Effect of Labour Productivity and Education Expenditure on Economic Growth in Nigeria

[1]Matthew Imoter Asue & [2]Godwin Akor Nyinya
[1,2]Department of Economics
Benue State University, Makurdi-Nigeria

Abstract
This study examined the effect of labour productivity and education expenditure on economic growth in Nigeria from 1986 to 2021. The ex-post facto design was employed in which econometric tools were used to analyze the data collected from the secondary sources about the variables. Descriptive statistics were used to describe the properties of the data set, followed by testing for the stationarity properties of the time series used. The Structural Vector Autoregressive (SVAR) model was used to account for the transmission mechanism. The findings of the study revealed that that economic growth responds positively to labour productivity and in a similar way, labour productivity responds positively to Education expenditure. The study concluded economic growth as central objective of labour productivity from government expenditure on education and achievements in economic growth can make a critical contribution to labour productivity. The recommends that government should as a matter of urgency; resolve the trending challenges (wages and allowances) amongst labour unions in Nigeria. A survey-feedback strategy should be promoted together with sensitivity training and effective leadership for labour force. This would protect the economy from further negative and insignificant trends in Labour productivity and as such impact economic growth significantly especially in the long run. The National Productivity Centre should strategically work with civil society to surmount the limitations on it by fragmentation or compartmentalization of its roles, responsibilities and mandate that prevents it from effectively collaborating with other departments and ministries of the Government in resolving problems that adversely affect and influence productivity.

Keywords: Economic growth, Education expenditure and Labour productivity
JEL Classification: E24, I22, I25, O40, H52

1. Introduction

From the Romer/Solow growth theory in 1990, the effect of education on technological innovation is direct. An investment in education is beneficial to the society, both at micro and macro levels and affects the system indirectly better. Education is basic to development and is also regarded as an instrument through which the society can be transformed. The global education expansion in the 20th century resulted in a historical reduction in education inequality across the globe. Following the agreement of the Millennium Development Goals, the first decade of the 21st century saw an important increase in international financial flows under the umbrella of development assistance. According to Steer and Smith (2015), development assistance for education had stopped growing since 2010, with notable aggregate reductions on flows going to primary education. These changes in the prioritization of development assistance for education across levels and regions, presented potentially large

distributional effects, particularly within low income countries that depend substantially on this source of funding for basic education (Steer & Smith, 2015).

Labour productivity also contributes to the growth of economies across the globe. The essence of Human Resources Development is to ensure that the workforce is continuously adapted for and upgraded to meet the new challenges of its total environment (Sholesi, 2021). This implies that those already on the job require retraining, reorientation or adaptation to meet the new challenges. According to Adamu (2013), this special human capacity can be acquired and developed through education, training, health promotion, as well as investment in all social services that influence man's productive capacities. Among important measures of the wellbeing of an economy, is the level and growth of economic output, commonly known as the Gross Domestic Product (GDP). However, economists and policy makers are also interested in the factors of production that are used in generating such output, as well as the level of efficiency associated with the inputs.

Despite several efforts aimed at enhancing education and labour productivity in Nigeria, they have continued to receive attention from the government. For instance, the educational sector has received less than the 26% recommended by UNESCO members (Ohaegbulem & Chijioke, 2023). It was observed that, the actual expenditure on education in Nigeria has trended on decline. In 2017, Federal Ministry of Edcuation (FME) declared that the funding of education at all levels in Nigeria is below the 26% benchmark recommended by UNESCO. Nigeria has been allocating 6 % of the national budget to the funding of its education (FME, 2017).

With the current population of about 171 million, 45% of which are below 15 years, there is huge demand for learning opportunities translating into increased enrolment which has created challenges in ensuring quality education since resources are spread more thinly (FME, 2017). The percentage of actual allocation to education from 2015, 2016, 2017 and 2018 stood at 10.28%, 7.92%,7.40% and 7.04% respectively which is still less than half of the 26% as requires by United Nations (UN) (FME's report, 2018). This has proven that the 26% recommended by UNESCO members is almost unrealistic in the Nigerian context. The study therefore seeks to investigate Education expenditure (Capital and Recurrent), Labour productivity and Economic Growth in Nigeria (Organization for Economic Cooperation and Development, 2018).

In a similar way, labour productivity was also observed to have declined. The constraints on productivity of labour and other factor inputs continues to put a drag on overall economic growth and this was further exacerbated in the fourth quarter of 2016. A growing unemployment rate of 14.2% in the 4th quarter, up from 13.9% in the 3rdquarter, coupled existing infrastructural challenges, remain considerable threats to realising Nigeria's full economic and productivity potentials. Labour productivity increased by 9.8% on quarterly basis and 10.8% year on year. The estimated total number of hours worked increased by 0.48% between Q3 and Q4, 2016, and increased by 1.9% between Q4, 2015 and Q4, 2016. The Q4 2016 saw a rise in labour productivity, the highest levels since Q1, and 2015 (NBS, 2016). While the overall level of productivity was high, there were several challenges that generally impacted on output and labour, and indirectly on labour productivity, keeping it below optimal levels. Some of these issues faced during the quarter were issues that spilled over from Q1 through Q2 and Q3, 2016 (Organization for Economic Cooperation and Development, 2018).

However, economic growth tended to increase within these periods as observed in real GDP despite the fall in labour productivity and education expenditure. Theoretically, it is expected that, this fall in labour productivity and education expenditure should attract negative response from economic growth. The paradox is particularly antithesis to Solow's (1956) theory which postulates that growth occurs from the accumulation of capital and an increase in labour force with improved technology.

Surprisingly, no recent study as reviewed to the best of my knowledge has attempted to examine the transmission from education expenditure through labour productivity to economic growth in Nigeria; neither has any study as reviewed to the best of my knowledge, considered VAR causality to ascertain separate causation amongst education expenditure with respect to the components (capital and recurrent expenditure), labour productivity and economic growth to the a more recent year of the study. It is based on the identified paradox and research gaps that the study was prompted to find out whether government expenditure on education has exerted impact on labour productivity for economic growth in Nigeria from 1986 to 2021.

2. Review of Related Literature

Conceptual Review

The concepts of education expenditure, labour productivity and economic growth are relevant to this study. These concepts are therefore reviewed in this section.

Education Expenditure

Public expenditure on education consists of current and capital public expenditure on education includes government spending on educational institutions (both public and private), education administration as well as subsidies for private entities (students/households and other privates entities). According to Organization for Economic Cooperation and Development (2018), government expenditure on education includes direct expenditure on educational institutions as well as educational-related public subsidies given to households and administered by educational institutions. This indicator is shown as a percentage of GDP, divided by primary, primary to post-secondary non-tertiary and tertiary levels. Public entities include ministries other than ministries of education, local and regional governments, and other public agencies. Public spending includes expenditure on schools, universities and other public and private institutions delivering or supporting educational services. This indicator shows the priority given by governments to education relative to other areas of investment, such as health care, social security, defense and security. Education expenditure covers expenditure on schools, universities and other public and private institutions delivering or supporting educational services (OECD, 2018)

According to World Bank (2017), all education systems rely on financing to function. Education finance systems pay for the inputs required to implement education policies, such as teachers, school buildings, and learning materials. Availability of financial resources does not guarantee a quality education, but a quality education is impossible to achieve without adequate resources. This implies that there must be willingness to utilize the financial resource of the economy for quality education to be attained. There must be availability of human resource for the financial resource to be effectively utilized. Some uses of education expenditures can make a marked difference in learning, particularly in the cases of inputs that

directly benefit students or resources that compensate for challenges arising from low-income settings. The same money can be wasted if it is allocated to input factors that only marginally affect learning or if policymakers fail to consider the conditions that must be met for factors to translate into learning gains.

The study conceptualizes education expenditure as spending made by the government of a country on Education as human resource needs and wants such as salaries for workers in the system, bursaries for students, and provision of infrastructures. Put differently, it can be view as expenditure incurred by public authorities like Federal, State and Local government for the purpose of human resource development.

Labour Productivity

Labour productivity, also known as workforce productivity, is defined as real economic output per labour hour. Growth in labour productivity is measured by the change in economic output per labour hour over a defined period. It measures the hourly output of a country's economy. Specifically, it charts the amount of real gross domestic product (GDP) produced by an hour of labour. Growth in labour productivity depends on three main factors: saving and investment in physical capital, new technology, and human capital (Maitra, 2018).

