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Are public spending determinants significant in per capita budget spending decisions in Nigeria?

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Abstract

The motivation for this study had been to assess whether the established determinants of public spending decisions in Nigeria which are government revenue, the inflation rate, the exchange rate, the growth rate of real gross domestic product, and the international price of oil, do actually affect per capita budget spending as assumed by the fiscal authorities. However, evidence from the baseline symmetric and asymmetric auto-regressive distributive lag regressions suggest otherwise. A further probe by adding population growth rate, and gross fixed capital formation to the baseline variables to have a robust regression, suggests that while gross fixed capital formation which measures for infrastructure development was insignificant, population growth rate was crucial for the instituted determinants to exert substantial effect on per capita spending. This outcome can be taken as evidence of why the budget on a yearly basis is being perceived by most citizens as an ineffective tool of fiscal policy. Since the fiscal authorities have continued to always assume that factors that play crucial role in formulating their spending decisions; are the same with those necessary in deciding the share of Nigerians in the budget; without due consideration for population growth. Hence, ridiculing whatever goal the budget is set out to achieve.

KEYWORDS

asymmetry, determinants, Nigeria, per capita budget, spending, symmetry

1 | INTRODUCTION

Every year, the Nigerian government is faced with the traditional task of expenditure planning. Simply because in both developed and developing countries, the government is primarily charged with the responsibility of delivering development or dividends of governance to its citizens. Hence, an important fiscal tool used for this is the budget, which captures the public expenditure on the provision of good health care, potable water, road construction, quality education, security, so on. Specifically, in a developing country such as Nigeria, Adamu and Chandana (2019) argued that the core objective of the government is mainly to improve on societal welfare through the introduction of relevant legal, political, economic, and social agendas. This, therefore, has led to growth in the magnitude, and structure of the Nigerian public sector as evidence in its outlay since the 1970s (Aladejare, 2019).

Hence, one core area of interest to public sector economists, which dates back to Wagner (1893) and Downs (1957) era, has remained the quest to fathom the determinants of public outlay growth. Ever since, various studies have identified a number of public expenditure determinants in both developed and developing countries to include foreign aid (Njeru, 2003; Quattara, 2006; Remmer, 2004; Swaroop, Shikha, & Rajkumar, 2000), ethnic fragmentations as well as the size of the external debt burden (Mahdavi, 2004; Shonchoy, 2010; Ezebuilo 2015), population and urbanization growth (Shelton, 2007), changing political regimes and institutions (Milesi-Ferretti, Perotti, & Rostagno, 2002; Persson & Tabellini, 1999; Shelton, 2007 and Shonchoy, 2010), increase in government income (Hong, 2015; Hong & Nadler, 2015 and Sideris, 2007), so on.

In the quest to determine the drivers of public expenditure in Nigeria, variables such as foreign direct investment, debt servicing obligation, income growth, degree of trade openness, rising population, and military regime were adduced by Aregbeyen and Akpan, (2013). Furthermore, study such as Akanbi (2014) opined that government receipt and governance, are key to the growth of public outlay in Nigeria. Similarly, Aregbeyen and Kolawole (2015) further found oil revenue to be a cogent determinant of government spending since it serves as the "life-wire" of the Nigerian economy. Of recent, attention has also been given to the role of volatility, especially in oil price, inflation rate, and the exchange rate, in determining the size of public expenditure (Aregbeyen and Fasanya 2017; and Aladejare, 2019).

However, a common bias with the analysis of the above studies is their exclusive preference for evaluating the determinants of the general government spending. While assuming such factors also impact the share of individuals in general government spending. It is possible that what actually drives growth in public outlay, may differ from what actually spur growth in per capita budget spending. Hence, a divergence between the determinants of a country's public expenditure and its per capita budget spending, could erode whatever goal the former was designed to achieve. The unending argument about the determinants of public expenditure has become crucial due to the urge by government policymakers to guarantee stability and proper management of fiscal imbalance in the economy (Aladejare, 2019; Uchenna & Evans, 2012). The case of Nigeria paints an interesting scenario, where despite the yearly growth in government spending both in real terms and as a share to gross domestic product (GDP), issues of development such as growing poverty, unemployment, the poor state of critical infrastructures, and insecurity in the economy continue to linger. To exacerbate these problems, the population of the country continues to grow by an annual average of 2.6%.

