

## Revisiting Government Expenditure and Private Investment Nexus: An ARDL Approach

(Tinjauan Semula Nexus Perbelanjaan Kerajaan dan Pelaburan Swasta: Satu Pendekatan ARDL)

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### ABSTRACT

*This paper re-examines the nexus between government expenditure and private investment in Nigeria over the period of 1981-2016. The study is rooted on Jorgenson's theory of investment, the Samuelson's version of the flexible accelerator theory and Keynesian-classical crowding-in/crowding-out theory of investment. The resulting empirical models comprise three equations; one each for private investment (PI), private domestic investment (PDI) and foreign direct investment (FDI). The study employed Autoregressive Distributed Lag technique to estimate the models. From the study, government expenditure showed positive impact on private investment in Nigeria. Our specific findings showed that: Federal government's capital expenditure (CAEX) showed positive and significant impact on both PI and PDI in the long run: a ₦1.00 billion each increase in CAEX increases PI and PDI by ₦0.12 and ₦0.238 billion respectively. CAEX showed negative but insignificant impact on FDI in both short and long run. State government's capital expenditure (SCEX) showed positive and significant impact on PI: A ₦1.00 billion increase in SCEX increases PI by ₦0.27 billion. Federal government's recurrent expenditure (REEX) showed positive and negative impact on FDI and PI respectively: A ₦1.00 billion increase in REEX increases FDI by ₦1.27 billion, and reduces PI by ₦0.28 billion. Our findings imply that, if the objective of government policy is to raise private investment or private domestic investment, then both the Federal Government and state governments should boost their capital expenditure.*

*Keywords: Government expenditure; Investment; Accelerator theory; crowd-in/out hypotheses; ARDL model*

### ABSTRAK

*Kertas ini menguji semula neksus antara perbelanjaan kerajaan dan pelaburan swasta di Nigeria bagi tempoh 1981-2016. Kajian ini berasaskan Teori Pelaburan Jorgenson, Teori Pencepat Boleh Ubah Versi Samuelson dan Teori Pelaburan Kesan Himpitan Dalam/Kesan Himpitan Luar Keynes-Klasik. Hasil model empirical merangkumi tiga persamaan; setiap satunya adalah pelaburan swasta (PI), pelaburan swasta domestik (PDI) dan pelaburan langsung asing (FDI). Kajian menggunakan teknik Autoregresif Lat Teragih (ARDL) untuk menganggarkan model. Daripada kajian, perbelanjaan kerajaan menunjukkan impak yang positif dalam pelaburan swasta di Nigeria. Penemuan spesifik kami menunjukkan: Perbelanjaan modal kerajaan persekutuan (CAEX) menunjukkan impak positif dan impak yang signifikan bagi PI dan PDI dalam jangka panjang: ₦1.00 bilion setiap kenaikan CAEX meningkatkan PI dan PDI masing-masing sebanyak ₦0.12 dan ₦0.238 bilion. CAEX menunjukkan impak negatif tetapi tidak signifikan bagi FDI dalam jangka pendek dan panjang. Perbelanjaan modal kerajaan negeri (SCEX) menunjukkan impak positif dan signifikan pada PI: ₦1.00 bilion peningkatan dalam SCEX meningkatkan PI sebanyak ₦0.27 bilion. Perbelanjaan berulang kerajaan persekutuan (REEX) menunjukkan impak positif dan negatif bagi FDI dan PI. Peningkatan ₦1.00 bilion REEX meningkatkan FDI sebanyak ₦1.27 bilion dan mengurangkan PI sebanyak ₦0.28 bilion. Kajian kami menunjukkan, jika objektif polisi kerajaan adalah untuk meningkatkan pelaburan swasta atau pelaburan domestik swasta, maka kedua-dua kerajaan persekutuan dan kerajaan negeri sepatutnya meningkatkan perbelanjaan modal mereka.*

*Kata kunci: Perbelanjaan kerajaan; pelaburan; teori pencepat; hipotesis himpitan dalam/luar; model ARDL*



## INTRODUCTION

One of the indisputable stylized facts of economic development has been the wide disparity in the economic performance of countries across the world. Attempts to explain these divergent outcomes have generated a voluminous theoretical and empirical literature on the nexus between investment and government spending. The scenario in the emerging economies most significantly the Asian Tiger economies epitomize the place of investment in the transitional process from traditional to modern economy. It is established in the literature that investment stimulates growth within a market economy; as a result, private investment no doubt remains the engine of growth with the government expenditure providing the enabling environment (Petrović, Arsić, Nojković (2020); Lee, Won, and Jei (2019); Olayungbo and Olayemi, 2018; Onifade, Çevik, Erdoğan, Asongu and Bekun, 2018; Maingi, 2017). Keynesian theory (1936), Harrod Model (1936) and the neo-classical approach to investment founded by Jorgenson (1963) highlighted the importance of investment as necessary condition for economic growth. Thus, investment is both a result and cause of economic growth. It was on this that Nguyen and Trinh (2018) found growth rate of investment as key index for calibrating economic performance.

In macroeconomic literature many studies have provided valuable insights on nexus between government expenditure and private investment especially in the fiscal debate. Among the recent studies are Bouakez, Larocque, Denis & Michel. (2018), Bermpetoglou, Pappa & Vella (2017), Jin, Shang and Xu (2018), Lee et al. (2019), Funashima and Ohtsuka (2019), Olayungbo et al. (2018). However, the direction of causal-effect between the two still remains highly controversial among different school of thoughts. Arguments along the Keynesian's IS-LM framework focus mainly on the ways the government chooses to finance its spending. The classical argued that, if increased government spending is mainly financed by borrowing, then the interest rate is likely to move up in the financial market due to more competition for limited loanable funds. Consequently, private investment will be reduced. This argument, commonly referred to as the crowding-out hypothesis, is strongly challenged by some counterviews.