Organization for Economic Cooperation and Development (2002) defined Labour productivity as output per unit of labour inputs. It is a measure of a country's economic output (real Gross Domestic Product) that is the result of a single hour of labour. Labour productivity is heavily affected by expenditure on physical capital, technology, and human capital. According Neagu (2012), the first determinant of labour productivity is human capital. Human capital is the accumulated knowledge (from education and experience), skills, and expertise that the average worker in an economy possesses. Typically, the higher the average levels of education in an economy, the higher the accumulated human capital and the higher the labour productivity.

In this study, labour productivity is conceptualized as the value that each employed person creates (output) per unit of his or her input (labour). The driving forces behind improvements in labour productivity are the accumulation of machinery and equipment, improvements in organisation as well as physical and institutional infrastructures, improved health and skills of workers ("human capital") and the generation of new technology. The human capital drivers (Education and Health) are of more concern to this study.

Economic Growth

Though, no single definition can adequately encompass the subject matter of economic growth, the following definitions provide a useful guide to the subject matter. Lipsey (1986) defined economic growth as the positive trend in the nation's total output overlong period of time. This implies a sustained increase in Gross Domestic Product for a long time. Schiller (1999) opined that economic growth is an increase in output (real GDP), an expansion in product possibility curve. Similarly, to Schiller (1999), Dolan and Lindsey (1991) expressed economic growth as most frequently expressed in terms of increase in GDP, a measure of the economy's total output of goods and services. This GDP as a measure of economic growth, like any other economic quantitative must be expressed in real terms. That is, it must be adjusted for the effects of inflations as for it to provide a meaningful measure of growth overtime.

Also, Jhingan (2008) explained that economic growth is related to a quantitative sustained increase in the country's per capita output or income accompanied by expansion in its labour force, consumption, capita and volume of trade. According to Aigbokhan (1995), Economic growth means an increase in the average rate of output produce per person usually measured on a per annum basic. It is also the rate of change in national output or income in a given period. Economic growth is the increase of per capital GDP or other measure of aggregate income. It is often measured as the rate of change in real GDP and refers only to the quantity of goods and services produced.

More recently, the Reserve Bank of Australia (2024) conceptualizes economic growth simply as an increase in the country's economy over a period of time. This size of an economy is typically measured by the total production of goods and services in the economy, which is called gross domestic product (GDP).

This study combines the ideas of Schumpeter, Friedman; Sheriffdeen and Yasiru to submit that economic growth means a steady expansion of economic sectors, increase in the output of a country's goods and services, changes in real gross domestic product to produce a full employment which is influenced by increase in aggregate demand or observed output.

Theoretical Review

The study is anchored on two theories. These theories are Human Capital theory and Neo-Classical Growth theory.

Human Capital Theory: This study is hinged on the theoretical foundation of the Human Capital Theory (HCT) propounded by Schultz, Becker, and Mincer in the early 1960s. Early applications of HCT focused primarily on the relationship between amounts of education and economic/social returns, but recent developments in the literature suggest that the quality of education (e.g., how educational time is spent) and when educational investments are made (e.g., early childhood vs. secondary education) are critical in the process of human capital formation. Human capital itself is a composite of an individual or workforce's knowledge, skills, and life experiences, and higher levels of human capital are expected to yield increased wages and GDP, benefitting individuals and society as a whole. Limitation is observed that, upper-level applications of HCT (e.g., at the national or state levels) treat education as a relatively homogenous input. However, HCT still provides a useful lens for understanding how policy can be developed by government and individuals to incentivize investment in education.

Neoclassical Growth Theory: Solow (1956) in his conventional neoclassical growth theory is of the view that growth occurs from the accumulation of physical capital and an increase in labour force with improved technology. The Cobb-Douglas production function is an empirical variant of this approach. In case of growth, accounting the analysis is decomposed into the growth of labour, capital and total factor productivity. When growth rates of output and capital are equal, the rate of growth of output is determined by the rate of growth of labour force and technological progress. Economic growth is as a result of the accumulation of physical capital and an expansion of the labour force and an exogenous factor known as technological progress, which makes physical capital and labour more productive. Also, the theory above posits that changes in quantities of factors of production accounts for growth. They discovered that most of the growth in output was explained by a linear trend in time which he termed

"technical change" ("index of our ignorance" in the words of Abramowitz and "the residual". Thus, we consider the neoclassical production function below;

$Y = F(L, K, T)$

Where Y: Aggregate real output

L: Quantity of labour

K: Physical capital stock

T: Technical change

Taking Hicks- neutral change (that is technical progress is neither capital nor labour intensive) as the basis, Solow then postulates the production function as;

$Y = A(t)\, F(K, L)$

Where A (t) = index of technical change which is called total factor productivity (TFP).
This proposition led to the formulation of the augmented Solow model using Cobb- Douglas production function by incorporating human capital into it.
Therefore, following Mankiw et al. (1992), Grammy and Assane (1997), Odusola (1998), the Solow Model is presented thus:

$$Y_{(t)} = K_{(t)}\, \alpha H_{(t)} \beta\, (A_{(t)}\, L_{(t)})^{1-\alpha-\beta}$$

Where $\alpha + \beta < 1$ implies decreasing returns to capital.

The theory is criticized from different points of view in time. One of the criticisms is that it is difficult to be tested; quality of education is not considered and those who take investment decisions cannot calculate its possible rates of return. Another point criticized is the problem of skills. Finally, the theory is the dual job market in the context that education will not be sufficient in eliminating income inequality (Harbison & Meyers, 1964). Notwithstanding, the theory remains relevant for this study as it is a most influential economic theory of western education, consistent with the ideologies of democracy and liberal progression found in most western societies.

This study is anchored on the neoclassical growth theory (Solow's model). The human capital role in the Solow's model asserts that factors such as education and health development are assumed to be drivers of economic growth of countries. Thus, the rationality of the public financing of investment in human capital responds to the objective of either equalizing opportunities or the supply (labour productivity) curve of human capital for each person in order to avoid market failures which might be the result of the need for high capital investment.

Empirical Review

The relationship between labour productivity and economic growth in Nigeria was examined by Ngutsav and Ijirshar (2018) covering a period from 1980 to 2015. The study employed Auto-regressive Distributed Lag (ARDL) model for the analysis. The choice for the

methodology was influenced by the mixed stationary levels at 5% level of significance. The study found significant relationship between labour productivity and agricultural sector growth; and between labour productivity and the growth in the service sector. However, no significant relationship between labour productivity and manufacturing sector growth was found. Similarly, no significant relationship between labour productivity and the growth in the oil and gas sector was observed. The review of this study has given more information for the current research in the area of labour productivity and economic growth and has done justice in terms of relationship between the two variables. The relationship between Ngutsav and Ijirshar's (2018) study and the present study is not in doubt as both studies border on labour productivity and economic growth in Nigeria. However, unlike the former, the present study incorporates educational expenditure as an independent variable.

Ngutsav, Akighir and Iorember (2017) investigated Education financing, Labour productivity and Economic development in Nigeria. They focused their study on the human capital theory. To analyse this relationship, the study adapted the Vector Autoregressive Model (VAR) with data from 1970 to 2015. The study found that there exist a long run relationship between education financing, labour productivity and economic growth in Nigeria. They also observed a positive but insignificant relationship between Education financing and Labour productivity in the short-run; and similarly, Labour productivity in the short-run had a positive but statistically insignificant relationship with Economic growth in Nigeria. The study concluded that Education financing in Nigeria has the positive potentials of boosting labour productivity in the country, but negligible because of inadequate education financing that is far below the UNESCO recommendation of 26% budgetary allocation to the educational sector of developing countries. The study however, did not reconcile the causal relationship between education financing and labour productivity and then labour productivity and economic growth in Nigeria. Also, investigating the transmission from education financing through labour productivity to economic growth in Nigeria would have added quality to the work.

Abdullah, Harun, and Jali (2017) investigated the effect of employment generated by government spending on education in Malaysia. The study used input-output analysis to describe employment generated by government spending on education. The impact on number of labours is based on industries in economic sectors. They established that, this spending is important role to increase the number of skilled labour, job creation and fulfil labour requirement in economic sectors. At the same time, education was also considered as human capital investment to increase the productivity of labour and reduce economic problems such as unemployment and poverty. Thus, education was considered as source of wealth in society. Their findings therefore presented that a study about impact of government spending on education and employment is necessary to determine how far education can impact employment in Malaysia. The end point of labour employment could be in form of labour productivity. This study could have accounted in details how education expenditure has impacted labour in the findings, specific submissions were not established.

