
Assessment of the relationship among Saving, Foreign Direct Investment, Capital Formation and Economic Growth in Nigeria

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Abstract

This study explored the relationship between domestic saving, foreign direct investment, capital formation and economic growth in Nigeria using time series data from 1988 to 2023. This work applied various econometric and statistical methods ranging from unit root test, co-integration test, to vector error correction mechanism to determine the relationship that exists between capital formation and Nigerian economy. It is being discovered that, based on VECM result that the variables in question are not contrary to economic a priori. It is imperative that, the interactive effect of domestic saving and foreign direct investment has a positive impact on the relationship that exists between capital formation and Nigerian economy. Other variables of human capital and export do affect Nigeria's economic growth in a positive way, while inflation, interest rate and import are inversely related to Nigeria's economic growth. It is recommended, based on empirical result that, there is a need for Nigerian government to raise its expenditure to provide more infrastructural facilities that include good roads, hospitals, schools, industrial estates, portable water and uninterrupted power supply among others. Provision of these mentioned infrastructural facilities will serve as an incentive for foreign and domestic investors to invest more in the country so as to reduce the level of poverty, unemployment, income inequality and high cost of living.

Introduction

The economic growth in less developed countries may not be fully understood without considering the role that is being played by capital formation. Capital formation is being recognized as one of the important factors that influences a country's economic growth. For a number of countries, especially from emerging economies to have a rapid and sustained economic growth and development, there must be an increase in the level of investment in fixed capital formation (Ahuja, 2020). Most African economies, Nigeria inclusive strive hard to achieve a prevailed level of economic progress to improve the living condition of their people, reduce the high unemployment rate, eradicate poverty and lessen the widening gap that exists between the poor and the rich. Among the reasons why African nations are lagging behind is because of lack of sufficient capital. This insufficiency in capital is what calls for foreign capital inflow to complement domestic resources, which in turn translate into increased capital formation. (Hailu, 2010). Foreign capital inflows would lead to an increase in economic growth if the host countries are endowed with the absorptive capacity in terms of technological advancement, modern infrastructural facilities, financial sector development and stable political and macroeconomic environment among others. Thus, there must be strong and efficient institutions to manage the inflows of foreign capital in the recipient countries (Wasi'u and Mubarak, 2018). Todaro and Smith (2020) were quoted to have said that Harrod-Domar growth model emphasized that the countries that are experiencing low

savings would seek external capital inflows in form of FDI and foreign aids to fill the savings-investment gap. As it is being discovered that foreign direct investment is a function of absorptive capacity that include domestic savings, human capital, regulated financial institutions to mention few. The main objective of this paper is to assess the relationship among saving, foreign direct investment, capital formation and economic growth in Nigeria. This study is therefore important for many reasons; first, it is an addition to the existing body of literature that will provide another platform upon which further researches will be based. The study also recognizes the inclusion of the interactive effect between foreign direct investment and savings to determine the level of capital formation with the view of examining whether foreign direct investment affects the relationship that exists between capital formation and economic growth. Finally the findings provide applied economists with a meaningful specification for estimating the impact of capital formation on economic growth. To achieve this objective, the study is organized into five parts. Part one covers introduction, part two reviews the relevant literature, part three present methodology, part four covers results and discussions and finally, part five is conclusions and recommendations.

Literature Review

The relationship that exists between fixed capital formation and economic growth has been reviewed by many researchers with different findings that generated mixed views and opinions. Many of the studies conducted explained that capital formation does affect economic growth in a positive way, whereas some found otherwise. Keynes (1936) happened to be the first to believe in the existence of an autonomous investment in the economy. He maintained that investment happens to be a function of the marginal efficiency of capital (MEC) in relation to some interest rate that reflects the opportunity cost of the investable funds. Kanu, and Ozurumba, (2014) studied the effect of fixed capital formation on economic growth in Nigeria, using vector autoregressive model. The study concluded that, capital formation has no significant effect on economic growth, especially in the short run. But it has, in the long run. They also deduced a direct relationship between fixed capital formations, export, and economic growth. Other variables of national savings and imports do affect economic growth in a negative way. The same findings that are also obtained by Ainabor, Shuaibu and kadiri, (2015). In contrast, while examining the short run and long run effect of fixed capital formation on economic growth, Ewubere, and Anuli, (2015) found that, fixed capital formation did not influence economic growth. Adelakun, (2015) examine the factors that affect domestic savings and Investment in Nigeria using ECM. The findings show a positive link that exists between domestic savings, investment and economic growth in Nigeria. These results were in conformity with that of Jagadeesh, (2015) and Kalu, and Joseph, (2020). Adhikary, (2022) undertook a research on foreign investment and poverty employing OLS technique in Nigeria the study showed that, foreign investment, market size, openness, exchange rate, foreign aids, technology and foreign debt explained poverty reduction in Nigeria positively.

