values for the test on the lagged levels of the independent variables. By providing the tables of critical values, this eases the implementation of the test, so that it becomes accessible to a broader range of researchers. These tables of critical values can be used by those wishing to apply the widely employed ARDL procedure with the three tests combined to arrive at a clear conclusion on the status of cointegration. In this paper we employed Sam et al. (2019) procedure.

To ensure the fitness of the models, three residual diagnostics and model stability tests are carried out in this study. These are: normality; serial correlation and heteroscedasticity tests. While the CUSUM and CUSUMSQ tests are used to check the stability of the models.

4. Results and Discussion

4.1 Results of Unit Root Tests

The results of Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests in Table 1 showed that, GDP and GEE have unit roots at their levels, however, after taking the first difference, the variables became stationary, this implies that they are integrated of order one (1).

Table 1: Results of ADF and PP Unit Root Tests

Variables	Level			
	ADF		PP	
	Intercept	Intercept & trend	Intercept	Intercept & trend
LGDP	-1.036065	-1.353905	0.465845	-3.059181
LGEE	-2.275225	-2.991441	-1.407680	-2.912587
Variables	First difference			
	ADF		PP	
	Intercept	Intercept & trend	Intercept	Intercept & trend
LGDP	-4.015493***	-3.443578**	-3.778344***	-3.558414**
LGEE	-5.209011***	-5.966086***	-10.63932***	-14.84772***

Note: Akaike Information Criterion (AIC) is employed to select optimum lag length in the ADF test; *** and ** indicate statistically significant at 1% and 5% respectively.

Source: Author's computation (2021)

Table 2: Result of Zivot-Andrews Unit Root Test

Variables	Level		First Difference	
	t-statistic	Break point date	t-statistic	Break point date
LGDP	-2.449713	1991	-5.412070**	2002
LGEE	-5.645513***	1993	-5.902205***	1996

Note: The maximum lag used is 4; both intercept and trend are used in the estimations; *** and ** indicate statistical significance at 1%, and 5% respectively. The asymptotic critical values as provided by Zivot-Andrews (1992) for model C at 1%, 5% and 10% are -5.57, -5.08 and -4.82 respectively.

Source: Author's computation (2021)

Nevertheless, the traditional unit root tests, particularly ADF have lower power in the presence of structural breaks (Perron, 1997). Hence, Zivot-Andrews (1992) unit root test which accommodate single structural break was carried out and from the results in Table 2, the null hypothesis of a unit root with structural break in the intercept and trend is rejected for LGDP which is found to be stationary at level $I(0)$, while, LGEE is stationary at first difference $I(1)$.

4.2 Results of the Bootstrap ARDL Cointegration Tests

The results of the bootstrap ARDL cointegration tests reported in Table 3 revealed that all the three test statistics without trend are statistically significant,

suggesting the existence of cointegration (long-run) relationship between government education expenditure and economic growth in Nigeria. However, the same equation (2) has an insignificant t_{DV}^V even at 10% level if tested with trend, which implies that the government education expenditure-growth nexus equation (2) with trend fall into degenerate lagged dependent variable case. Nevertheless, since the trend term is not statistically significant when included in the equation (2), the equation without trend is preferred and the conclusion is that cointegration is found for the relationship among the variables in the model without trend. Moreover, equation (2) not falls into the degenerate lagged independent variable case, which is consistent with the $I(1)$ findings of the three unit root tests conducted.

Table 3: Results of the Bootstrap ARDL Cointegration Tests

Unrestricted Constant and no trend	Optimum lag length	$F_{overall}^{III}$	t_{DV}^{III}	F_{IDV}^{III}	Dummy	Cointegration Status
(LGDP LGEE,DUM)	(1, 2, 0)	10.198***	-4.848***	7.631**	D2002	Cointegration
Unrestricted Constant and trend	Optimum lag length	$F_{overall}^V$	t_{DV}^V	F_{IDV}^V	Dummy	Cointegration Status
(LGDP LGEE,DUM)	(1, 2, 1)	6.0487**	-2.213	4.717*	D2002	Degenerate lagged dependent variable

Note: Akaike Information Criterion (AIC) is used to select optimum lag length; ***, **, * indicate statistical significance at 1%, 5% and 10% levels respectively, with the references from Table 4; $F_{overall}^{III}$ and $F_{overall}^V$ are the statistics for testing $\phi_1 = \phi_2 = \phi_3 = 0$ without and with trend respectively; t_{DV}^{III} and t_{DV}^V are t-statistics for testing $\phi_1 = 0$ without and with trend respectively; F_{IDV}^{III} and F_{IDV}^V are F-statistics for testing $\phi_2 = \phi_3 = 0$ without and trend respectively. Dummy variable (D2002) is specified as one (1) at the break point year 2002 onward and zero otherwise.