Brezis and Brand (2018) investigated the Effects of Education on Labour Productivity focusing on the differences between tradable and non-tradable industries in Israel. The research focuses on regression analysis to ascertain the differences in labour productivity between tradable and non-tradable industries, and the Contribution of education and human capital to the differences between these two sectors. Using historical time series data and labour surveys conducted by the Central Bureau of Statistics of Israel (CBS), the study builds

upon a data set ranging from 1995 up to 2010, allowing for employment, output and educational trends to be examined.it was observed that while productivity rose substantially in the tradable sector, in the non-tradable sector, output per worker has remained the same; although, the rise in human capital in both sectors does not differ significantly. The study emphasizes that heterogeneous ability of individuals as well as a double duality both in the labour market and the higher-education might explain these facts. They made a point that the differences in labour productivity between sectors double duality in the economy and permit a separation of individuals by their ability, these conclusions were relevant in adding quality to this study.

Conducting a study on the impact of human capital development and economic growth in Nigeria from 1981-2016, Ogunleye et al. (2017) employed a survey research design and annual time series data from the specified period which was further analysed using ordinary least squares (OLS). Their findings from the empirical result presented that human capital development has significant impact on economic growth of Nigeria. It was also observed that life expectancy and primary school enrolment exhibited a negative and insignificant impact on economic Growth in Nigeria. The study concluded that the government should allocate adequate resources to the development of human capital to enhance economic growth and also increase total expenditure on education. It was observed however that the study didn't specify the link from education to economic growth with is productivity.

Máté, Darabos and Dajnoki (2016) investigated the impact of human capital on labour productivity regarding 'et 2020' targets. Taking into account new endogenous growth theories, our models include the lagged dependent variables among the repressors. A dynamic regression specification requires exceptional instrumentation of these lagged endogenous variables, for which we used the empirically offered GMM estimators, developed by Bond and Arrelano (1991). The methods employ lagged levels of the dependent and predetermined variables, as well as differences between the exogenous variables as instruments. The purpose of the study was to explore the present educational attainment performance in various OECD countries and to analyse the determinants of productivity growth regarding these educational targets. The study found that in long run, an increase in the level of human capital resulted in a greater increase in productivity in those countries where the tertiary education and early school leaver ratios targets are achieved. Their conclusions highlight that educational reforms are needed to rethink the establishment of knowledge societies. As a recommendation, such reforms would have been specified to present a focus for policy formulation. It would have been clearer to establish causation amongst the human capital variables used with economic growth.

The empirical review in this study has presented different research topics, objectives and findings. A clear gap between the present and the reviewed studies has been identified in variable combination, econometrics approach in terms of methodology. The most recent study relative to this research in Nigeria context is that of Ngutsav, Akighir and Iorember (2017). It was observed that their study neglected the causal Relationship amongst the variables (Education financing, Labour productivity and Economic growth) This study therefore covers the highlighted gaps and focus on the study questions to attain the stated objectives and also test for the established hypotheses.

3. Methodology

The data used for this study was time series data which was obtained from secondary sources. The data were collected from Central bank of Nigeria statistical Bulletins for all variables except for Labour productivity which was obtained from National Bureau of Statistics.

Model Specification

A structural VAR frame work was set up following the transmission flow as presented below;

Education expenditure $\longrightarrow$ Labour productivity $\longrightarrow$ Economic growth

This transmission flow can be put in equation form following Solow (1956). The model suggests that education expenditure and labour productivity depend on economic growth. Thus,

$$RGDP = \alpha_0 + \alpha_1 L + \alpha_2 K + \alpha_3 GREE + \alpha_4 GCEE + \alpha_5 GEH + e \quad (1)$$

Using the elasticity of the respective study variables so as to overcome the problems arising from measurement errors, the model is logged as follows:

$$\ln RGDP = \alpha_0 + \alpha_1 \ln L + \alpha_2 \ln K + \alpha_3 \ln GREE + \alpha_4 \ln GCEE + \alpha_5 \ln GEH + e \quad (2)$$

A transmission model is extracted below to reflect only the main variable in the transmitting mechanism.

$$LnRGDP = \beta_0 + \beta_1 \mathrm{Ln}L + \beta_2 LnGREE + \beta_3 LnGCEE + u \quad (3)$$

As a pass-through analysis, only the main variables of the study (Education expenditure: Capital and recurrent; Labour productivity and Economic growth) are selected to entered into a Structural VAR (SVAR) model in level form and represented to justify the specifications of the order of variables in the model which yields the under listed transposed matrix of the form:

$\ln RGDP_t = f(\ln RGDP_{t-1}, \mathrm{Ln}L_{t-1}, \ln GREE_{t-1}, \ln GCEE_{t-1}, \mathrm{Ln}L_t, \ln GREE_t, \ln GCEE_t)$ ..... (4)

$\mathrm{Ln}L_t = f(\ln RGDP_{t-1}, \mathrm{Ln}L_{t-1}, \ln GREE_{t-1}, \ln GCEE_{t-1}, \ln RGDP_t, \ln GREE_t, \ln GCEE_t)$..... (5)

$\ln GREE_t = f(\ln RGDP_{t-1}, \mathrm{Ln}L_{t-1}, \ln GREE_{t-1}, \ln GCEE_{t-1}, \ln RGDP_t, \mathrm{Ln}L_t, \ln GCEE_t)$ ..... (6)

$\ln GCEE_t = f(\ln RGDP_{t-1}, \mathrm{Ln}L_{t-1}, \ln GREE_{t-1}, \ln GCEE_{t-1}, \ln RGDP_t, \mathrm{Ln}L_t, \ln GREE_t)$..... (7)

The overparametarised SVAR (1) of the system of equations above can be further expressed as follows;

$$\ln RGDP_t = \alpha^1_{11}\ln RGDP_{t-1} + \alpha^1_{12}\ln L_{t-1} + \alpha^1_{13}\ln GREE_{t-1} + \alpha^1_{14}\ln GCEE_{t-1} + \alpha^0_{12}\ln L_t + \alpha^0_{13}\ln GREE_t + \alpha^0_{14}\ln GCEE_t + U_{t1} \quad (8)$$

$$\ln L_t = \alpha^1_{21}\ln RGDP_{t-1} + \alpha^1_{22}\ln L_{t-1} + \alpha^1_{23}\ln GREE_{t-1} + \alpha^1_{24}\ln GCEE_{t-1} + \alpha^0_{21}\ln RGDP_t + \alpha^0_{23}\ln GREE_t + \alpha^0_{24}\ln GCEE_t + U_{t2} \quad (9)$$

$$\ln GREE_t = \alpha^1_{31}\ln RGDP_{t-1} + \alpha^1_{32}\ln L_{t-1} + \alpha^1_{33}\ln GREE_{t-1} + \alpha^1_{34}\ln GCEE_{t-1} + \alpha^0_{31}\ln RGDP_t + \alpha^0_{32}\ln L_t + \alpha^0_{34}\ln GCEE_t + U_{t3} \quad (10)$$

$lnGCEE_t = \alpha^1_{41} lnRGDP_{t-1} + \alpha^1_{42} lnL_{t-1} + \alpha^1_{43} lnGREE_{t-1} + \alpha^1_{44} lnGCEE_{t-1} + \alpha^0_{41} lnRGDP_t + \alpha^0_{42} lnL_t + \alpha^0_{43} lnGREE_t + U_{t4}$ ..... (11)