Neo-Classical Theory of Growth

Neo-classical growth model was first initiated in the late 50s as a result of a wide research that was conducted by development economists. R. Solow and J.E. Meade happened to be the ones who contributed much to this growth theory. This model laid emphasis on fixed capital formation and savings as the main determinants of growth (Ahuja, 2020). Neo-classical growth model considered labor and fixed capital as the main determinants of output/income and technology is added as exogenous factor (Hendrik, 2002).

The neo-classical production function is as follows;

$$G = YF(L, K) \dots\dots\dots (2.1)$$

Where; G is the gross domestic product (GDP), L = human capital development, K = stock of capital and Y = technological knowledge which is exogenously determined. The rationale behind why technology Y is incorporated in the function is because; it is a factor augmenting, which implies an increase in productivity of both factors.

Methodology

The analysis is tended to test whether or not the series used in the model are stationary. Co-integration test is employed when the series/data is stationary at first difference. There would be an employment of vector error correction model (VECM) to determine the speed of adjustment of the model. Finally, the study conducts granger causality test to determine the causality direction between variables. The data is sourced from National Bureau of Statistics (NBS) and Central Bank of Nigeria (CBN).

Unit Root Tests

The following is the augmented dickey fuller regression test;

$$\Delta X_t = \alpha_0 + \alpha_1 t + \alpha_2 X_{t-1} + \sum_{i=0}^p \Delta X_{t-i} + e_t \dots\dots\dots (3.1)$$

The variable ΔX_{t-1} in the augmented dickey fuller regression test shows the first differences with p lags, whereas e_t happens to be the variable that adjusts the randomness of autocorrelation.

The Phillips-Perron test regression equation is thus;

$$\Delta y_t = \delta_0 + \delta_2 y_{t-1} + e_t \dots\dots\dots (3.2)$$

Where Δ is the operator of first difference, e_t is an error term, t is a time trend, y is a series, and δ_0 is a constant term.

Co-Integration Test

Test for co-integration is applied to determine the existence of a linear combination between variables and the rationale behind this, is that, even when some of the variables are non-stationary, their long run relation would be stationary.

The first step is the estimation of closed an unrestricted p^{th} order VAR in k series. The vector autoregressive model is written as:

$$Y_t = \pi_1 Y_{t-1} + \pi_2 Y_{t-2} + \dots + \pi_p Y_{t-p} + \beta X_t + \varepsilon_t \dots\dots\dots (3.3)$$

The above equation is estimated in its first difference as;

$$\Delta Y_t = \Omega y_{t-1} + \sum_{i=1}^{p-1} \pi \Delta Y_{t-i} + \beta X_t + \varepsilon_t \dots\dots\dots (3.4)$$

Vector Error Correction Model (VECM)

The vector error correction model (VECM) is conducted whenever dependent and independent variables are happened to have linear combination. The vector error correction model (VECM) is

capable of incorporating short run and long run effects. The equation is presented with the vector error correction model specification as follows:

$$\Delta Y_t = \alpha_1 + \alpha_2 \Delta X_t - \Omega U_{t-1} + Y_t \dots\dots\dots (3.5)$$

This specification is capable of incorporating the information of both short run and long run. Therein, α_1 is the short run multiplier effect that estimates the influence of explanatory variable X_t on explained variable Y_t . The parameter Ω is the adjustment effect that shows how disequilibrium is going to be corrected. The rationale behind VECM is to certify the speed of adjustment from the short run dynamic to the long run equilibrium. (Asteriou and Hall, 2021).