Source: Author's computation (2021)

Table 4: Upper Bound Critical Values

References	p = 0.010	p = 0.050	p = 0.100
Narayan (2005)			
$F_{overall}^{III}$	7.337	5.260	4.377
$F_{overall}^V$	8.803	6.437	5.420
Pesaran et al. (2001)			
t_{DV}^{III}	-4.10	-3.53	-3.21
t_{DV}^V	-4.53	-3.95	-3.63
Sam et al. (2019)			
F_{IDV}^{III}	8.58	5.68	4.46
F_{IDV}^V	8.82	5.66	4.37

Note: $F_{overall}^{III}$ and $F_{overall}^V$ refer to overall F-statistics for cases III and V respectively; t_{DV}^{III} and t_{DV}^V refer to t-statistics for the dependent variable for cases III and V respectively; F_{IDV}^{III} and F_{IDV}^V refer to F-statistics for the independent variable for case III and V respectively. The number of explanatory variables in all cases is $k = 2$ and $N = 40$ is the sample size.

Sources: Pesaran et al. (2001); Narayan (2005) and Sam et al. (2019).

4.3 Results of the Long-run and Short-run Estimates

The results of the estimated long-run and short-run coefficients are reported in Table 5. The findings reveal that holding other factors constant, an increase in government education expenditure has positive impact on economic growth in Nigeria. Specifically, a 1% increase in government expenditure on education leads to increase in economic growth by 0.12% and 0.002% in the long-run and the short-run, respectively. Thus, increasing government education expenditure is associated with

higher economic growth and vice versa. This finding lends support to the Keynesian hypothesis that increasing government expenditure lead to increase in economic growth. The results are also consistent with the works of Urama et al. (2018); Omodero and Nwangwa (2020) and the recent findings of Korikiye and Niyekpemi (2021). However, this result is not consistent with the finding of Ayeni and Omobude (2018) who found out that government expenditure on education has positive but insignificant effect on economic growth in Nigeria.

Table 5: Results of Long-run and Short-run Estimates

Long-run Estimated Coefficients				
Regressors	Coefficient	Standard Error	t-Statistic	Prob.
C	1.561704	0.267378	5.840800	0.0000
LGEE	0.122539	0.025794	4.750625	0.0000
DUM	0.534709	0.142507	3.752148	0.0007
Short-run Estimated Coefficients				
$\Delta LGDP$	0.843602	0.032262	26.14868	0.0000
$\Delta LGEE$	0.002314	0.007850	0.294780	0.0701
$\Delta LGEE_{t-1}$	-0.011699	0.007831	-1.493903	0.1450
ECT_{t-1}	-0.156398	0.027432	-5.701374	0.0000
R^2	0.449495			
F-stat	11.07032			0.0000
D.W-stat	2.368007			

Note: Δ is the first difference operator.

Source: Author's computation (2021).

The coefficient of the error correction term lagged by one period (ECT_{t-1}) is negative and statistically significant at 1%, therefore meets our expectation. This result demonstrates that 15.63% of any deviations from the equilibrium will be corrected within one year. Jointly, the independent variables (LGEE and DUM) in the model are adequately explaining the variations of GDP in Nigeria. This indicates by the adjusted R-square (0.4495) which implies that, 44.95% of the variations in GDP,

over the period (1981 to 2020), are explained by government expenditure on education. The D-W statistics (2.368007) reveals no autocorrelation.

4.4 Results of Diagnostics Tests

The results of diagnostic tests reported in Table 6 show that the bootstrap ARDL model passes all the tests except normality. Thus the estimated relationship is free from problems of serial correlation and heteroscedasticity. In addition, there is no omitted variable bias.

Table 6: Model Diagnostic Tests

Test Statistic	Results
Normality: Jarque-Bera	11.2007 [0.0037]
Serial Correlation: Breusch-Godfrey LM Test; F(2, 30)	0.5984 [0.5561]
Functional Form: Ramsey Reset; F(1,31)	1.7348 [0.1551]
Functional Form: Ramsey Reset; F(1,31)	1.5387 [0.2241]

Source: Author's computation (2021).

4.5 Results of Diagnostics and Model Stability

To investigate the stability of model, cumulative sum of recursive residuals (CUSUM) and cumulative sum of

squares of recursive residuals (CUSUMQ) tests were used and the result in figure 4.1 revealed that the model is stable. The CUSUM and CUSUMQ lines are within the 5% statistical significant level boundaries.