By collecting like terms from the system above, the matrix form is therefore presented below;

$$\underbrace{\begin{bmatrix} 1 & -\alpha 0_{12} & -\alpha^0_{13} & -\alpha^0_{14} \\ -\alpha^0_{21} & 1 & -\alpha^0_{23} & -\alpha^0_{24} \\ -\alpha^0_{31} & -\alpha^0_{32} & 1 & -\alpha^0_{34} \\ -\alpha^0_{41} & -\alpha^0_{42} & -\alpha^0_{43} & 1 \end{bmatrix}}_{\mathbf{A_0}} \underbrace{\begin{bmatrix} lnRGDP_t \\ lnL_t \\ lnGREE_t \\ lnGCEE_t \end{bmatrix}}_{\mathbf{Z_t}} =$$

$$\underbrace{\begin{bmatrix} \alpha^1_{11} & \alpha^1_{12} & \alpha^1_{13} & \alpha^1_{14} \\ \alpha^1_{21} & \alpha^1_{22} & \alpha^1_{23} & \alpha^1_{24} \\ \alpha^1_{31} & \alpha^1_{32} & \alpha^1_{33} & \alpha^1_{34} \\ \alpha^1_{41} & \alpha^1_{42} & \alpha^1_{43} & \alpha^1_{44} \end{bmatrix}}_{\mathbf{A_1}} \underbrace{\begin{bmatrix} lnRGDP_{t-1} \\ lnL_{t-1} \\ lnGREE_{t-1} \\ lnGCEE_{t-1} \end{bmatrix}}_{\mathbf{Z_{t-1}}} + \underbrace{\begin{bmatrix} U_{t1} \\ U_{t2} \\ U_{t3} \\ U_{t4} \end{bmatrix}}_{\mathbf{V_t}} \quad \text{....(12)}$$

Where;

A_0 = 4x4 matrix of contemporaneous effects
Z_t = 4x1 column matrix of estimable endogenous variables
A_1 = 4x4 matrix of estimable coefficients of the endogenous variables
Z_{t-1} = 4x1 column vector matrix of lagged estimable endogenous variables
V_t = 4x1 column vector matrix of the white noise in the system

The above model cannot be estimated using SVAR because the number of parameters is more than the number of equations. Since we cannot estimate an overparameterised model based on economic theory and institutional knowledge, certain restrictions will be imposed on some parameters of the A_0 matrix following equations 8 to 11 in order to resolve the problem of identification in SVAR.by recursive approach, we can impose restrictions on the upper elements above the matrix diagonal to zero.

To explain the intuition behind the orthogonal restriction in SVAR models, Bernanke and Gertler (1986) presented the structural innovations as primitive exogenous forces, not directly observed by the econometrician, which buffet the system and cause oscillations. Because these shocks do not have common causes, it is natural to treat them as approximately uncorrelated. However, Bernanke pointed out that this does not imply no contemporaneous correlation between the variables in the structural model. Thus one would not want to restrict individual u' s (structural shocks in his notation) to entering one and only one structural equation. In general; thus the matrix A is allowed to have arbitrary off-diagonal elements. Under this interpretation, then, the stochastic parts of individual structural equations would be allowed to contemporaneously correlate in an arbitrary way; but the correlation between any two equations would arise explicitly because the equations are influenced by one or more of the same fundamental shocks, indicated as U_t. Hence in SVAR, the dynamic relationships in the economy are modelled as a relationship between shocks and allows a theory (Human capital theory) guided look at the data

This restriction is shown below;

$-\alpha^0_{12} = -\alpha^0_{13} = -\alpha^0_{14} = -\alpha^0_{23} = -\alpha^0_{24} = -\alpha^0_{34} = 0$

Thus, the generic SVAR model can be specified as;

$A_0Y_t = A_1Y_{t-1} + A_2Y_{t-2} + A_3Y_{t-3} + ... + A_pY_{t-p} + U_t$ .....(13)

$\Rightarrow A_0Y_t = A_1Y_{t-1} + U_t$ .....(14)

Where;

A_0 = matrix of coefficients of contemporaneous effects

Y_t = vector matrix of estimable endogenous variables

A_1 = matrix of coefficients of parameters

Y_{t-1} = vector matrix of lagged endogenous variables

$U_t = ß\eta_t$ = vector matrix of uncorrelated structural shocks of the system.

With $Var(U_{1t})$ set to unity and A_0 being chosen to capture the contemporaneous interactions among the Y_{1t}, along with the standard deviation of the structural shocks in the model. Following the recursive approach, we can impose restrictions on the upper elements above the matrix diagonal to zero. Therefore, restricting A_0 matrix above in recursive specifications yields:

$lnRGDP_t = lags + U_{t1}$.....(15)

$lnL_t = \alpha^0_{21}lnRGDP_t + lags + U_{t2}$.....(16)

$lnGREE_t = \alpha^0_{31}lnRGDP_t + \alpha^0_{32}lnL_t + lags + U_{t3}$.....(17)

$lnGCEE_t = \alpha^0_{41}lnRGDP_t + \alpha^0_{42}lnL_t + \alpha^0_{43}lnGREE_t + lags + U_{t4}$.....(18)

Thus, the parsimonious form of equations is specified in a triangular matrix below;

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ -\alpha^0_{21} & 1 & 0 & 0 \\ -\alpha^0_{31} & -\alpha^0_{32} & 1 & 0 \\ -\alpha^0_{41} & -\alpha^0_{42} & -\alpha^0_{43} & 1 \end{bmatrix} \begin{bmatrix} \partial_t^{lnRGDP} \\ \partial_t^{lnL} \\ \partial_t^{lnGREE} \\ \partial_t^{lnGCEE} \end{bmatrix} = \begin{bmatrix} \sigma_1 & 0 & 0 & 0 \\ 0 & \sigma_2 & 0 & 0 \\ 0 & 0 & \sigma_3 & 0 \\ 0 & 0 & 0 & \sigma_4 \end{bmatrix} \begin{bmatrix} \Sigma_1 \\ \Sigma_2 \\ \Sigma_3 \\ \Sigma_4 \end{bmatrix} \text{.....(19)}$$

From equation 19, it was expressed that;

$U_t = ß\eta_t$

$$\text{And } ß = \begin{bmatrix} \sigma_1^2 & 0 & 0 & 0 \\ 0 & \sigma_2^2 & 0 & 0 \\ 0 & 0 & \sigma_3^2 & 0 \\ 0 & 0 & 0 & \sigma_4^2 \end{bmatrix} = \text{unit variance i.e., } var(\eta_t) = 1$$

Thus;

$$A_0=\begin{bmatrix} 1 & 0 & 0 & 0 \\ -\alpha^0_{21} & 1 & 0 & 0 \\ -\alpha^0_{31} & -\alpha^0_{32} & 1 & 0 \\ -\alpha^0_{41} & -\alpha^0_{42} & -\alpha^0_{43} & 1 \end{bmatrix}\begin{bmatrix} \ln RGDP_t \\ lnL_t \\ lnGREE_t \\ lnGCEE_t \end{bmatrix} =$$

$$\begin{bmatrix} \sigma_1^2 lnRGDP_t & 0 & 0 & 0 \\ 0 & \sigma_2^2 lnL_t & 0 & 0 \\ 0 & 0 & \sigma_3^2 lnGREE_t & 0 \\ 0 & 0 & 0 & \sigma_4^2 lnGCEE_t \end{bmatrix}\begin{bmatrix} U_t^{lnRGDP} \\ U_t^{lnL} \\ U_t^{lnGREE} \\ U_t^{lnGCEE} \end{bmatrix} \text{----------(20)}$$

Among others, the restriction used in this work is by making the system recursive. Proposed by Wold (1951), this assumes that A_0 is typically lower triangle and structural shocks are not correlated. This is a method of identifying the parameters of structural equations. Wold's suggestion reduces the number of unknown parameters to exactly the number estimated in the summative model.

It is noted that A_0 which is lower triangular matrix, measures the contemporaneous effect or long run path. This implies that $var(U_{1t}) = \sigma_1^2$, $var(U_{2t}) = \sigma_2^2$, $var(U_{3t}) = \sigma_3^2$ and $var(U_{4t}) = \sigma_4^2$, such that Cov (U_{1t} U_{2t} U_{3t} U_{4t}) = 0.

More so, the zeros at the upper diagonal implies that there must be no serial correlation among the structural shock in the model. The ß matrix measures the structural shocks in the SVAR system. Also the lower triangular matrix of variance of the parameters changes the zeros. Furthermore, it is also set to avoid spill over effect of the shocks on other variables in the model.