Model Specification

Vector Error Correction Model

The VECM is happened to be applied to determine the influence of interactive effects of domestic savings and foreign direct investment on Nigerian economy. This model is aligned with the ones adopted by Onyinye, Idenyi, and ifeyinwa, (2017) and their estimated model is:

$$GDP_t = \beta_0 + \beta_1 GCA_{t-1} + \beta_2 GCE_{t-1} + U_t \dots\dots\dots (3.6)$$

Where

GDP = gross domestic product

GCA = gross capital accumulation

GCE = gross capital expenditure

U = random term

The modified version of the model will be presented in mathematical form as:

$$\% \Delta GDP = f(CF_t, HK_t, DS_t, FDI_t, FDI * DS_t) \dots\dots\dots (3.7)$$

The equation (8) is turned into a short run econometric form as:

$$\% \Delta GDP_t = \alpha_1 + \alpha_2 CF_t + \alpha_3 HK_t - \alpha_4 DS_t + \alpha_5 FDI_t + \alpha_6 FDI_t * DS_t + U_t \dots\dots\dots (3.8)$$

The vector error correction model (VECM) captures the long run effects and statistical significance of the parameters explains the possibility of explained variable to turn to the equilibrium condition. (Lutkepohl, 2005).

$$\% \Delta GDP_t = \alpha_1 + \alpha_2 CF_t + \alpha_3 HK_t - \alpha_4 DS_t + \alpha_5 FDI_t + \alpha_6 FDI_t * DS_t + \alpha_7 \% \Delta GDP_{t-1} + \alpha_8 \% \Delta GDP_{t-2} + U_t \dots\dots\dots (3.9)$$

Where;

$\% \Delta GDP_t$ = GDP percentage change

CF_t = (fixed) capital formation

HK_t = human capital development

FDI = foreign investment

DS = domestic savings

$FDI * DS$ = interaction term between foreign investment and domestic savings

t = time

U_t = residual term

α_1 is the constant term, whereas $\alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7$ and α_8 are the coefficients of regressors.

Result and Discussions

Unit Root Test

The summary of ADF and PP unit root tests are presented below:

Table 1: Augmented Dickey Fuller and Phillips Perron Tests: @Level

Variables	ADF Test Statistic	PP Test Statistic	CV @1%	Order of Integr.
GDP % Change	-3.15	-4.17	-4.37	Non-stationary
CF _t	-2.73	-2.66	-4.28	Non-stationary
DS _t	-1.72	-4.22	-3.67	Non-stationary
FDI _t	-2.46	-2.56	-3.66	Non-stationary
HK _t	-2.46	-1.79	-4.30	Non-stationary
INFR _t	-3.57	-2.55	-4.30	Non-stationary
INTR _t	-2.31	-2.51	-4.71	Non-stationary
EXP _t	-2.74	-2.71	-4.28	Non-stationary
IMP _t	-2.43	-2.43	-4.28	Non-stationary

Source: Author's computation using Eviews 9

Table 1 shows ADF and PP test at level and the conclusion is that, when the value of the test statistic is greater than that of critical at whatever significance level, the null hypothesis would be rejected and conclude by showing the absence of unit root. When the test statistic is lower than the critical in absolute terms, there exists the evidence of non-rejection that is, accepting null of a unit root hypothesis. The conclusion is that of having non-stationarity at level. Looking at the table 1, the test statistics for the series in question are lower than the critical values at one percent significance level. These suggest acceptance of null hypothesis.

Table 2: Augmented Dickey Fuller (ADF) Phillips Perron Test: @first difference

Variables	ADF Test Statistic	PP Test Statistic	CV @1%	Order of Integr.
GDP % Change	-9.37	-9.39	-3.67	I(1)
CF _t	-5.49	-5.91	-3.67	I(1)
DS _t	-7.73	-11.52	-3.67	I(1)
FDI _t	-10.23	-10.24	-3.67	I(1)
HK _t	-5.07	-3.38	-4.29	I(1)
INFR _t	-5.54	-8.00	-4.31	I(1)
INTR _t	-8.55	-7.58	-4.23	I(1)
EXP _t	-8.26	-8.86	-4.30	I(1)
IMP _t	-5.69	-6.64	-3.67	I(1)

Source: Author's computation using Eviews 9

All the variables, in question are stationary at first difference. Therefore, the null hypotheses for all the time series under consideration are rejected. Hence, at one percent significance level, all variables are found to be integrated of order one, I (1), that is, they are stationary at first difference.