The counterview by the accelerator principle opined that an increase in government spending will produce a higher level of income which, in turn, may crowd-in private investment. This rests on the premise and reality that private agents are induced to invest more at higher income level. Rational expectation hypothesis is another counterview. It opined that debt-financed government expenditure may not lead to a crowding-out effect, if private agents fully discount the current debt financed government expenditure by taking into account the

expected increase in future taxes when making current investment decisions (Kindal 2010).

The implication of these counterviews is that government fiscal decisions are irrelevant to both private investment and output level. Another school emphasizes the possibility of coupling expansion fiscal and monetary policies by the government. This simultaneous rightward shift of both IS and LM curves will neutralize crowd-in effect on investment. The Neoclassical ignore neutrality hypothesis and focus on substitutability and complementarity relationships between government expenditure and private investment (Ighodaro & Okiakhi 2010).

The substitutability hypothesis believed that as productive government expenditure increases, the rate of capital accumulation increases beyond the optimal level. The available loanable funds for the private agent reduces, forcing the interest rate upward. Consequently, the private agents cut their investments in order to reestablish the optimal rate of capital accumulation in the economy. Thus, crowd-out private investment. In contrast, the complementarity hypothesis expect government spending on infrastructure and human capital to raise the marginal productivity of private capital. Therefore, induce more private investment (Konstantinouy & Partheniou 2019; Berperogiou et al. 2017).

Following the work of Miyamoto, Nguyen and Sergeyev (2017), Boehm (2018) and Fan, Liu and Coyte (2017), empirical investigations should not only address the effects of aggregated government spending; understanding the effects of disaggregated government expenditure on investment is of much important to policy makers. This of course allows application of fiscal policy through appropriate spending channels. This study investigates the nexus between disaggregated government expenditure and disaggregated private investment in Nigeria. The 36 federating states with federal capital territory spend 30 percent of Nigerian revenue, therefore, the impact of states governments' expenditure should not be ignored. This justifies the inclusion of states government expenditure to this study.

Therefore, in the light of the above discussion it is imperative to ask these questions: Does Federal Government capital expenditure have impact on private investment in Nigeria?; does Federal Government capital expenditure have impact on private domestic investment in Nigeria?; does Federal Government capital expenditure have impact on foreign direct investment in Nigeria?; and does States Government capital expenditure have impact on private investment in Nigeria? Answers to these questions are the focus of this study.

This paper is motivated by the fact that over the years, aggregate investment as percent of Nigeria GDP has fluctuated and many times dropped below the minimum requirement (20 percent) as stipulated by

International Monetary Fund for sustainable economic development. Fall in oil revenue in the last quarter of 2015 caused by crashed in world oil price, preceded exchange rate volatility and Nigerian economic recession. Thus, government capital expenditure on economic of service fell drastically while national debt has been rising significantly, as palliative to sustainability of recurrent spending. Consequently, the position of Nigerian infrastructure has witnessed unprecedented set back, hampering overall economic performance. Thus, aggregate investment has not been exempted. Therefore, the need to revisit nexus between disaggregated spending and private investment is timely by this study. This study covers the period of 36 years (1981 to 2016). The choice of this period is informed by data availability.

The remaining part of this paper is sectioned as followed: The next section contains the empirical and theoretical literature; section three presents the method and materials used; section four present the preliminary findings; section five presents the econometrics findings and policy implication deduced; and the last section presents the concluding remark.

## LITERATURE

### THEORETICAL FRAMEWORK

Classical and Keynesian investment theories have come under attacks over the decades, from both neo-classical and post-Keynesian. According to Keynes, fiscal expansion premised on less than full employment/output level, will generate more income for household, and boost aggregate demand and investment. This equally boost output via multiplier mechanism. The classical held contrary opinion premised on persistent constant full employment, and savings-investment-interest rest sensitivity (Sineviciene 2015).

To the Orthodox, expansionary fiscal policy would induce higher interest rates, reduce after-tax income and increase wages. Consequently, dampen firms' profitability and marginal propensity to invest. In another view, financing expanded government expenditure either through loan or taxes, decreases savings and aggregate demand. Consequently, drives up interest rate and makes loanable funds further expensive for private sector, and by implication crowd-out private sector investment. The submission of Ricardo on the subject matter stands neutral. According to Ricardo, consumers form expectation and steadily anticipate for change in government spending and tax policy. This action neutralizes the anticipated impact of fiscal policy on private investment. The general public tend to save its surplus money to pay more tax in the nearest future needed to service and pay off debt. In other words, expectations on rise in future tax compels consumers

to save rather than spending the excess income earned from fiscal expansion (increased government spending/decreased tax). Thus, the excess income-saving equivalent neutralizes expansionary fiscal policy.

Samuelson's accelerator theory viewed investment from the demand side of the conventional circular flow of income frame work. It was on this that Harrod (1936; 1948) adjured growth in investment to growth rate of output. The model assumes that the demand for machinery and factories is driven by the demand for goods. Thus, a new investment in plant and machinery will be required to meet new demand for goods. Hence, changes in output level have direct implications on the level of business investment.