This implies that our normalised SVAR of the form $A_0Z_t = A_0Z_{t-1} + U_t$ reduced to $A_0\partial_t = ß\eta_t$. But we know $ß\eta_t = ßU_t$, hence the baseline for our estimable SVAR model can be specified in a reduced form as;

$A_0\partial_t = ßU_t$ .....(21)

Equation 21 is presented in matrix form as thus;

$$\underset{A_0}{\begin{bmatrix} 1 & 0 & 0 & 0 \\ -\alpha^0_{21} & 1 & 0 & 0 \\ -\alpha^0_{31} & -\alpha^0_{32} & 1 & 0 \\ -\alpha^0_{41} & -\alpha^0_{42} & -\alpha^0_{43} & 1 \end{bmatrix}}\underset{\partial_t}{\begin{bmatrix} \partial_t^{lnRGDP} \\ \partial_t^{lnL} \\ \partial_t^{lnGREE} \\ \partial_t^{lnGCEE} \end{bmatrix}} = \underset{ß}{\begin{bmatrix} \sigma_1^2 lnRGDP_t & 0 & 0 & 0 \\ 0 & \sigma_2^2 lnL_t & 0 & 0 \\ 0 & 0 & \sigma_3^2 lnGREE_t & 0 \\ 0 & 0 & 0 & \sigma_4^2 lnGCEE_t \end{bmatrix}}\underset{U_t}{\begin{bmatrix} U_t^{lnRGD} \\ U_t^{lnL} \\ U_t^{lnGREE} \\ U_t^{lnGCEE} \end{bmatrix}} \quad (22)$$

Where; A_0 = matrix of long run contemporaneous effect

∂_t = column vector matrix of estimable endogenous variables

ß = matrix of structural shocks in the model; $var(\eta_t) = 1$, unit matrix

U_t = column vector matrix of error terms in the model.

Therefore, the "S" matrix is specified as;

$$\begin{bmatrix} \partial_t^{lnRGDP} \\ \partial_t^{lnL} \\ \partial_t^{lnGREE} \\ \partial_t^{lnGCEE} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ -\alpha^0_{21} & 1 & 0 & 0 \\ -\alpha^0_{32} & -\alpha^0_{32} & 1 & 0 \\ -\alpha^0_{41} & -\alpha^0_{42} & -\alpha^0_{43} & 1 \end{bmatrix} \begin{bmatrix} \sigma_1^2 lnRGDP_t & 0 & 0 & 0 \\ 0 & \sigma_2^2 lnL_t & 0 & 0 \\ 0 & 0 & \sigma_3^2 lnGREE_t & 0 \\ 0 & 0 & 0 & \sigma_4^2 lnGCEE_t \end{bmatrix} \begin{bmatrix} U_t^{lnRGDP} \\ U_t^{lnL} \\ U_t^{lnGREE} \\ U_t^{lnGCEE} \end{bmatrix} \quad \text{.....(23)}$$

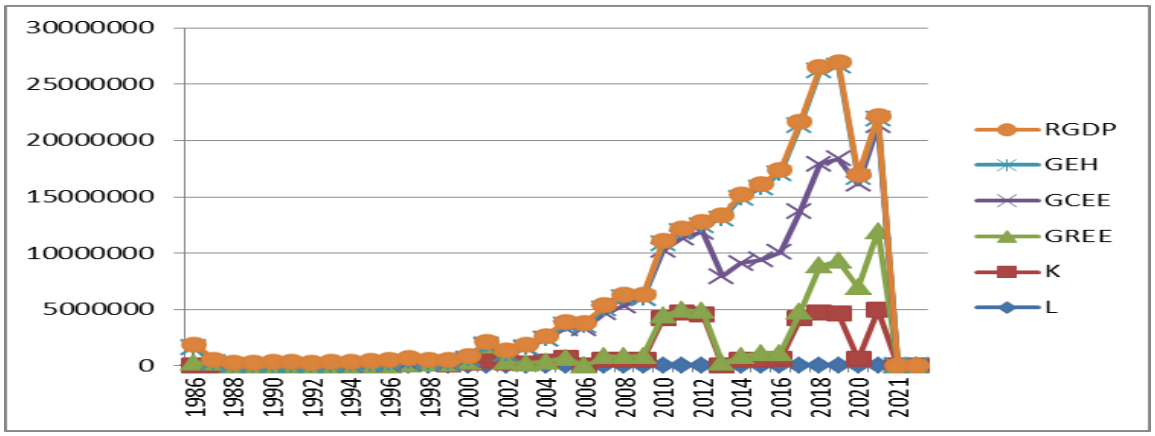
This represents the initial impact of transmission in the SVAR model. The impulse response will however determine the final impact of the transmission in the SVAR model.

Method of Data Analysis

The data obtained were first put through a trend analysis to check flow amongst variable within the study period. Wald Tests was set in place with SVAR methodology. Impulse Response and Forecast Variance Decomposition were also conducted.

4. Results and Discussion

In order to trace out the trend analysis of the study variables, their co-movement levels have been analyzed and the result is presented in Figure 1:



Source: Author's Computation from E-views 10 Output

Figure 1 Trend result between Education expenditure and Labour productivity in Nigeria

The results in Figure 1 show the trend between Education expenditure and Labour productivity in Nigeria. The study took a base year from 1986 up to 2021. Within this period, both capital and recurrent expenditure on education in Nigeria presented different trend from year to year. Capital expenditure on education took an upward trending within the study period above recurrent expenditure on education throughout the study period. The upward trend of capital expenditure on education peaked in 2018 but reverted from 2019. The trend in capital expenditure on education is evident and can be attributed to monthly salaries paid to teaching and non-teaching staff in Nigeria schools, especially at the tertiary level of education and sundry expenses. The payments of these expenditures were observed to be prioritized against capital expenditure. For instance, the number of capital interventions through the Universal Basic Education Commission (UBEC) and Tertiary Education Trust Fund (TETFUND) were made by government or its agencies compared with the monthly payment and running cost was partially skewed in favor of recurrent expenditure from the year 2002.

Recurrent education expenditure took a wavelike but upward trend within the study period. It took a recovery from 2008 up to 2014 but declined from 2015 to 2016. In 2017, a swift recovery was observed with a wavelike upward trend. Recurrent expenditure on education peaked in 2018. The cuts in fiscal spending including education expenditure; could be responsible for the fluctuations that presented the wavelike trend experienced in recurrent educational spending. However, labour productivity and capital productivity rallied at low ebbs compared to the expenditure on education throughout the study period.

Table 1: Descriptive Statistic

	LNRGDP	LNL	LNK	LNGREE	LNGCEE	LNGEH
Mean	10.37249	2.381871	12.31718	3.444888	1.622233	2.614358
Median	10.27359	2.487010	12.39775	4.171030	1.768405	3.504595
Maximum	11.15353	2.856207	15.32040	6.142682	1.953020	5.551874
Minimum	9.631547	1.131122	9.337102	-1.491631	0.616050	-3.186541
Std. Dev.	0.528971	0.408091	2.040728	2.319357	0.385168	2.578624
Skewness	0.218603	-1.238866	-0.082681	-0.742799	-1.353000	-0.627132
Kurtosis	1.525031	4.262462	1.677634	2.450612	3.640347	2.198915
Jarque-Bera	3.254188	10.63282	2.441994	3.449641	10.63216	3.045505
Probability	0.196500	0.004910	0.294936	0.178205	0.004912	0.218111
Observations	33	33	33	33	33	33

Source: Author's Computation from Eviews 10 Output

It can be seen from the Table 1 that economic growth has a mean value of 10.37 from 1986 to 2021 and a standard deviation of 0.53 indicating that even though Nigeria have moderate growth rate, the spread in terms of growth does not vary high (significantly vary) within this period despite different macro-economic reforms adopted by the country.

The variable Labour productivity (L) has the highest mean rating of 2.38 with a standard deviation of 0.40, the maximum and minimum values were 2.85 and 1.13 in the years 2015 and 1986 respectively. The spread in terms of labour productivity was observed to be low at 0.40. The minimum value of labour productive observed in 1986 can be attributed to factors such as the prevalent petrol scarcity, low investment and inefficient government spending and over engagement in the economy and the decline in power generation before the structural Adjustment program.

Government Recurrent Expenditure on Education (GREE) averaged 3.44, presenting a spread of 2.31. Its maximum value was 6.14 in 2018 and a minimum of -1.49 in 1986. The mean of Government Capital Expenditure on Education (GCEE) stood at 1.62 with a standard deviation of 0.38. Maximum capital expenditure was recorded at 1.95 in 2009 and the minimum of the variable was 0.61 in 1986.

The peak in recurrent education expenditure observed in 2018 could be due to government committing to increase spending on education following a strike by the Academic Union of Universities, ASUU, that forced Nigerian universities to shut down due to poor funding of universities and the failure of government to implement an agreement it signed in 2009 with ASUU to improve facilities and enhance staff welfare at the institutions.