Residual Tests

To know whether the model is the best or otherwise, the diagnostic tests for normality, serial correlation, and heteroskedasticity are conducted. Thus, for null hypotheses the model is normally distributed, serially non-correlated, and homoskedastic. Null hypotheses would not be rejected when the values of probability are greater than 5%. When the values of probability are less than 5%, null should be rejected. The results for serial correlation, normality and heteroskedasticity are presented in table 3.

TABLE 3 Results for Diagnostic Tests

Tests	Statistic/Chi-Square	Prob
Normality Test	13.23409	0.1040
Serial Correlation Test	13.92151	0.6046
Heteroskedasticity Test	178.0914	0.5262

Source: Author's computation using Eviews 9

The diagnostic tests results for normality, serial correlation and heteroskedasticity as presented in the table 3 show that, the probability values are greater than 5%. Thus, null is accepted and the model is proved to be the best whose residuals are normally distributed, un-correlated and homoscedastic.

The test of co-integration (*Trace and Maximum Eigen statistics*)

Table 4.0: Co-integration Test (Trace and Maximum Statistics)

Hypothesis	Trace Stat.	CV @5%	Maximum Stat.	CV @5%	P-Value
None*	446.93	197.37	133.01	58.43	0.0000
At most 1*	313.92	159.53	97.40	52.36	0.0100
At most 2	216.52	125.62	69.99	46.23	0.1401
At most 3	146.54	95.75	53.62	40.08	0.5039
At most 4	92.92	69.82	46.36	33.88	0.1037
At most 5	46.56	47.86	27.52	27.58	0.6204
At most 6	19.05	29.80	12.25	21.13	0.4100
At most 7	6.79	15.49	6.45	14.26	0.6017
At most 8	0.35	3.84	0.35	3.84	0.5566

Trace test stat. shows 2 co-integrating equations at 5% significance level.

Source: Author's computation using Eviews 9

The results from the table 4.0, trace and maximum eigen statistics show rejection of null hypothesis of no linear combination (no co-integration) and accept the alternative that supports the presence of co-integration at 5% significant level. There is the evidence for the presence of two co-integrating vectors. Thus, there is a robust and dynamic linear combination between Nigeria's economic growth and explanatory variables that determine the variability in economic growth.

4.1 The Long run Co-integrating Equation Result

Variables	DCF _t	DDS _t	DFDI _t	DHK _t	DINFR _t	DINTR _t	DEXP _t	DIMP _t
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GDP %change	0.18	-11.35	-2.06	2.09	0.04	-0.02	3.66	-2.29
	(0.69)	(0.61)	(0.068)	(0.44)	(0.00)	(0.00)	(0.29)	(0.20)

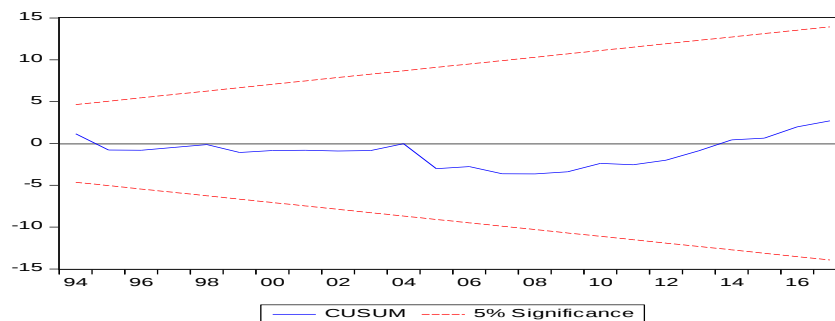
Source: Author's computation using Eviews 9

The table 4.1 presents that, there is a linear relation between dependent and independent variables in Nigeria. It is of importance to show that domestic savings, foreign investment, interest rate and imports are inversely related with Nigeria's economic growth in long run. Capital formation, human capital, inflation rate and export exert positive influence on Nigeria's economic growth. All these results are in line with economic theory except the findings on inflation rate and foreign direct investment whose coefficients show positive and negative signs respectively. The findings on inflation rate are in line with what classical economists perceived. Griffin and Enos (1970) believed that FDI is fully consumed and substituting domestic resources, hence, it exerts negative effect on economic growth especially if it is not being accompanied with strong socio-economic institutions.