### REVIEWED STUDIES

An important implication of the substitutability and complementarities hypotheses as pioneered by Classical and Keynesian respectively, is the reality that different categories of government expenditure (capital and recurrent) may produce different effects on private investment. In response to these theoretical controversies, some recent empirical studies have produced mixed results. For example, studies by Nguyen and Trinh (2018), Fan et al. (2017), Funashima et al. (2019), Furceri and Sousa (2018), Boehm (2018), Bouakez et al. (2018), and Malizard (2015) provided evidence in support of substitutability hypothesis. Among the studies that aligned with complementarity hypothesis are Deleidi, Mazzucato and Semieniuk (2020), Deleidi (2019), Petrović et al (2020), Ambler, Bouakez and Cardia (2017), Konstantinouy et al. (2019), Bouakez, Guillard, and Roulleau-Pasdeloup (2016), Maingi (2017), Akinlo and Oyeleke (2018), Olayungbo et al. (2018), Jin et al. (2018) and Bouakez et al. (2018). However, Sinevičienė (2015) and Ouédraogo, Sawadogo and Sawadogo (2019) found variations among countries in the level of crowding-out and crowding-in effect respectively among Sub-Saharan Africa countries. The degree was much higher in countries with a strong private sector. In India, Bahal, Raissi and Tulin (2018) found evidence of time variance; they were evidence of crowding-out during the period 1950-2012, but the period 1980-2012 aligned with crowding-in hypothesis. The justification for the variation hinged on India policy reforms during the early 1980s.

On disaggregated level, Mohib, Irfan and Khalil, (2015) and Joseph, Tochi-Nze and Ekundayo (2016) produced mixed result. Mohib et al. (2015) found government's capital expenditure to have crowd-in private investment, while recurrent expenditure crowd-out private investment. Government expenditures on agriculture, health and transport and communication support crowding-in hypothesis, while community servicing and debt servicing expenditures support crowding out hypothesis. Likewise, findings by Joseph

et al. (2016) showed that recurrent expenditure and external debt crowd-out private investment, while capital expenditure showed crowding-in effect. In the case of Furceri et al. (2018), only capital goods crowd-out both private consumption and investment, but Jin et al. (2018) and Konstantinouy et al. (2019) found a crowd-in effect. Similar study in the United States by Bouakez et al. (2018) found crowd-in and crowd-out effect on private consumption and investment respectively. Konstantinouy et al. (2019) found three years lag between shock in government spending and the time it reflected on private investment. In France, Malizard (2015) found evidence of mixed findings; recurrent spending on military crowd-out private investment, while capital spending on military equipment produced a crowd-in effect.

On the account of private consumption and investment, as found by Boehm (2018), government consumption and investment crowd-out and crowd-in private consumption and investment respectively. Miyamoto et al. (2017) viewed government spending-private investment nexus from two different interest rate regimes in Japan. It found evidence of crowd-in effect on both private investment and consumption during zero-bond interest rate, but crowd-out when the interest rate was normalized. A very similar study by Mamedi (2016) found contrary results; under zero-based interest rate government aggregate spending crowd-out private investment, but crowd-in effect was found under normal interest rate regime. Bernperoglou et al. (2017) examined government expenditure from three different levels (federal, state and local governments). Spending by government at all levels complementarily crowd-in private consumption. However, crowd-out effect of Federal government appeared stronger than the state government because of the large size of the former. At the sectorial level, Deleidi et al. (2020) and Carneiro, Armand, Locatelli, Mihreteab, and Keating (2016) found government spending to have produced crowd-in effect on private investment in power and health sectors respectively.

Therefore, from the reviewed studies, the outcome of fiscal policy on private investment depends on channel of government expenditure under consideration. This present study is different from previous literature based on the following: First, it evaluates disaggregated government spending and its impact on private investment in Nigeria. Second, inclusion of state government expenditure makes it unique. Also, different econometric models have been used. Few of the studies in Nigeria have taken the stationarity of the variables into account. However, this study employs relevant econometric tools based on the behavior of the variables, thus void of problems of spurious results.

## METHOD AND MATERIALS

This study is rooted on accelerator theory and Neo-classical theory. According to the accelerator theory, the level of investment depends on rate of changes in the level of output (Harrod 1936). Neo-classical theory believe that investment capital stock is a function of the user cost of capital, the level of output and the unit price of capital (Jorgenson 1967). Thus, the original Jorgenson's model was stated as:

$$K^* = \frac{P\alpha Y}{C} \quad (1)$$

Equation (1) is transformed to:

$$K_t^* = \phi P_t Y_t C_t^{-\alpha} \quad (2)$$

$$\text{Thus, } \Delta K = \Delta (\phi P_t Y_t C_t^{-\alpha}) \quad (3)$$

Where  $K_t^*$  denotes optimal capital stock in a country,  $P$  is price of output proxy by inflation,  $Y$  is output,  $C$  is user cost of capital proxy by interest rate (Jorgenson 1967).  $\phi$  and  $\alpha$  represent the distribution parameter and constant elasticity of substitution between capital stock and labor. The available capital for investment when depreciation is zero, is stated as:

$$I_t = \Delta K_t^* \quad (4)$$

Substituting (3) into (4), investment model is derived as

$$I_t = \phi_1 \Delta P_t + \phi_2 \Delta Y_t + \phi_3 \Delta C_t + \mu_t \quad (5)$$

This study factored in fiscal policy (government expenditure and indirect tax on output) into the model because it is the core explanatory variable.

$$PI_t = \alpha + \phi_i \Delta K_{it}^* + \beta_j X_{ij} + \delta_k FP_{tk} + \mu_t \quad (6)$$

Where  $PI$  is the private investment,  $\Delta K_{it}^*$  is a vector of acelerator theory on function of Investment,  $FP_{tk}$  is a vector of fiscal policy variables,  $X_{ij}$  is a vector conditioning variable and  $\epsilon$  is the stochastic error term.