The mean of Government expenditure on Health (GEH) was 2.61 with a standard deviation of 2.57. Health expenditure was highest in 2015 at 5.55 and minimum in 1986 at -3.18. The Stock of physical capital also presented an average value of 12.31% with a maximum at 15.32 in 2014 and a minimum of 9.33 in 1986.

The Jarque-Bera statistics is used to measure the normality of the variable used in the estimate, it is used to verify whether the error term is normally distributed. In the estimate in Table 1, the Jarque-Bera statistics for RGDP, K, GREE and GEH has the probability values of 0.196500, 0.294936, 0.178205 and 0.218111 respectively which invariably means that the variables are normally distributed, while GCEE and L indicates non normal distribution with the probability values of 0.004910 and 0.004912 respectively.

Lag Order Selection

The study specified the maximum length of lag (k) using different information criteria. The lag selection test result for the SVAR model specified is presented in Table 2.

Table 2: Lag Order Selection for SVAR Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-12.58484	NA	3.69e-05	1.143782	1.332374	1.202847
1	132.3536	239.8981	5.14e-09	-7.748524	-6.805562	-7.4532
2	145.1272	17.61881	6.89e-09	-7.526016	-5.828683	-6.994433
3	186.5407	45.69766*	1.44e-09	-9.278672	-6.826969	-8.510829
4	217.0872	25.27986	7.99e-10*	-10.28188*	-7.075806*	-9.277777*

* indicates lag order selected by the criterion

Source: Author's computation from Eviews-10 output

The result of the lag order section in the Table 2 show that Lag four (4) is the optimal lag for the study models as indicated by Akaike Information criterion (AIC), Schwarz Information Criterion (SIC) and Hanna-Quinn Information Criterion (HQ). Thus the study model will be estimated using Lag four (4) for optimal performance and adequate representation of the data.

Table 3: Result of Unit Root Test (ADF)

Variable	ADF Test Statistic at Level	Prob.	ADF Test Statistic at 1st Diff	1% Critical Value	5% Critical Value	10% Critical Value	Prob*	Order of Integration
RGDP	-0.70	0.8312	-3.11	-3.66	-2.96	-2.62	0.0358	I(1)
LNL	-3.23	0.2074	-9.98	-3.66	-2.96	-2.62	0.0000	I(1)
LNK	-1.59	0.4719	-5.36	-3.66	-2.96	-2.62	0.0001	I(1)
LNGREE	-1.81	0.3680	-7.17	-3.66	-2.96	-2.62	0.0000	I(1)
LNGCEE	-0.72	0.9907	-4.13	-3.66	-2.96	-2.62	0.0329	I(1)
LNGEH	-2.56	0.1111	-10.09	-3.66	-2.96	-2.62	0.0000	I(1)

Source: Author's Computation from E-views 10 Output

* indicates the rejection of null hypothesis of a time series having unit root problem.

Note: These critical values are computed from Mackinnon (1996) and if the probability value of a particular variable is less than 5% level of significance (that is, 0.05), we reject the null hypothesis of the variable having a unit root problem. This implies that the said variable is stationary at the specific level of concern.

From the results of the unit root presented in Table 3, all the variable; RGDP, L, K, GREE, GCE and GEH were not stationary (contained unit root) at levels but became stationary after first difference (that is, integrated at first difference I(1)). This implies that, all the variables were not having unit root problem after first difference. This is indicated by their probability

values been less than 0.05 after first difference. As a precursor to the empirical analysis, the order of integration of the individual series was evaluated and this warranted the use of Structural VAR (SVAR) to decide on the indirect effects or the purpose of accountings for transmission effect or inter-temporal effect in the model from education expenditure (Recurrent and Capital), labour productivity and economic growth, (i.e from GCEE→GREE→L→RGDP)

Table 4: Johansen Unrestricted Rank Cointegration Test Results

Null Hypothesis	Trace Statistic	0.05 Critical Value	Prob.**	Null Hypothesis	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r = 0*	168.54	95.75	0.0000	r = 0*	68.25	40.07	0.0000
r ≤ 1*	100.29	69.81	0.0000	r ≤ 1*	41.13	33.88	0.0057
r ≤ 2	59.16	47.85	0.0031	r ≤ 2	31.87	27.58	0.0132
r ≤ 3	27.29	29.79	0.0947	r ≤ 3	15.28	21.13	0.2696
r ≤ 4	12.01	15.49	0.1564	r ≤ 4	7.49	14.26	0.4326
r ≤ 5	4.51	3.84	0.0335	r ≤ 5	4.52	3.84	0.0335

Source: Author's computation using Eviews 10

Table 4 revealed that there is co-integration among the variables. This is because the Trace Statistic of are greater than the critical values at 5% level of significance respectively. Also, Max-Eigen Statistic are greater than the critical values at 5% level of significance respectively. We therefore reject the null hypothesis of none* of the hypothesized number of co-integrating equations. Hence according to the results, the overall variables are co-integrated meaning that there is a long run association between the research variables. This implies that in the long run, the two variables would move together in a direction.

The long run relationship existing between the variables is shown in the model below and all sign for the coefficient of the variables in the long run model are all reversed.

$$\ln RGDP = 1.00 - \underset{(0.69917)}{0.377}\ln L - \underset{(0.03046)}{0.273}\ln K - \underset{(0.29481)}{3.301}\ln GREE - \underset{(0.41853)}{3.108}\ln GCEE + \underset{(0.41853)}{1.517}\ln GEH \quad (24)$$

Source: *Authors' Computation from Eviews 10 (Appendix V)*
Note: *Standard Error in parenthesis*

The cointegration equation (24) present information about the long run relationship of labour productivity, education expenditure with economic growth; which are explained as the major variables of interest for the study. The coefficient of labour productivity is negatively signed and statistically insignificant at 5% levels. This implies that a unit change in labour productivity will lead to a 0.377% decrease in economic growth in Nigeria. Government recurrent expenditure on education also has a negative relationship with economic growth within the study period and is statistically insignificant. It indicated that a unit change in government recurrent expenditure on education will lead to a 3.377% decrease in economic growth in Nigeria. Also, Government capital expenditure on education displayed a negative relationship with economic growth and statistically insignificant. The coefficient displayed that a unit change in government capital expenditure on education will lead to a 3.108% decrease in economic growth in Nigeria.

Table 5: Recursive SVAR Result (GCEE→GREE→L→RGDP)

	RGDP	L	GREE	GCEE
RGDP	1	0	0	0
L	0.868552(0.02)	1	0	0
GREE	-0.035275(0.69)	2.693524(0.00)	1	0
GCEE	0.844385(0.03)	0.514910(0.04)	0.033898(0.065)	1

Source: Author's Computation from Eviews-10 Output (Probability values n parenthesis)

From the SVAR results in Table 5, it was observed that economic growth (RGDP) respond positively to changes in government capital expenditure on education (GCEE) contemporaneously by 0.84%. This shows that government capital expenditure on education is directly related to economic growth in Nigeria. Economic growth however presented a negative response to changes in Government recurrent expenditure on education GREE contemporaneously by 0.03%, indicating an indirect relationship between the variables. The result also is justified by the current state of the education sector in Nigeria, the poor wages and salaries amongst other recurrent needs of the sector could be responsible for the negative response.

Also, the SVAR estimates show that a change in labour productivity (L) by 0.86% will lead to a positive contemporaneous change in Economic growth. By implication, labour productivity has a direct relationship with economic growth in Nigeria within the study period. Labour productivity (L) responds positively to changes in government capital expenditure on education (GCEE) contemporaneously by 2.69% and presents a direct relationship to labour productivity in Nigeria. Similarly, labour productivity responds positively to changes in government recurrent expenditure on education (GREE) contemporaneously by 0.51%, presenting a direct relationship between the variables. The result also shows there is a positive response by recurrent expenditure on education (GREE) from changes in government capital expenditure at 0.03% contemporaneously, indicating a direct relationship between recurrent and capital expenditure on education in Nigeria.

Table 6: VAR Residual Heteroskedasticity Tests

Joint test:

Chi-sq	Df	Prob.
185.8917	160	0.0789

Source: Author's Computation from Eviews 10 Output

Table 6 shows VAR Residual Heteroscedasticity test result which indicates whether there is constant covariance of the error term in the model or not. The joint prob-value was greater than 5% level of significance, while Chi-square reveals 185.8917 significant value at 10% critical level. This implies the residuals do not suffer from heteroscedasticity problem at 5% crticial level. The study therefore accepts the null hypothesis of homoscedastic residuals at 5% critical value.