Therefore, this study aims to widen the debate on spending determinants in developing countries, particularly in Nigeria by exploring the significance of aggregate budget determinants as established by the budget planners, in determining the per capita budget spending. Established determinants of the annual budget by the Nigerian fiscal authorities since the 1970s, has always been anchored in critical macroeconomic variables such as the exchange rate, the international price of oil, the growth rate of the real GDP, government revenue, and the inflation rate (2018 Budget speech, 2017; p. 12). These variables, therefore, constitute the baseline determinants of the per capita public spending examined in this study. In addition, to measure the impact of volatile variables such as the exchange rate, the international price of oil, and the inflation rate, an asymmetric or Non-linear Auto-Regressive Distributive Lag (NARDL) approach was adopted. For the purpose of robustness, population growth and gross fixed capital formation were further added to the baseline regression, to yield robust regression estimates. Hence, suggesting in particular the importance of population growth in per capita budget spending determination in Nigeria.

The structure of this paper is ordered as follows. Section 2 contains relevant study literature reviews (theoretical and empirical). While in Section 3, the data sources and adopted study methodology is revealed. In Section 4, the empirical findings from the estimated study models are presented. While Section 5 captures the conclusions and recommendations arrived at in the study.

2 | LITERATURE REVIEW

2.1 | Theoretical review

It is assumed that the nexus between economic growth and population growth was first brought to limelight by Wagner (1893), as a crucial factor that drives upward the increase in public outlay. This was based on the observed experience of the industrialized welfare states as at the time. Wagner's hypothesis was later christened the "Wagner's law," and has continued to generate a significant amount of theoretical and empirical debates when venturing into the drivers of the increase in public spending in countries around the world. (see Peacock & Wiseman, 1961; Musgrave, 1969; Shonchoy, 2010; Durevall & Henrekson, 2011; Facchini & Melki, 2013: and Magazzino, Giolli, & Mele, 2015).

Wagner developed what is today known as "the law of increasing state activity." He theorized that economic development over a period of time is usually accompanied by an observable intensive and extensive growth in government activities and responsibilities. Thus, such phenomenon often triggers increase in public spending.

In addition, Wagner's law of expanding state activity can be evaluated in three different dimensions. First, the study posits that industrialization and modernization would give rise to an enormous quantum of public activities as an alternative for private ones. Hence, there is an increase in demand for public protective and regulative activity. Furthermore, the higher the intensity of division of labour and urbanization attached to industrialization, the more the required spending on implementation of contracts, as well as on law and order, with the intent to ensure the optimum performance of the economy. This is because Wagner's law assumes that industrialization is often followed with a growing share of public expenditure in the GDP.

The second aspect posits that having a situation whereby the real income level is increased, a relative enlargement in the appropriated welfare outlay should be anticipated. Indicating that the use of GDP per capita as a gauge of economic development expansion impacts the availability of economic wealth to be used in offsetting public expenditure. This could be reasoned as the fundamental aspect of Wagner's law since economic growth has continued to remain the focal point of development for decades, while still playing an essential purpose in most of the public policy studies.

Lastly, Wagner is of the view that "natural monopolies" can best be controlled by the public sector. This conclusion he reached when he cited the example of railroads as natural monopolies. While also acknowledging that it would be extremely cumbersome for the private sector to raise funds for such natural monopolies, as well as engage in its efficient management. Thus, suggesting that as the population of a nation grows, it is expected that the demand for essential infrastructures such as hospitals, schools, roads, dams, etc., should rise, which further triggers an upward trend in public outlay.

2.2 | Empirical literature

Various studies have tried to ascertain factors that determine an upward trajectory of public spending specifically in Nigeria. Their findings have shown that some of the reasons often adduced for growth in public expenditure can be anchored on the political, economic, and sometimes the social composition of the country as revealed in the following reviews.

Okafor and Eiya (2011) pointed out that the main determinants of government spending in Nigeria constitute four major variables, which are inflation, population, revenue from the tax, and the public debt. Inflation was found to decrease growth in public spending, while population, tax revenue, and the size of the public debt were indicated to be positive determinants of public spending in Nigeria.

An essential point made by Ukwueze (2015) suggests that when the internal allocation of government spending is being made, it is crucial to consider the demographic nature of the population. This is because if for instance, the youth population of a nation forms the majority of the whole; it would be rational for the government to devote more funds into job-creating ventures to help grow the economy, and education to provide quality manpower, while also spending on health to ensure a sound and healthy workforce. On the contrary, having a high proportion of the population already beyond the 65-year mark will encourage improve government spending in social services. With the aim of caring for adult citizens through payments of pension and grants, Ukwueze further noted that factors such as the size of the population, population density, and urban population, also constitute important determinants of internal budget allocation.