After the empirical work of Aschauer (1989) several theoretical and empirical studies have contributed to literature on nexus between government spending and private investment. However, findings remains inconclusive. Post Aschauer studies introduced different macroeconomic variables, and their findings have equally become relevant to policy maker. Therefore, following Jorgenson (1967), Akinlo and Oyeleke (2018) and Chen, Yao and Malizard (2016), we proxy price ( $P$ ) with inflation ( $INF$ ), output ( $Y$ ) with Real GDP per capita, and cost of capital ( $C$ ) with interest



rate. The empirical findings by Ouedraogo et al. (2019) and Abel (2017) suggested the importance of credit to private sector (CPS) and indirect tax on output (NT) respectively, in investment model. The inclusion of state government capital expenditure is novelty because it spends 30 percent of Nigerian government revenue. Three models were estimated to attain the set objectives. Thus, the ARDL models are stated as:

$$\begin{aligned} \Delta PI_t = & \delta_i + \sum_{i=0}^p \delta_{1i} \Delta PI_{t-i} + \sum_{i=0}^q \delta_{2i} \Delta GDPPC_{t-i} \\ & + \sum_{i=0}^q \delta_{3i} \Delta INR_{t-i} + \sum_{i=0}^q \delta_{4i} \Delta INF_{t-i} + \sum_{i=0}^q \delta_{5i} \Delta CPS_{t-i} \\ & + \sum_{i=0}^q \delta_{6i} \Delta REX_{t-i} + \sum_{i=0}^q \delta_{7i} \Delta CEX_{t-i} + \sum_{i=0}^q \delta_{8i} \Delta NT_{t-i} \\ & + \sum_{i=0}^q \delta_{9i} \Delta SCEX_{t-i} + \lambda ECT_{t-i} + \Delta t \end{aligned} \tag{7}$$

This study further disaggregated private investment to examine the nexus between explanatory variable and its components (private domestic investment and foreign direct investment).

$$\begin{aligned} \Delta FDI_t = & \delta_i + \sum_{i=0}^p \delta_{1i} \Delta FDI_{t-i} + \sum_{i=0}^q \delta_{2i} \Delta GDPPC_{t-i} \\ & + \sum_{i=0}^q \delta_{3i} \Delta INR_{t-i} + \sum_{i=0}^q \delta_{4i} \Delta INF_{t-i} + \sum_{i=0}^q \delta_{5i} \Delta CPS_{t-i} \\ & + \sum_{i=0}^q \delta_{6i} \Delta REX_{t-i} + \sum_{i=0}^q \delta_{7i} \Delta CEX_{t-i} + \sum_{i=0}^q \delta_{8i} \Delta NT_{t-i} \\ & + \sum_{i=0}^q \delta_{9i} \Delta SCEX_{t-i} + \lambda ECT_{t-i} + \Delta \end{aligned} \tag{8}$$

$$\begin{aligned} \Delta FDI_t = & \delta_i + \sum_{i=0}^p \delta_{1i} \Delta FDI_{t-i} + \sum_{i=0}^q \delta_{2i} \Delta GDPPC_{t-i} \\ & + \sum_{i=0}^q \delta_{3i} \Delta INR_{t-i} + \sum_{i=0}^q \delta_{4i} \Delta INF_{t-i} + \sum_{i=0}^q \delta_{5i} \Delta CPS_{t-i} \\ & + \sum_{i=0}^q \delta_{6i} \Delta REX_{t-i} + \sum_{i=0}^q \delta_{7i} \Delta CEX_{t-i} + \sum_{i=0}^q \delta_{8i} \Delta NT_{t-i} \\ & + \sum_{i=0}^q \delta_{9i} \Delta SCEX_{t-i} + \lambda ECT_{t-i} + \Delta t \end{aligned} \tag{9}$$

$\lambda = (1 - \sum^p \sigma_1)$  Represents the speed of adjustment parameter- it must be negative, less than one and significant.

$ECT = (PI_{t-1} \text{ or } FDI_{t-1} \text{ or } PDI - \theta X_t)$  Represents the error correction term in the three models.

Where: PI is private investment, PDI is private domestic investment and FDI is foreign direct investment (as dependent variables). INF is inflation rate, GDPPC is GDP per capita, INR is interest rate, CPS is credit to private sector, REX is recurrent expenditure (by the Federal government), CEX is capital expenditure (by the Federal government), NT is net indirect taxes on product, and SCEX is capital expenditure (by all the 36 state governments and Federal Capital Territory). We sourced Data from Central Bank of Nigeria and World Development Indicator, covering 1981 to 2016. Augmented Dickey Fuller test, ARDL Bound test and ARDL model were employed as estimating techniques. Pesaran, Shin and Smith (2001) suggested ARDL techniques as most suitable, when the variables in a model are combination of I(1) and I(0).

## RESULTS AND DISCUSSION

### PRELIMINARY ANALYSIS

Figure 1 shows that federal government capital expenditure was stationary during 1981-1994, fluctuated during 1994-2003, and assumed inverted U-shape during 2004-2016. Figure 2 shows that federal government recurrent expenditure was stationary during 1981-1998, but moved upwardly during 1999-2016.