Stability Test

Stability test is applied to ensure that the data generating process is consistent with the estimated parameters of the model that shows graphs of the residuals about zero line within the range of plus and or minus. The stability test highlights that, the residuals that are not within the standard error bands shows instability in the coefficient of the model.

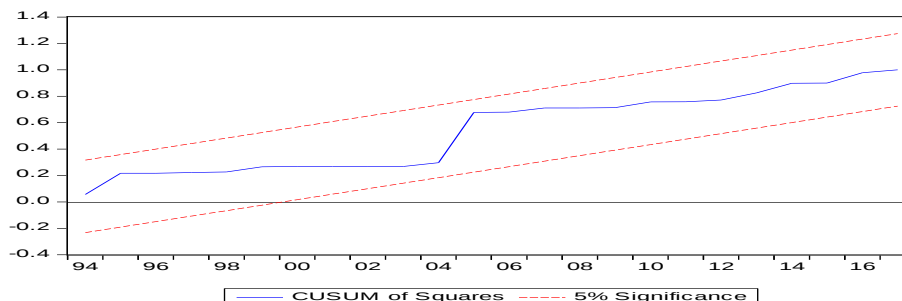
5.0 CUSUM Plot Recursive Residuals Estimates



Source: Author's computation using Eviews 9

Figure 5.0 shows that, the CUSUM plot lies within 5% significance level, thus the model is stable.

5.1 CUSUM Square Plot Recursive Residuals Estimates



Source: Author's computation using Eviews 9

Figure 5.1 shows that, the CUSUM square plot lies within 5% significance level, thus the model is stable.

Vector Error Correction Model (VECM)

The results of vector error correction mechanism are obtained below;

Table 6: Vector Error Correction Model (VECM)

Variables	Coefficients	Standard Error Test	Test Statistic
D(DECM(-1))	-0.56	0.35	-2.80
D(D%GDP(-1))	-0.45	0.27	-1.70
D(D%GDP(-2))	0.27	0.18	-1.44
D(DCF(-1))	0.14	0.08	1.46
D(DCF(-2))	0.13	0.21	2.09
D(DHK(-1))	0.12	2.07	0.06
D(DHK(-2))	-0.78	1.41	-0.55
D(DDS(-1))	-0.01	0.05	-0.15
D(DDS(-2))	-0.06	0.03	1.26
D(DFDI(-1))	-0.07	0.02	3.74
D(DFDI(-2))	0.03	0.04	2.11
D(FDI*DDS(-1))	0.08	0.17	-0.44
D(FDI*DDS(-2))	0.13	0.21	0.22
C	-0.003	0.008	-0.376
R ² 0.87 Adj. R ² 0.80 F-Stats 13.09 DW 1.9			

Source: Author's computation using Eviews 9

The table 6 indicates that, the values of capital formation in two preceding periods, value of human capital in first preceding period, foreign investment value in one preceding period, values of the interactive effect of foreign investment and domestic savings in two preceding periods and the value of percentage change in GDP in second preceding period happen to have a direct linkage with Nigeria's economic growth.

All other variables, with the exclusion of previously mentioned were inversely related to Nigeria's economic growth, implying a negative relation that exists between them and economic growth. Moreover, the ECM result exhibits the short-run dynamics between explained and explanatory variables. The ECT coefficient that has a negative sign of (-0.56) signifies the ability to correct any distortion or disequilibrium in Nigerian economy. Therefore, the Nigerian economy is capable of adjusting itself towards equilibrium. The adjustment speed shows that 56% of the deviation from equilibrium is corrected every year. This means that, it will, on average take two years for any distortion in Nigerian economy to revert to equilibrium. The measure of the goodness of the fit of the regression line, i.e. R-squared and adjusted R² are put at 86% and 80% respectively.

In other words, there is about 86% explanation to the changes in Nigeria's economic growth caused by the changes of independent variables in question. The remaining 14% variation in Nigeria's economic growth is captured by the error term.