In a study by Uchenna and Evans (2012), they showed that rather than the notion that economic growth determines the path of government spending in Nigeria, fiscal decentralization and uncertainty in the political environment were the major culprits. However, a later study by Ekpung and Ekpenyong (2013) noted that there are four determining factors for the structure and growth in government outlay in Nigeria. These factors are a fiscal deficit, the debt obligation of the government, income of the government, and the GDP. Similarly, Aladejare (2013) had also shown that the desire to grow the economy through improving growth in the GDP has always been the upward motivating factor for government spending in Nigeria, especially in the capital spending plan of the government.

Aregbeyen and Akpan (2013) on their part empirically found a number of variables responsible for the long-run marked enlargement in public spending. These variables include returns from the inflow of foreign aid, which produce an expansion in government recurrent expenditure, with an opportunity cost of infrastructural outlay. The debt servicing obligation of the government, and economic liberalization were found to reduce funds available for government spending. In addition, an increase in the size of the country's population, as well as budget for the election years, was revealed as factors that trigger the upward movement of public outlay.

The study by Foye (2014) evaluated the determinants of government capital expenditure in Nigeria, through the use of a short-run dynamic model; and found that macroeconomic variables such as real GDP, public debt, trade openness, private investment, and foreign direct investment (FDI) are the major drivers of government capital expenditure.

Government revenue from oil has also been found to be a determinant of public expenditure in Nigeria, as evident in the study by Aregbeyen and Kolawole (2015). This finding likely motivated a later study by Aregbeyen and Fasanya (2017), who examined just how much do public spending react to uncertainty in oil prices in Nigeria. Their submission was that despite the fact that real oil prices, the rate of inflation, as well as discount rate differentials, for quite a while suggest the long-term dynamic path of government expenditure; asymmetric impact from oil price shock to government spending was however missing.

On the contrary, Aladejare (2019) had stressed that asymmetry plays a crucial part when determining the significance of budget spending in Nigeria. Specifically, the study found significant asymmetric behaviour in yearly budget determinants such as the price of oil, the inflation rate, and the exchange rate. Hence, concluding that when evaluating the determinants of public spending growth, asymmetric behaviours of fiscal policy determinants should also be considered.

Also, Adamu and Chandana (2019) having noted the growth in the size of public expenditure in Nigeria, submits that such growth was as a result of changes in variables such as revenue from oil, the rate of inflation, taxation, the growing size of the country's population, trade openness, and the country's expanding GDP size. These variables the study conclude have a crucial impact on the fiscal operation of the country.

It is evident from the review that studies on Nigeria have mainly concentrated on the determinants of government spending. Summarily, these determinants include the size of government revenue, the exchange rate, real GDP growth, FDI, the size of public debt, the rate of inflation, the international oil price, etc. However, there is a dearth of studies that have examined whether such determinants significantly impact the share of Nigerians in their budget, that is, the per capita budget spending. Thus, this gap in the literature constitutes the motivation for this study, as this would help to unravel if government spending per citizen has been significant over the years. Similar to Aladejare (2019), this study will also adopt the annual determinants of public spending as established by the fiscal authorities in Nigeria, which are the exchange rate, the rate of inflation, the international oil price, and the real GDP growth rate.

3 | DATA SOURCES AND METHODOLOGY

3.1 | Data sources

Data for this study were sourced from the World Bank World Development Indicator (WDI, 2018) and the Central Bank of Nigeria (CBN) statistical bulletin. Annual time series variables, spanning from 1970 to 2018 were collected from both sources. As prior stated, the choice of public spending determinants in this study, are based on established variables used by the Federal Government of Nigeria in their annual public outlay planning. These variables are the official nominal exchange rate of the naira to the US dollar, the rate of inflation, and the real GDP growth rate, all sourced from the WDI. While the Nigerian international price of oil (Forcados) is sourced from the Organization of Petroleum Exporting Countries annual statistical bulletin. Government revenue as a share of GDP, which also constitutes one of the established determinants by the fiscal authorities is sourced from the CBN Statistical bulletin. Furthermore, per capita budget spending which is our dependent variable is also sourced from the CBN Statistical bulletin.