Figure 3 shows that all-state-government capital expenditure was stationary during the period 1981-2000, but formed an inverted U-shape during 2001-2016. Figure 4, 5 and 6 depicts gross domestic product, private investment and private domestic investment respectively; they formed U-shape during the period of 1981-2016.

Figure 7 shows that foreign direct investment fluctuated during the period of 1981-2007 and assumed an inverted U-shape during the period of 2008-2016. Figure 8 depicts credit to private sector; it was stationary during the period 1981-2005, but moved upwardly during 2006-2016. Figure 9 and 10 depict inflation rate and interest rate respectively; both fluctuated during the period review. Figure 11 depicts net indirect tax on goods and service; it formed U-shape and inverted U-shape during the period 1981-2005 and 2006-2016 respectively.

Table 1 provides a glance understanding of the descriptive statistics of the variables in the models. Private investment is the summation of PDI and FDI. It has maximum and minimum value of ₦78.6 billion and ₦9.9 billion respectively, with an annual average value of ₦34 billion. Total private investment during the period reviewed skewed largely towards private domestic investment (PDI). The PDI recorded the maximum value of ₦74 billion as against ₦8.8 billion recorded by the FDI. PDI and FDI recorded an annual average value of ₦31 billion and ₦2.7 billion respectively during the period reviewed. Government capital expenditure recorded maximum, minimum and annual mean value of ₦1.152 trillion, ₦4.1 billion and ₦368 billion respectively, while Nigeria recorded recurrent expenditure of ₦4.178, 4.7 and ₦1.063 trillion respectively. It shows that government expenditure skewed towards recurrent during the period under reviewed.

The maximum, minimum and mean aggregate capital expenditure of all states in Nigeria during the period of reviewed stood at ₦1.9 trillion, ₦1 billion and ₦473.9 billion respectively. Nigeria recorded ₦2.563 trillion and ₦1.6696 trillion as maximum and mean value of gross domestic product per capita respectively. The country recorded maximum and minimum inflation rate of 72.8% and 5.3% respectively, with maximum and minimum lending rate 36% and 21.4% respectively.