The estimated long run equation is presented as:

$$\% \Delta GDP_t = -0.002 + 0.14CF_t + 0.12HK_t - 0.01DS_t - 0.07FDI_t + 0.08FDI_t * DS_t - 0.45\% \Delta GDP_{t-1} + 0.27\% \Delta GDP_{t-2} + U_t \dots (4.1)$$

(0.01) (0.08) (2.07) (0.05) (0.02) (0.17) (0.27) (0.18)

Results for co-integration test show that economic variables under consideration are linearly combined, that is, there is a long run relation between them. This necessitated the application of VECM to see how long Nigeria's economic growth will take to revert to equilibrium.

The positive relation that exists between capital formation and economic growth in Nigeria as shown in table 4.1 implies that an eighteen percent increase in Nigerian economy is being stimulated by an increase in capital formation. All other variables under consideration, with an exception of interest rate, domestic saving, foreign investment, and import do also have a direct relation with economic growth in Nigeria. From table 6, it is found that, percentage change in GDP in first preceding period, human capital in second preceding period, domestic savings in two preceding periods and foreign direct investment in first preceding period have inverse relationship with Nigerian economy. Domestic savings is theoretically expected to assume negative signs since it is a withdrawal from income's stream, thus, it conforms to the economic a priori. Griffin, et al., (1970) believed that FDI does affect economic growth in a negative way since it substitutes domestic resources. On the other hand, percentage change in GDP in second preceding period, capital formation in two preceding periods, human capital in first preceding period, foreign direct investment in second preceding period and interactive effect of domestic saving and foreign investment in two preceding periods that were theoretically expected to assume positivity, ended up assuming it. This is also not contrary to what was theoretically expected. Thus the physical capital, when accumulated will play a significant role in revamping Nigeria's economic growth. Capital goods raise the economy's productive capacity and accumulation of more physical capital assets will increasingly raise national output/income in Nigeria. Human capital is as significant as the fixed capital formation in increasing the production and productive capacity of an economy. An educated, well-trained and highly skilled individual is expected to be much more productive than the otherwise. Likewise, an individual with good health will contribute to economy to a large extent than a sick one. Thus, accumulation of human capital will increase the ability of Nigerian economy to produce more goods and services. Results in table 6 have formed an inverse relation that exists between domestic saving and Nigerian economy. Foreign investment in first preceding period exerts negative influence on Nigerian economy as shown in table 6. This result was an indication that, an increase in foreign direct investment would negatively affect Nigeria's economic growth if not being accompanied with other factors such as domestic savings, human capital, technology, modern infrastructure, regulated financial institutions etc. It is also relevant to discuss that, the positive nature of the coefficient of interactive effect of foreign investment and domestic saving in Nigeria revealed that a unit increase in it would move up Nigerian economy by 13%. It is imperative to mention that the ECM coefficient that is found to be inverse as expected implies that, 56% variability in Nigeria's economic growth will correct itself due to the changes in capital formation and other explanatory variables annually. Thus, it would, on average take Nigerian economy two years to revert back to its long run mean level.

Conclusions and Recommendations

Improvement in people's living condition is what really matters, as there is no country in the world that can revamp the people's welfare without a sustained economic growth. For third world nations

to realize a prevailed and sustained economic growth and development there must be an investment in physical capital goods. A number of scholars such as Moyo (2013), Blanchard (2021) and Alwyn (1995) agreed that, the reason for China's economic performance and that of four Asian Tigers must not have been unconnected with their reliance on physical and human capital. Nigerian economy suffers from high rate of unemployment, poverty and fall in people's living condition. These and other factors are the reasons for the country's retrogression. Based on the empirical findings, it is understood that, capital formation affected Nigeria's economic growth in a positive way.

Based on the empirical results of this study, it is recommended that the federal government of Nigeria should increase its spending to provide modern infrastructures that include roads, hospitals, schools, industrial estates, portable water and uninterrupted power supply among others. Provision of these mentioned infrastructural facilities will serve as an incentive for foreign and domestic investors to invest more in the country so as to reduce the level of poverty, unemployment, income inequality and high cost of living. The interactive effects of savings and foreign investment that are having a positive relation with Nigerian economy, establishes the importance of having absorptive capacity in the country not only in terms of domestic savings but also in terms of having strong and efficient institutions, modern infrastructure, advanced technology, and stable macroeconomic and political environments to mention few. The absorptive capacity should positively influence foreign direct investment, which in return will lead to a sustained and prevailed economic growth in Nigeria.

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