However, the aforementioned determinants were considered as baseline variables. Hence, a more robust model incorporating population growth rate and gross fixed capital formation was later estimated, and compared with the baseline model. A justification for this is built on the possibility that, public spending determinants could have been more impactful if the growth rate of the population, as well as the level of infrastructure development in the country (which are both omitted) are given much consideration in the budget planning process. Both variables were also sourced from the WDI.

3.2 | Methodology

For the purpose of simultaneously gauging the long-term and short-term impact of public spending determinants on the per capita budget spending, this study adopts the autoregressive distributive lag (ARDL) model as proposed by Pesaran and Shin (1999). However, this approach is deficient in measuring the magnitude of the asymmetric impact from volatile variables to a response variable. For instance, the impact of an increase in the international oil price, the rate of inflation, or the exchange rate may definitely vary from when there is a fall in the values of these volatile variables. The linear or symmetric ARDL model will not give such asymmetric information, as it is only empowered to give an aggregate effect of a regressor on a response variable. To solve this deficiency, Shin, Yu, and Greenwood-Nimmo (2014) recommended the use of a nonlinear or asymmetric ARDL model (NARDL). Its essence is to offer an asymmetric channel to the conventional linear ARDL model as suggested in Pesaran and Shin (1999), and Pesaran, Shin, and Smith (2001). Thus, to ensure the robustness of our analysis, this study adopted the use of both the symmetric and asymmetric ARDL model in evaluating the relevance of established public spending determinants, on the per capita budget spending of the government in Nigeria.

3.2.1 | The symmetric (linear) ARDL model

We begin our analysis by proposing a symmetric effect of public spending determinants, on the per capita budget spending of the Federal Government, as shown in the linear ARDL model below.

$$\begin{aligned}\Delta lPBS_t = {} & \propto_0 + b_1 lPBS_{t-1} + b_2 RGDPG_{t-1} + b_3 OIL_{t-1} \\ & + b_4 INF_{t-1} + b_5 OEXH_{t-1} + b_6 GREGDP_{t-1} \\ & + b_7 W_{t-1} + \sum_{j=1}^{p} \pi_i \Delta lPBS_{t-j} + \sum_{j=0}^{p} \rho_i \Delta RGDPG_{t-j} \\ & + \sum_{j=0}^{p} \sigma_i \Delta OIL_{t-j} + \sum_{j=0}^{p} \theta_i \Delta INF_{t-j} \\ & + \sum_{j=0}^{p} \vartheta_i \Delta EXH_{t-j} + \sum_{j=0}^{p} \tau_i \Delta GREGDP_{t-j} \\ & + \sum_{j=0}^{p} \delta_i \Delta W_{t-j} + \mu_{t1}\end{aligned} \tag{1}$$

$$Note\, i = 1,2,...,N; \qquad t = 1,2,...,T.$$

where *lPBS* is the log of per capita budget spending of the government; *RGDPG* is the real GDP growth rate, *OIL* is the Nigerian Forcados oil price, *INF* is the inflation rate, *EXH* is the official exchange rate, *GREGDP* is the government revenue per GDP, and *W* is a vector of robust regressors.

Re-specifying Equation 1 to capture the error-correcting term yields:

$$\begin{aligned}\Delta lPBS_t = {} & \emptyset_{i1} ECM_{t-1} + \sum_{j=1}^{p} \pi_i \Delta lPBS_{t-j} + \sum_{j=0}^{p} \rho_i \Delta RGDPG_{t-j} \\ & + \sum_{j=0}^{p} \sigma_i \Delta OIL_{t-j} + \sum_{j=0}^{p} \theta_i \Delta INF_{t-j} \\ & + \sum_{j=0}^{p} \vartheta_i \Delta EXH_{t-j} + \sum_{j=0}^{p} \tau_i \Delta GREGDP_{t-j} \\ & + \sum_{j=0}^{p} \delta_i \Delta W_{t-j} + \mu_{t1}\end{aligned} \tag{2}$$

Hence:

$$\begin{aligned}ECM_{t-1} = {} & lPBS_{t-1} - \pi_0 - \pi_1 RGDPG_{t-1} - \pi_2 OIL_{t-1} \\ & - \pi_3 INF_{t-1} - \pi_4 EXH_{t-1} - \pi_5 GREGDP_{t-1} \\ & - \pi_6 W_{t-1}\end{aligned} \tag{3}$$

where "*ECM*" as shown in Equations 2 and 3 denotes the symmetric error correction term. In addition, the parameter $\emptyset_i$ serves as the short-term error-correcting speed of adjustment to the long-term equilibrium path. Put differently, it captures how long it will take for the system to correct itself back to its long-run equilibrium path, suppose a shock is introduced into the relationship. Hence, the long-term parameters given as π_0, π_1, π_2, π_3, π_4, π_5 and π_6 in Equation 3, are computed as $-\frac{\propto_0}{b_1}$, $-\frac{b_2}{b_1}$, $-\frac{b_3}{b_1}$, $-\frac{b_4}{b_1}$, $-\frac{b_5}{b_1}$, $-\frac{b_6}{b_1}$ and $-\frac{b_7}{b_1}$, respectively.