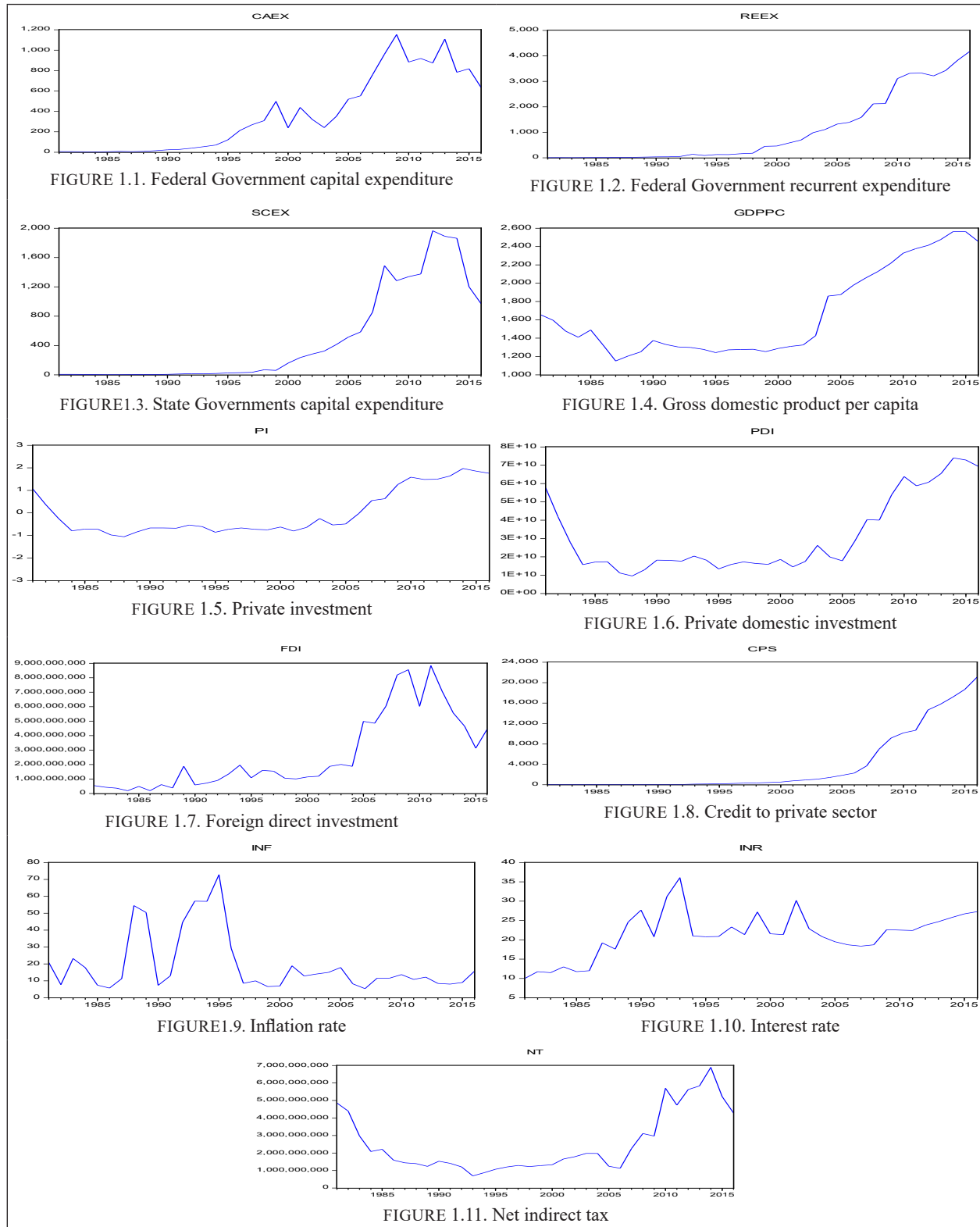


FIGURE 1. Trend of the variables

TABLE 1. Descriptive Statistics

Variables	Observation	Std. Dev.	Mean	Median	Maximum	Minimum
PI (₦Billion)	36	22.71	34.00	21.00	78.60	9.95
CEX (₦Billion)	36	372.32	368.14	255.67	1152.79	4.10
REX (₦Billion)	36	1352.55	1063.05	313.88	4178.59	4.75
SCEX (₦Billion)	36	1.03	473.97	64.53	1965.30	1.03
CPS (₦Billion)	36	6302.89	3856.11	391.56	21082.72	8.57
FDI (₦Billion)	36	2.64	2.70	1.57	8.84	0.189
PDI (₦Billion)	36	20.80	31.20	18.40	74.00	9.57
GDPPC (₦Billion)	36	478.14	1669.64	1418.79	2563.09	1151.12
INFL (Rate)	36	17.69	19.60	12.54	72.83	5.38
INR (Rate)	36	5.86	21.37	21.33	36.09	10.00
NT (₦Billion)	36	1.74	2.55	1.72	6.93	6.90

TABLE 2. Augmented Dickey Fuller and Phillip Peron Test

Variables	ADF Statistic	5% Critical Value	P-Value	Remark	PP Statistic	5% Critical Value	P-Value	Remark
D(LOGCEX)	-5.833536	-2.951125	0.0000	I(1)	-5.866305	-2.951125	0.0000	I(1)
D(LOGRER)	-4.812455	-2.951125	0.0004	I(1)	-7.872910	-2.951125	0.0000	I(1)
D(LOGSCEX)	-3.956220	2.951125	0.0045	I(1)	-3.867239	-2.951125	0.0056	I(1)
D(LOGPI)	-4.025735	-2.957110	0.0039	I(1)	-4.606064	-2.951125	0.0008	I(1)
D(LOGPDI)	-3.878828	-2.957110	0.0057	I(1)	-4.624328	-2.951125	0.0007	I(1)
D(LOGFDI)	-11.15135	-2.951125	0.0000	I(1)	-11.15135	-2.951125	0.0000	I(1)
D(LOGGDPPC)	-4.344214	-2.951125	0.0016	I(1)	-4.331327	-2.951125	0.0017	I(1)
D(INF)	-5.416306	-2.951125	0.0001	I(1)	-2.906336	-2.951125	0.0000	I(1)
D(LOGNT)	-5.092719	-2.951125	0.0002	I(1)	-5.092717	-2.951125	0.0002	I(1)
D(INR)	-6.600579	-2.954021	0.0000	I(1)	-8.183291	-2.951125	0.0000	I(1)
D(LOGCPS)	-4.252015	-2.951125	0.0020	I(1)	-4.135155	-2.951125	0.0028	I(1)

Note: Variables were screened at 5% level of significance

TABLE 3. ARDL Bound Test

	Model 1 Private investment	Model 2 Private domestic investment	Model 3 Foreign direct investment
F-statistic	8.53	10.43	3.17
K	8	8	8
5% I(0)	2.22	2.22	1.91
5% I(1)	3.39	3.39	3.11

Note: Variables were screened at 5% level of significance

TABLE 4. Residual diagnostic tests

Model	Breusch-Godfrey Serial Correlation LM Test F-statistic (P-value)	Breusch-Pagan-Godfrey Heteroskedasticity Test F-statistic (P-value)
Private Investment	2.034 (0.2027)	1.085 (0.4509)
Private domestic investment	3.166 (0.0820)	1.310 (0.3134)
Foreign direct investment	4.817 (0.1112)	0.4297 (0.9565)

Note: P-value in parenthesis ( ) at 5% significance level

## UNIT ROOT TEST

The results from Augmented Dickey Fuller and Phillip Perron tests (in Table 2) show that all the series are stationary at first difference at 5 percent significant level. That is, they are all I(1) series.

## COINTEGRATION TEST

The results of ARDL tests in Table 3 conform the existence of long run relationship in the three models. The value of F-statistic (8.53, 10.43 and 3.17) for model 1, 2 and 3 respectively is greater than upper bound value at 5% significance level. Therefore, the variables in the three models cointegrate.

## RESULTS ARDL MODELS

The results of Breusch-Godfrey LM test for serial correlation and Breusch-Pagan-Godfrey test for heteroskedasticity, as shown in Table 4 implies that the P-value of F-Statistic across the three models is greater than 0.05 significant levels. Therefore, the results from the model are void of spurious regression.

## ARDL ESTIMATES

The estimated adjusted R<sup>2</sup> in Table 5, 6 and 7 show that the models account for about 97%, 97.1% and 93.4% variation in aggregate private investment, private domestic investment and foreign direct investment respectively. The F-statistic 78.1, 56.92 and 23.97 are evidences that each of the three models adequately capture the relationship between the variables. The Error Correction Terms CointEq(-1) are all negative and significant, an evidence that convergence to long run are feasible in the models.