Table 7 VAR Residual Normality test result

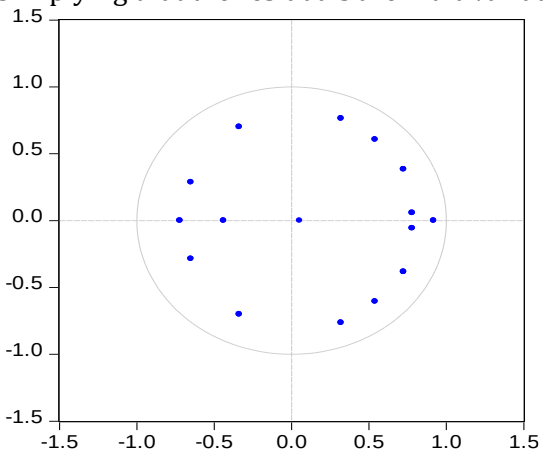
Component	Skewness	Chi-sq	Df	Prob.*
1	-0.357267	0.616925	1	0.4322
2	-0.574155	1.593325	1	0.2069
3	-1.085521	5.695385	1	0.0170
4	0.250596	0.303526	1	0.5817
Joint		8.209162	4	0.0842

Component	Kurtosis	Chi-sq	Df	Prob.
1	4.528384	2.822617	1	0.0929
2	4.018524	1.253513	1	0.2629
3	3.791765	0.757494	1	0.3841
4	3.386548	0.180548	1	0.6709
Joint		5.014172	4	0.2858

Component	Jarque-Bera	Df	Prob.
1	3.439542	2	0.1791
2	2.846838	2	0.2409
3	6.452880	2	0.0397
4	0.484074	2	0.7850
Joint	13.22333	8	0.1044

Source: Author's Computation from Eviews 10 Output

The result in Table 7 above shows the normality test joint probability values of skewness, kurtosis, and Jarque-Bera statistics all more than 5% critical level and the null hypothesis presents that residuals are multivariate normal. Since the joint probability values of skewness, kurtosis and jarque-Bera statistics are more than the significance level of 5% at 0.08%, 0.28% and 0.10% respectively, we therefore accept the null hypothesis at 0.05 critical values implying that the residuals are multivariate normal.



Source: Author's Computation from Eviews 10 Output
Figure 2 Stability Test using Inverse Root of AR Characteristic Polynomial

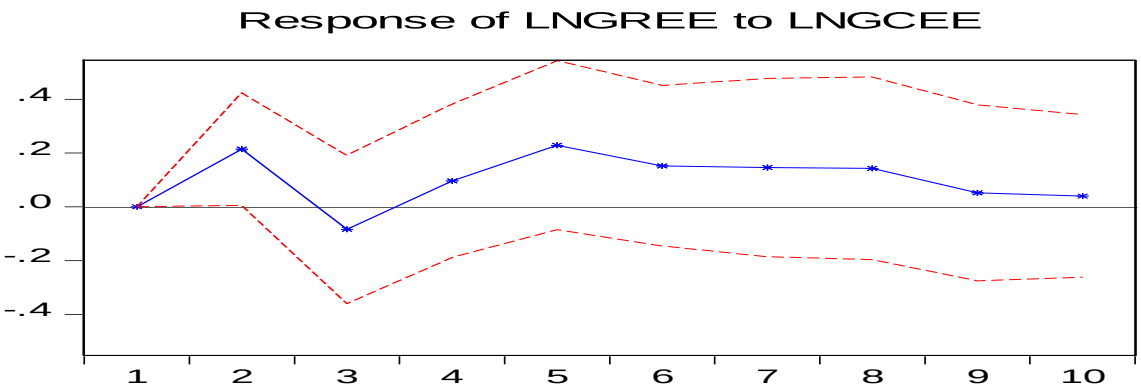
The result in Figure 2 presents that all the variables are stable within the study period as indicated in the circle. The model is proven dynamically stable (as all eigen-values lie within the unit circle) using the result of inverse roots of Autoregressive (AR) characteristic polynomial. This means that results or estimates produced are stable and can stand statistical inferences**.** This is a further confirmation of the normality test.

Table 8 VAR Residual Heteroskedasticity Tests

Chi-sq	Df	Prob.
185.8917	160	0.0789

Source: Author's Computation from Eviews 10 Output

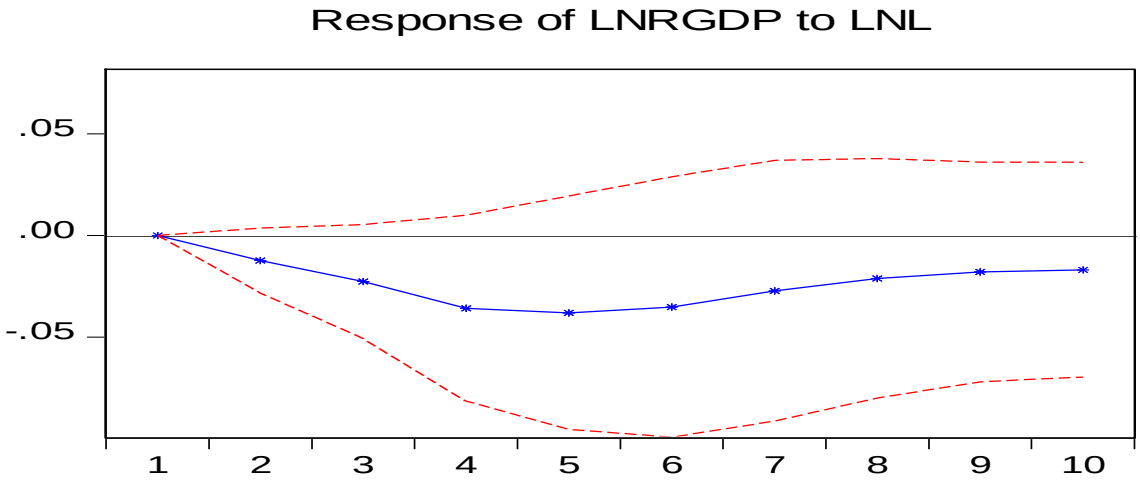
Table 8 shows VAR Residual Heteroscedasticity test result which indicates whether there is constant covariance of error term in the model or not. The joint prob-value is greater than 5% level of significance at 7.89%, while Chi-square reveals 185.8917 significant value. This implies the residuals do not suffer from heteroscedasticity problem. The study therefore accepts the null hypothesis of residuals is homoscedastic at 5% critical value.



Source: Author's Computation from Eviews 10 Output

Figure 3: Response of Government recurrent expenditure on education to an Innovation in Government capital expenditure on education

The result in Figure 3 indicates that a one Standard Deviation (SD) innovation to Government capital expenditure on education will present a temporal shock in Government recurrent expenditure on education, combining positive and negative values of different sizes at different periods. GREE will pose no response at the first period but will swiftly rise in period two in the positive region and then will decline swiftly in period three at a minimum in the negative region. In period four recurrent expenditure on education will rise swiftly and maintain a steady response from capital expenditure up to period five and decline steadily down, approaching the equilibrium line without contact within the positive region from period six down to period ten, maintaining a temporal shock. This implies that, there is a tendency for continues fluctuating response from recurrent expenditure on education about the innovation in capital expenditure in the short run from positive to negative after which it will take a positive response at the beginning of the long run, with a declining tendency but no to the negative region on temporal bases.



Source: Author's Computation from Eviews 10 Output
Figure 4: Response of Economic Growth to an Innovation in labour productivity

From the Impulse Response Function (IRF) result in Figure 4, it is observed that a one Standard Deviation (SD) impulse (innovation) to labour productivity initially will have no response from economic growth at the beginning of the short run. But from period two to four, there will be a negative response from the equilibrium, declining gradually within these periods with a rising turn at the end of short run (period five) but in the negative region at different values. The steady rise will continue in the beginning of the long run from period six up to period eight after which it will maintain a steady response with little difference in size and value up to period ten. This implies that in Nigeria, an innovation to labour productivity will present a negative but response from economic growth majorly in the short run but a better response will emerge in the long run, posing a recovery response to the positive region.