3.2.2 | The asymmetric (nonlinear) ARDL model

For the purpose of ensuring the robustness of our analysis, and ascertaining the magnitude of the asymmetric effect of variables such as the international oil price, the inflation rate, and the exchange rate, an asymmetric model as shown below was used. The nonlinear ARDL model will enable the unique determination of positive and negative shocks, derived from the prior listed variables considered to be volatile in nature. Hence, the asymmetric model is as specified as follows:

$$\begin{aligned}\Delta lPBS_t = {} & \propto_0 + b_1 lPBS_{t-1} + b_2 RGDPG_{t-1} + b_3^+ OIL_{t-1}^+ \\ & + b_3^- OIL_{t-1}^- + b_4^+ INF_{t-1}^+ + b_4^- INF_{t-1}^- \\ & + b_5^+ EXH_{t-1}^+ + b_5^- EXH_{t-1}^- + b_6 GREGDP_{t-1} \\ & + b_7 W_{t-1} + \sum_{j=1}^{p} \pi_i \Delta lPBS_{t-j} + \sum_{j=0}^{p} \rho_i \Delta RGDPG_{t-j} \\ & + \sum_{j=0}^{p} \left(\sigma_i^+ \Delta OIL_{t-j}^+ + \sigma_i^- \Delta OIL_{t-j}^- \right) \\ & + \sum_{j=0}^{p} \left(\theta_i^+ \Delta INF_{t-j}^+ + \theta_i^- \Delta INF_{t-j}^- \right) \\ & + \sum_{j=0}^{p} \left(\vartheta_i^+ \Delta EXH_{t-j}^+ + \vartheta_i^- \Delta EXH_{t-j}^- \right) \\ & + \sum_{j=0}^{p} \tau_i \Delta GREGDP_{t-j} + \sum_{j=0}^{p} \delta_i \Delta W_{t-j} + \mu_{t2}\end{aligned} \tag{4}$$

Where variables with positive (+) superscript signify positive effects, and variables with negative (−) superscript signifies negative effects. For the purpose of deriving the error correction version of Equation 4, we formulate the following equation.

$$\begin{aligned}\Delta lPBS_t = {} & \emptyset_{i2} ECM_{t-1} + \sum_{j=1}^{p} \pi_i \Delta lPBS_{t-j} + \sum_{j=0}^{p} \rho_i \Delta RGDPG_{t-j} \\ & + \sum_{j=0}^{p} \left(\sigma_i^+ \Delta OIL_{t-j}^+ + \sigma_i^- \Delta OIL_{t-j}^- \right) \\ & + \sum_{j=0}^{p} \left(\theta_i^+ \Delta INF_{t-j}^+ + \theta_i^- \Delta INF_{t-j}^- \right) \\ & + \sum_{j=0}^{p} \left(\vartheta_i^+ \Delta EXH_{t-j}^+ + \vartheta_i^- \Delta EXH_{t-j}^- \right) \\ & + \sum_{j=0}^{p} \tau_i \Delta GREGDP_{t-j} + \sum_{j=0}^{p} \delta_i \Delta W_{t-j} + \mu_{t2}\end{aligned} \tag{5}$$

where the term "*ECM*" in Equation 5 represents the nonlinear error correction, which shows the long-run equilibrium in the asymmetric model. The parameter $\emptyset_i$ signifies the speed of adjustment term of the error-correcting process.