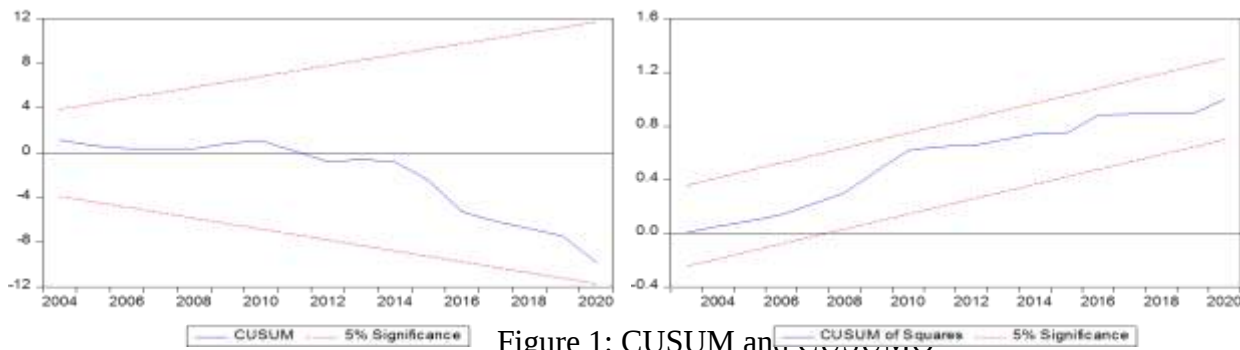


Figure 1: CUSUM and CUSUMQ

5. Conclusion and Recommendations

This paper has employed the bootstrap ARDL approach for cointegration to examine the relationship between government education expenditure and economic growth in Nigeria from 1981 to 2020. Based on the results and discussion, it is concluded that, there is cointegration (long-run) relationship between government education expenditure and economic growth in Nigeria. The results also revealed that government expenditure on education

has positive and significant effect on economic growth in Nigeria both in the short-run and in the long-run. Based on these findings, the paper recommends that, the government budgetary allocation to education sector at various levels should be increased in adherence to UNESCO (2018) minimum benchmark which recommends governments to dedicate at least 15% to 20% of their annual budget to education sector. This will improve human capital development that will lead to sustainable economic growth in Nigeria.

References

- Abubakar, A. & Yusuf, M. (2018). Public Debt and Economic Growth in Nigeria: Asymmetric Co-integration Analysis. *UMYUK Journal of Economics and Development (UJED)*, 1(1), 1-11.
- Ayeni, A. O., & Omobude, O. F. (2018). Educational expenditure and economic growth nexus in Nigeria. *Journal for the Advancement of Developing Economies*, 7(1), 59-77.
- Farayibi, A. O., & Folarin, O. (2021). Does government education expenditure affect educational outcomes? New evidence from sub-Saharan African countries. *African Development Review*.
- Goh, S. K., Sam, C. Y., & McNown, R. (2017). Re-examining foreign direct investment, exports, and economic growth in asian economies using a bootstrap ARDL test for cointegration. *Journal of Asian Economics*, 51, 12-22.
- Korikiye, W. S., & Niyekpemi, B. O. (2021). Human capital and economic growth nexus in Nigeria. *Journal of Global Economics and Business*, 2(6), 31-49.
- Lawanson, O. I., & Umar, D. I. (2020). Education Expenditure-Led Growth: Evidence from Nigeria (1980-2018). *International Business Research*, 13(3), 133-133.
- Mallick, L., & Dash, D. P. (2015). Does Expenditure on Education Affect Economic Growth in India? Evidence from Cointegration and Granger Causality Analysis. *Theoretical & Applied Economics*, 22(4).
- McNown, R., Sam, C. Y., & Goh, S. K. (2018). Bootstrapping the autoregressive distributed lag test for cointegration. *Applied Economics*, 50(13), 1509-1521.
- Narayan, P. K. (2005). The saving and investment nexus for China: evidence from cointegration tests. *Applied economics*, 37(17), 1979-1990.
- Omodero, C. O., & Nwangwa, K. C. (2020). Higher Education and Economic Growth of Nigeria: Evidence from Co-Integration and Granger Causality Examination. *International Journal of Higher Education*, 9(3), 173-182.
- Owusu-Nantwi, V. (2015). Education expenditures and economic growth: evidence from Ghana. *Education*, 6(16), 1-6.
- Ozatac, N., Taspinar, N., El Rifai, O., & Eren, B. (2018). The Relationship between government expenditure on education and economic growth: The Case of France. In *The impact of globalization on international finance and accounting* (pp. 61-70). Springer, Cham.
- Perron, P. (1997). Further Evidence on Breaking Trend Functions in Macroeconomics Variables. *Journal of Econometrics*, 80, 355-385.
- Pesaran, M. H., Shin, Y., & Smith, R.J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics*, 16, 289-326.
- Sam, C. Y., McNown, R., & Goh, S. K. (2019). An augmented autoregressive distributed lag bounds test for cointegration. *Economic Modelling*, 80, 130-141.
- UNESCO (2018). *International policies for Third World education: UNESCO, literacy and development*. Routledge.
- Urama, C. E., Itanwu, B. E., Ogbonna, O. E., & Obodoechi, D. N. (2018). Public Capital and Recurrent Education Expenditures and Economic Growth in Nigeria: An Empirical Investigation. *Economic Research*, 2(10), 28-38.

Zivot, E., and Andrews, D. (1992). Further Evidence of the Great Crash, the Oil-Price shock and the Unit-Root Hypothesis. *Journal of Business and Economic Statistics*, 10, 251- 270.