The results of the ARDL models in Table 5, 6 and 7 reveal that Federal government capital expenditure (CEX) has positive impact on private investment (PI) in both short and long run. It was not significant in foreign direct investment (FDI) model, but was found significant in the long run in the case of private domestic investment (PDI) model. Specifically, ₦1billion increase in CEX increases PI and PDI by ₦0.12billion and ₦0.24billion unit respectively in the long run. The magnitude of the coefficients show that CEX was more impactful on PDI (0.24) than on PI (0.12). This is not a surprise, since CEX had no impact on FDI. Federal government recurrent expenditure (REX) showed negative and positive impact on private investment and foreign direct investment respectively, but showed no impact on private domestic investment. As REX increases by ₦1billion, PI reduces by ₦0.28billion, while FDI increases by ₦1.27billion.

The magnitude of the coefficients showed that REX was more impactful on FDI (1.27) than on PI (-0.28), but remain insignificant under PDI model. These findings lend credence to Mohib et al. (2015) whose findings established positive relationship between government capital expenditure and private investment, while the recurrent expenditure showed negative sign. REX (-0.28) was more impactful on PI than CEX (0.12); in the FDI model, REX had 1.27 impact while CEX was not significant; in PDI model, CEX had 0.24 impact while REX was not significant. In private investment (PI) model, SCEX had more than CEX, but less than REX. GDPPC was the most impactful variable across the three models; with positive coefficient value of 1.5, 3.0 and 1.7 for PI, FDI and PDI respectively. The position of the GDPPC in the three models lend credence to Keynesian investment theory; rise in aggregate demand boosts investment. Gross domestic product per capita (GDPPC) shown positive impact on the three forms of investments, both in the short run and long run.

As shown in Table 5, 6 and 7, credit to private sector (CPS) was only found significant in FDI model and showed negative sign; as CPS increases by ₦1billion, FDI reduces by ₦0.837billion. Indirect tax rate on the output of private sector was found positively significant in PI and PDI model but not significant in FDI model. As indirect tax levied on output increases by 1 percent, PI and PDI increases by 28.9 percent and 41.5 percent respectively. State capital expenditure (SCEX) showed positive impact on private investment but showed no impact on FDI and PDI. ₦1billion increased in SCEX increases PI ₦0.273billion.

Inflation rate and interest rate, proxy by consumer price index and maximum lending rate respectively, were found both significant in the three models. As inflation rate increases by 1 percent, PI, FDI and PDI increase by 0.65 percent, 3.38 percent and 0.35 percent respectively in the long run. Our findings went contrary to Deleidi et al. (2020) and Deleidi (2018). This lends credence to Fleming and Mudelling exchange rate theory which states that at lower domestic interest rate capital tends to fly out in search for robust returns. Also, moderate rise in inflation might boost the marginal propensity to profit for domestic investor, being incentive to investment even when the cost of production rises, provided that elasticity demand for those product are fairly inelastic. These results lends credence to earlier studies, such as Petrović et al. (2020), Deleidi et al. (2020), Deleidi (2018), Berperogiou et al. (2017), Magableh and Ajlouni (2016) and Olayungbo and Olayeni (2018), Ouedraogo et al (2019), Maingi (20017), Akinlo et al. (2018), Bahal et al (2018), Miyamoto et al (2017) and Ambler et al (2017). While it contradicts the ealier findings of Funashima et al. (2019), Furceri et al (2018) and Nguyen and Trinh (2018).



TABLE 5. ARDL for Private Investment

Short run ARDL Model			Long run ARDL Model		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
D(LOGPI(-1))	0.615755	0.0012	LOGCEX	0.122460	0.0197
D(LOGCEX)	0.194307	0.0307	LOGCPS	-0.059068	0.4994
D(LOGCPS)	-0.093724	0.5036	LOGGDPPC	1.504216	0.0000
D(LOGGDPPC)	-0.557491	0.2310	LOGNT	0.289009	0.0004
D(LOGGDPPC(-1))	-1.423628	0.0164	LOGREX	-0.283460	0.0081
D(LOGNT)	0.270298	0.0147	LOGSCEX	0.273782	0.0000
D(LOGREX)	0.013159	0.9182	INF	0.006522	0.0016
D(LOGREX(-1))	0.436005	0.0050	INR	0.013520	0.0154
D(LOGSCEX)	0.155935	0.0880	C	6.401684	0.0044
D(LOGSCEX(-1))	-0.315683	0.0008			
D(INF)	0.005510	0.0234			
D(INF)	-0.003096	0.1758	Adjusted R <sup>2</sup>	0.970	
D(INR)	0.011349	0.1060	F-statistic	78.1	
CointEq(-1)	-1.586701	0.0000	Prob(F-statistic)	0.0000	

Note: Variables were screened at 5% level of significance

TABLE 6. ARDL for Private Domestic Investment

Short run ARDL Model			Long run ARDL Model		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
D(LOGPDI(-1))	0.583138	0.0042	LOGCEX	0.238070	0.0032
D(LOGCEX)	0.162529	0.2041	LOGCPS	-0.182161	0.0621
D(LOGCPS)	0.025757	0.8994	LOGGDPPC	1.699314	0.0000
D(LOGGDPPC)	0.220032	0.6838	LOGNT	0.415044	0.0001
D(LOGGDPPC(-1))	-1.891901	0.0088	LOGREX	-0.126227	0.1468
D(LOGNT)	0.328177	0.0152	LOGSCEX	0.100150	0.1155
D(LOGREX)	-0.197534	0.1453	INF	0.003459	0.0537
D(LOGSCEX)	-0.047135	0.6650	INR	0.020234	0.0032
D(LOGSCEX(-1))	-0.222641	0.0517	C	2.253080	0.3590
D(INF)	0.004183	0.1182			
D(INF)	0.001426	0.4897	Adjusted R <sup>2</sup>	0.971	
D(INR)	0.006448	0.3972	F-statistic	56.92	
CointEq(-1)	-1.564916	0.0000	Prob(F-statistic)	0.0000	