In addition, the long-term coefficients for each independent variable in Equation 4 is estimated as $-\frac{\omega_t}{b_1}$. Given that ω represents a unique regressor coefficient. However, for asymmetric variables, the long-term coefficient is being captured as $-\frac{\omega_t^+}{b_1}$ and $-\frac{\omega_t^-}{b_1}$. These effects are respectively estimated as positive, and negative partial sum decompositions of variations in the international oil price, the rate of inflation, and the exchange rate, as revealed below.

$$OIL_t^+ = \sum_{k=1}^{t} \Delta OIL_k^+ = \sum_{k=1}^{t} max(\Delta OIL_k, 0) \tag{6}$$

$$OIL_t^- = \sum_{k=1}^{t} \Delta OIL_k^- = \sum_{k=1}^{t} min(\Delta OIL_k, 0) \tag{7}$$

$$INF_t^+ = \sum_{k=1}^{t} \Delta INF_k^+ = \sum_{k=1}^{t} max(\Delta INF_k, 0) \tag{8}$$

$$INF_t^- = \sum_{k=1}^{t} \Delta INF_k^- = \sum_{k=1}^{t} min(\Delta INF_k, 0) \tag{9}$$

$$EXH_t^+ = \sum_{k=1}^{t} \Delta EXH_k^+ = \sum_{k=1}^{t} max(\Delta EXH_k, 0) \tag{10}$$

$$EXH_t^- = \sum_{k=1}^{t} \Delta EXH_k^- = \sum_{k=1}^{t} min(\Delta EXH_k, 0) \tag{11}$$

4 | RESULTS AND DISCUSSION OF FINDINGS

4.1 | Descriptive and correlation analysis of data

Table 1 which captures the descriptive analysis of the variables, reveals that the minimum per capita budget spending in Nigeria is about ₦16.15; translating to about 4 kobos per day per person. While the maximum per capita budget spending is about ₦46,566.40, also translating to about ₦127.58 per person daily. On the average, the per capita budget spending is revealed to be about ₦9,041.46 ($29.55), which translates into about ₦24.77 ($0.08) per day on each citizen. Interestingly, these figures show that despite the upward trajectory path of government spending since the 1970s to date, the value allotted to each citizen in the annual budget remains grossly inadequate. A comparison of the Nigerian situation with some of its contemporaries, reveals that while the per capita budget spending in Nigeria for 2018 alone is about $152.17 (CBN statistical bulletin 2018). In Ghana, the value for 2018 is about $391.93 (MOFEP 2018); Egypt in 2018 had its per capita budget to be about $850.58 (MOF 2018), while South Africa was about $762.16 (Trading Economics 2019). To further exacerbate the issue, the cost of living in the country can be said to be high, judging by the average annual inflation rate of about 18.4% (see Table 1). Nigeria's average annual population growth rate of 2.6%, is also the third fastest in the West Africa region behind Niger and Mali, respectively (WDI, 2018).

Contained in Table 2 is the correlation matrix for the study variables. Most of the relationships exhibit weak correlation, indicating the reduced severity of the problem of multi-collinearity between the variables. However, the three highest correlations observed can be considered moderate, despite their tendency of expanding the estimated standard errors in our regressions; they still do not weaken the validity of the conclusions we can draw from the estimates. Since we assume that the functional form of our model is rightly specified.

4.2 | Unit root test

Although the ARDL methodology is suitable in capturing series that are stationary either in the level form or at first difference or having a combination of level and first difference stationary series. One precondition for adopting the methodology requires the dependent variable to be of

TABLE 1 Descriptive statistics of variables

	lPBS	*IPO*	*EXH*	*INF*	*GREGDP*	*RGDPG*	*POG*	*lGFC*
Mean	9,041.455	36.6153	68.8181	18.4017	18.6429	3.68493	2.6031	2.5858
Max.	46,566.40	114.2100	306.450	72.8355	37.9683	33.7358	3.0443	3.3649
Min	16.14643	1.8000	0.54678	3.45765	5.17000	−13.1279	2.2840	0.6313
SD	12,534.17	31.2885	85.0282	15.7616	8.40412	7.1118	0.1521	0.5769
No. Obs.	49	49	49	49	49	49	49	48

TABLE 2 Study variables correlation matrix

	lPBS	*IPO*	*EXH*	*INF*	*GREGDP*	*RGDPG*	*POG*	*lGFC*
lPBS	1							
IPO	0.72	1						
EXH	0.86	0.69	1					
INF	−0.09	−0.28	−0.25	1				
GREGDP	0.06	0.01	−0.04	−0.13	1			
RGDPG	0.17	0.05	0.20	0.09	0.17	1		
POPG	0.02	0.24	0.01	−0.06	0.20	−0.20	1	
lGFC	−0.02	0.40	0.07	−0.18	0.03	−0.33	0.53	1