Table 9: Variance Decomposition of Economic growth

Period	S.E.	LNRGDP	LNL	LNGREE	LNGCEE
1	0.020776	100.0000	0.000000	0.000000	0.000000
2	0.040638	94.16129	0.201537	4.506158	1.131015
3	0.061187	85.88596	1.142003	12.42468	0.547350
4	0.079448	80.74806	1.283996	17.54933	0.418607
5	0.094975	79.97677	1.944977	17.74812	0.330130
6	0.108590	80.37594	1.796403	16.99112	0.836537
7	0.120561	80.54536	1.760067	16.22527	1.469299
8	0.131316	80.21965	1.671115	15.83239	2.276847
9	0.139960	79.87867	1.567277	15.68351	2.870540
10	0.146655	79.83477	1.433696	15.26571	3.465820

Source: Author's Computation from Eviews 10 Output

Results in Table 9 show that in the short term starting from the second period, an innovation to economic growth (RGDP) would account for 94.16% variation in economic growth (own shock). In period three, four and five, economic growth would account for 85.88%, 80.74% and 79.97% variation in economic growth respectively in the short run. An innovation to labour productivity (L) in the second period would account for 0.20% variation in economic growth, after which the variation will turn to increase in period three, four and five in the short run at 1.14%, 1.28% and 1.94% respectively.

Also, Government recurrent expenditure on education would cause 4.51% variation in economic growth at the second period and continued on the increase in period three, four and five at 12.42%, 17.54% and 17.74% in the short run. For long run variation, Government recurrent expenditure on education would turn to decline continuously from period six to ten causing 16.99%, 16.22%, 15.83%, 15.68% and 15.26% variations in economic growth respectively. While Government capital expenditure on education would causes 1.13% variation economic growth in period two after which it will drop continually in period three, four and five at 0.54%, 0.41% and 0.33% respectively in the short run. As the long run begins in period six, Government capital expenditure on education would cause 0.83% variation in economic growth, higher than the end of the short run (period five) and the variation would continue on the increase from period seven, eight, nine and ten at 1.46%, 2.27%, 2.87% and 3.46% respectively in economic growth of Nigeria.

5. Conclusion and Recommendations

The study concludes that economic growth responds positively to labour productivity and in a similar way, labour productivity responds positively to Education expenditure. Thus, this study views economic growth as central objective of labour productivity from government expenditure on education and achievements in economic growth can make a critical contribution to labour productivity.

From the findings of this study, the following recommendations are put forth:

i. As observed in the causal relationship between education expenditure and labour productivity, government should continue to increase its recurrent expenditure on education and do more to capital expenditure on education; both must be on the increase so as to boost the impact of the sector on Labour productivity. This can be achieved by building up the progressive tax system, fairer taxation of multinationals and corporations, reducing exemptions and ineffective incentives and reducing corruption and tax avoidance. Reducing tax exemptions alone could have a significant impact on the overall education budget. Government should close loopholes that allow tax evasion and miss management of generated revenue; and push for stronger tax and royalty arrangements for extractive industries.

ii. The National Productivity Centre should strategically work with civil society as a way of surmounting the limitations on it by fragmentation or compartmentalization of its roles, responsibilities, mandate that prevents it from effectively collaborating with other departments and ministries of the Government in resolving problems that adversely affect and influence productivity. For example, while the National Productivity Centre can cause higher productivity by collaborating with Education Ministries at State and federal levels to prevent deleterious disruptions to educational programs and training, it is not doing

this effectively because the roles of both departments and ministries are rigidly defined in a way that abhors infringement by non-members of individual ministries and departments.

References

Abdullah, M. B., Harun, M., & Jali, M. R. M. (2017). Employment generated by government spending on education. *International journal of academic research in business and social sciences*, *7*(2), 738-742.

Adamu, P.A. (2013) "The Impact of Human Capital Formation on Economic Development in Nigeria: An Error Correction Approach". In: Human Resource Development in Africa: *International Journal of Management, Social Sciences, Peace and Conflict Studies (IJMSSPCS)*, 6(2), 467- 497.

Aigbokhan, B. E. (1995). *Macroeconomics: Theory, policy and evidence*. Benin City: Idenijies Publishers.

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. Review of Economic Studies, 58, 277-297.
https://doi.org/10.2307/2297968

Bernanke, B. & Gertler, M. (1986). Agency costs, collateral, and business fluctuations. Proceedings, Federal Reserve Bank of San Francisco. National Bureau of Economic Research.

Brezis, E. S., & Brand, G. (2018). Productivity gap between sectors and double duality in labor markets. *Open Economies Review*, *29*, 725-749.

Chappelow, J. (2018). Investment in physical, human capital, economic growth and life expectancy in Bangladesh: An empirical investigation.

Dolan, E. G., & Lindsey, D. E. (1991). *Macroeconomics* (6th ed.). Chicago, IL: The Dryden Press.

Elise, S. B., & Gilad, B. (2016). *Productivity gap between tradable and non-tradable industries and duality in higher education* (Working Paper No. 2017-10). Bar-Ilan University, Department of Economics.

Grammy, A. P., & Assane, D. (1997). New evidence on the effect of human capital on economic growth. *Applied economics letters*, *4*(2), 121-124.

Harbison, F., & Myers, C. A. (1964). *Human resources as the wealth of nations*. New York, NY: Oxford University Press.

Jhingan, M. L. (2008). *Macroeconomic theory*. Delhi, India: Vindra Publications.

Lipsey, R. G. (1986). *Economics*. New York, NY: Harper and Row.

MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. *Journal of applied econometrics*, *11*(6), 601-618.

Maitra, B. (2018). Investment in physical, human capital, economic growth and life expectancy in Bangladesh: An empirical investigation. *South Asia Economic Journal*, *19*(2), 251-269.

Máté, D., Darabos, É., & Dajnoki, K. (2016). The impact of human capital on labour productivity regarding 'et 2020'targets. *Network Intelligence Studies*, *4*(7), 61-67.

Neagu, O. (2012). Measuring the Effects of Human Capital on Growth in the Case of Romania. *Annals of the University Dunarea de Jos of Galati: Fascicle: I, Economics & Applied Informatics*, *18*(1).

Ngutsav, A., & Ijirshar, V. U. (2018). Labour productivity and economic growth in Nigeria: A disaggregated sector analysis. *Lafia Journal of Economics and Management Sciences, 3*(1), 256–276.

Ngutsav, A., Akighir, D. T., & Iorember, P. T. (2017). Education financing, labour productivity, and economic development in Nigeria. *International Journal of Advanced Studies in Economics and Public-Sector Management, 23*(12), 1–15.

Odusola, A. F. (1998). Human capital investment and the empirics of economic growth in Nigeria. In *NES Annual Conference Proceeding*.

Ogunleye, O. O., Owolabi, O. A., Sanyaolu, O. A., & Lawal, O. O. (2017). Human capital development and economic growth in Nigeria. *Journal of Business Management*, *3*(8), 17-37.

Ohaegbulem, E. U., & Chijioke, S. C. (2023). On Nigeria's Budgetary Allocations to The Education Sector (1960-2023) In View of UNESCO'S Benchmarks. *International Journal of Mathematics and Statistics Studies*, *11*(4), 32-44.

Organisation for Economic Co-operation and Development. (2002). *Education at a glance*. Paris, France: OECD Publishing.

Organization for Economic Cooperation and Development (2018). OECD Compendium of Productivity Indicators 2018. OECD Compendium of Productivity Indicators. Available at https://www.oecd.org/en/publications/oecd-compendium-of-productivity-indicators-2018_pdtvy-2018-en.html

Reserve Bank of Australia (2024). Economic Growth. Available at https://www.rba.gov.au/education/resources/explainers/economic-growth.html

Shiller, R. J., (1999). Human behavior and the efficiency of the financial system," Handbook of Macroeconomics, in: J. B. Taylor & M. Woodford (ed.), Handbook of Macroeconomics, edition 1, volume 1, chapter 20, pages 1305-1340 Elsevier.

Sholesi, O. Y. (2021). Human Resource Development Practices and Organizational Performance: Evidence from De United Food Industries Limited Ota Ogun State, Nigeria. International Journal of Academic Research in Business and Social Sciences, 11(4), 75-88.

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, *70*(1), 65-94.

Steer, L., & Smith, K. (2015). Financing Education: Opportunities for Global Action. *Center for Universal Education at The Brookings Institution*.

The Report Nigeria. (2018). *Education and health report in Nigeria*.

Wold, H. O. (1951). Dynamic systems of the recursive type: Economic and statistical aspects. *Sankhyā: The Indian Journal of Statistics*, 205-216.

World Bank. (2017). *World development indicators* [CD-ROM]. Washington, DC: The World Bank.