Note: Variables were screened at 5% level of significance

TABLE 7. ARDL for Foreign Direct Investment

Short run ARDL Model			Long run ARDL		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
D(LOGFDI(-1))	-0.379609	0.0630	LOGCEX	-0.009762	0.9686
D(LOGCEX)	0.118364	0.7238	LOGCPS	-0.836634	0.0431
D(LOGCEX(-1))	-0.474604	0.2513	LOGGDPPC	3.006602	0.0041
D(LOGCPS)	-1.153067	0.0624	LOGNT	-0.120194	0.6869
D(LOGCPS(-1))	2.145390	0.0017	LOGREX	1.269236	0.0476
D(LOGGDPPC)	1.263943	0.4054	LOGSCEX	0.032199	0.8671
D(LOGNT)	-0.113514	0.6742	INF	0.033791	0.0081
D(LOGREX)	1.198699	0.0023	INR	-0.065254	0.0599
D(LOGSCEX)	0.638130	0.0333			
D(LOGSCEX(-1))	-0.389580	0.1942			
D(INF)	0.009799	0.1890			
D(INF)	-0.014480	0.0635			
D(INR)	0.038692	0.1284	Adjusted R <sup>2</sup>	0.934	
D(INR(-1))	0.046397	0.0512	F-statistic	23.97	
CointEq(-1)	-0.944426	0.0116	Prob(F-statistic)	0.0000	

Note: Variables were screened at 5% level of significance

#### POLICY IMPLICATIONS

Federal government capital expenditure is potent at stimulating private investment through private domestic investment, while recurrent expenditure is potent at stimulating foreign direct investment. All-state-government expenditure is potent at stimulating private investment. It points to the fact that in the build-up to stimulate investment, Nigerian government must be selective in its approach towards using any component of expenditure. The state government capital expenditure crowd-in private investment, an indication that collaboration between federal and states governments could yield more productive result than the conventional federal fiscal policy. For instance, the bail-out received by states governments from the federal government special fund, significantly, cushioned the effects and shorten the period of 2016 recession. This study agrees with previous studies that GDP and recurrent expenditure are important to growth trajectory of FDI in Nigeria. It is an indication that capital inflows thrives when the economy booms. Invariable, oil sector is the largest recipient of FDI in Nigeria while the nonoil remains unattractive. Nigerian government should boost FDI in nonoil sector especially agriculture and mining sector. However, for government policy to be efficacious, it is imperative to create conducive investment climate coupled with fiscal reform and selective fiscal implementation. For instance, Nigeria oil sector receives more than 80 percent of FDI, therefore, federal government in collaboration with the states governments should grant fiscal preferential treatment inform of tax concessions to foreign investors

as incentive to drive non-oil sector. Also, Interest rate on loan remains the bane to small and medium private investors. Internal rate of returns (IRR) rarely breakeven the prevailing market interest rate. Nigerian government should cushion the impact of interest on indigenous domestic investment via preferential interest rate policy. Investors in nonoil sector should be given low or zero-based interest loan. Also, security of life and property remains the central focus of foreign investors. The trend of insurgency over the decade has ranked Nigeria among most difficult countries to do business. If government will attract inflow of FDI, insurgency must be dealt with.

FDI and private domestic investment hold huge prospect for Nigeria economy. The current dwindling in Nigerian government's revenue preceded by fall in crude oil price in the international market, will be resuscitated if both FDI and domestic investment are geared towards nonoil sector. It is expected to yield positive spillover effect on unemployment level, as well improve Nigeria balance of payment status.

#### SUMMARY AND CONCLUDING REMARKS

This study re-visits government expenditure and private investment nexus in Nigeria. While there is a plethora of studies on this subject, this paper appears to be the first to take cognizance the position of all-state government capital expenditure in the context of private investment. This becomes imperative because of its share in Nigeria fiscal budgetary plan. Research methodology adopted is another landmark this paper made. Following the behaviour of the variables in

the models, unlike the previous studies on the subject matter, this paper employed appropriate research techniques. The Augmented Dickey Fuller and Phillip Perron tests show that all the variables are stationary at first difference. Therefore, ARDL bound test becomes the most suitable cointegration test (Pesaran, Shin & Smith 2001).

For meaningful comparative analysis we came up with three models which captured private investment, private domestic investment and foreign direct investment. We equally disaggregated government spending into capital and recurrent expenditure. There are evidences of variation in our results on the impact of disaggregated components of government expenditure on aggregated investment. During the period under review (1981-2016), the impact of Federal government capital expenditure on aggregated private investment and private domestic investment support Keynesian crowding-in hypothesis. Federal government recurrent expenditure and private investment nexus supported classical-crowding-out hypothesis, while its nexus with foreign direct investment supported Keynesian-crowding-in hypotheses. The inclusion and result of all-state-government expenditure is novelty. All-state-government expenditure and private investment nexus supported Keynesian-crowding-in hypothesis. Our residual diagnostic results show that our models are void of spuriousness. Our study agrees with Deleidi et al. (2020); that expanding private investment is a function of right application of appropriate fiscal policy instruments. This is possible via effective governance as suggested by Su and Bui (2017). The study advocated for selective use of government expenditure in stimulating investment in Nigeria.

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