TABLE 3 Unit root tests

	ADF test			PP test		
	With constant	With constant and trend	Without constant and trend	With constant	With constant and trend	Without constant and trend
lPBS	−7.8447***[b]	−7.9912***[b]	−1.9775**[b]	−7.6319***[b]	−7.9397***[b]	−5.8262***[b]
IPO	−6.0788***[b]	−6.0033***[b]	−6.0684***[b]	−6.0325***[b]	−5.9513***[b]	−6.0248***[b]
EXH	−4.6551***[b]	−5.1991***[b]	−4.2180***[b]	−4.6597***[b]	−5.0192***[b]	−4.2152***[b]
INF	−3.4121**[a]	−3.9781**[a]	−2.1031**[a]	−3.2466**[a]	−3.2340*[a]	−1.9427*[a]
GREGDP	−7.5128***[b]	−7.5112***[b]	−7.5817***[b]	−7.5247***[b]	−7.5227***[b]	−7.5817***[b]
RGDPG	−5.9809***[a]	−6.1316***[a]	−5.1226***[a]	−6.0634***[a]	−6.1488***[a]	−5.2679***[a]
POPG	−4.4669***[b]	−5.7152***[b]	−4.5733***[b]	−2.7440*[a]	−2.7167	−2.5463**[b]
lGFC	−2.6947*[a]	−6.6018***[b]	−6.6746***[b]	−2.7287*[a]	−8.0654***[b]	−8.3085***[b]

Note: a and *b* indicate stationarity at level and first difference respectively, and *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

first difference stationary (i.e., I[1]). While the regressor variables can be a combination of both level and first difference variables, but not second-order stationary. Hence, to ensure conformity with this condition, the Augmented Dickey–Fuller (ADF) and the Phillip–Perron (PP) unit root tests are conducted on the variables; with Table 2 showing the level of stationarity of each series used.

Output in Table 3 indicates that per capita budget spending (i.e., the response variable) conforms with being stationary at the first difference level as required, for both the ADF and the PP test. Furthermore, the regressor variables are revealed to be mostly first difference stationary. With exception to the inflation rate and the growth rate of real GDP which are level stationary. Thus, having a mix of level and first difference regressor variables conforms with the ARDL procedure, thus, justifying the ARDL model adopted for this study.

4.3 | Cointegration test

Table 4 shows the bounds cointegration test result for both the baseline symmetric and asymmetric models. Judging by the F-statistic values of 3.91 (for symmetric) and 7.15 (for asymmetric), both the symmetric and asymmetric models exceeds the critical upper bound (i.e., I[1]) at the 5% and 1% significance levels respectively. Based on these outcomes, we conclude that the variables co-move in the long-term. Hence, the magnitude of the long and short-term effects of the regressors on the response variable can be evaluated; as well as the adjustment period from short-term distortion to long-term equilibrium path determined.

4.4 | Estimated baseline results

4.4.1 | Symmetric baseline estimates

It is evident from the output of Table 5 that the adopted determinants of government spending by the fiscal authorities, exhibit no significant long-run effect on the per capita budget spending of the government, thus suggesting their ineffectiveness in the determination of what gets expended on each citizen.

TABLE 4 Bounds test

Bounds test for symmetric model						
	Baseline regression: K = 5			Robust regression: K = 7		
Significance	F-statistic	I(0)	I(1)	F-statistic	I(0)	I(1)
10%	3.9188**	2.08	3	3.9548***	1.92	2.89
5%		2.39	3.38		2.17	3.21
2.5%		2.7	3.73		2.43	3.51
1%		3.06	4.15		2.73	3.9
Bounds test for asymmetric model						
	Baseline regression: K = 8			Robust regression: K = 10		
	F-statistic	I(0)	I(1)	F-statistic	I(0)	I(1)
10%	7.1454***	1.85	2.85	5.2528***	1.76	2.77
5%		2.11	3.15		1.98	3.04
2.5%		2.33	3.42		2.18	3.28
1%		2.62	3.77		2.41	3.61

Note: ** and *** represent significance at 5% and 1%, respectively, K is number of variables, and Ho: No long-term relationship.

However, the short-term result shows that per capita budget spending of the government only responds positively, and significantly to changes in the exchange rate and the government revenue. In terms of the magnitude of the significant response, the exchange rate exerts a very low impact on the per capita budget. Such that if the nominal value of the exchange rate was to rise by 100%, the per capita budget spending will rise by less than a percent. Similarly, the short-term magnitude effect of a change in government revenue is positive. The result suggests that only a 2 % increase in the per capita budget spending will take place if government revenue should even double.

Furthermore, the cointegrating term of the model is significant and rightly signed. Its value of −0.03 indicates that in the presence of long-term equilibrium distortion, it will take a long while, specifically, about 33 years to correct.

4.4.2 | Asymmetric baseline estimates

Evidence from Table 5 reveals that unlike the baseline symmetric regression, government revenue positively and significantly impacts the per capita budget spending of the government in the long-term. This outcome is expected as improved government revenue should also translate to improve budgetary spending per citizen. Similarly, per capita budget spending is expected to rise in the long-term with increase in the rising rate of inflation. This shows that the fiscal authorities need to be mindful of the pace at which inflation climbs in the economy when deciding how much to expend per citizen. Since a faster pace at which inflation rises could denote faster rising cost of living. Other government spending determinants such as the growth rate of the real GDP, positive and negative behaviour of the international price of oil, positive and negative behaviour of the exchange rate, and the decline in the rate of inflation, do not trigger any significant long-term response from per capita budget spending.

In the short term, an increase in the pace at which the naira depreciates to the US dollar, is suggested to yield a significant positive effect on the per capita budget spending. Implying that when the nominal value of the naira depreciates faster, the cost of import per capita in the budget is expected to rise. This short-term effect is usually observed when there is a sudden surge in the demand for and scarcity of FOREX, thus increasing the depreciating rate of the naira. The implication is an increase in subsidy payment by the government on products such as imported refined petroleum products, and imported agricultural inputs. Nigerian government have consistently captured such subsidy outlays in the annual budget for about 20 years, with the goal of cushioning their effects on the citizens. For example, the Nigerian Extractive Industries Transparency Initiative stated that the Nigerian government expended over three trillion naira in subsidizing imported refined petroleum products from 2006 to 2011 alone.

Lastly, the cointegrating term's value (−0.53) is obviously much more robust than that of the symmetric model. Indicating that about 24 months will be required for short-run distortions to be corrected, and for long-run equilibrium path to be restored.

TABLE 5 Baseline ARDL estimates

Dependent variable: Δ*lPBS*				
	Symmetric model result		**Asymmetric model result**	
Independent variable	**Coefficient**	***p*-value**	**Coefficient**	***p*-value**
Constant	3.3581	.3632	3.1999	.0000***
IPO	0.0184	.7239		
EXH	0.0112	.6215		
INF	0.1504	.2699		
GREGDP	0.2156	.3184	0.0260	.0222**
RGDPG	−0.1215	.5370	−0.0092	.2643
IPO^+			0.0004	.4902
IPO^-			0.0038	.5688
EXH^+			0.0006	.2497
EXH^-			−0.0674	.3437
INF^+			0.0211	.0000***
INF^-			−0.0037	.3860
Δ*EXH*	0.0050	.0080***		
Δ*GREGDP*	0.0194	.0009***		
ΔEXH^+			0.0057	.0002***
v_{t-1}	−0.034	.0000***		
ε_{t-1}			−0.5334	.0000***
Adj. R^2	0.2794		0.5581	
J-B	2.0218	.3639	0.7522	.6865
LM(1)	0.7679	.3809	0.5885	.4430
LM(2)	0.8292	.6606	0.5903	.7444
LM(3)	3.2416	.3559	6.1059	.1066
ARCH(1)	0.1814	.6702	0.0008	.9771
ARCH(2)	0.6876	.7091	1.1906	.5514
ARCH(3)	0.7140	.8699	1.4964	.6831

Note: J-B is the Jarque–Bera test for error normality, LM(.) is the LM test for error autocorrelation up to the lag order given in the parenthesis, and ARCH(.) is the ARCH test for autoregressive conditional heteroskedasticity up to the lag order given in the parenthesis, where *, ** and *** indicates significance levels at 10%, 5% and 1% respectively.

TABLE 6 Out-of-sample forecast performance using 90% of the full sample

	RMSE			**Campbell–Thompson test**		
Model	**h = 1**	**h = 3**	**h = 5**	**h = 1**	**h = 3**	**h = 5**
Symmetry	0.278	0.247	0.122	0.333	0	−0.6
Asymmetry	0.049	0.068	0.087	-	-	-

Intuitively, the neglect of the role of asymmetry, as well as the omission of other vital determinants in the budget planning process by the fiscal authorities, could be responsible for the poor performance of the baseline estimates. Therefore, to confirm the significance of asymmetry in the budget spending decision, a forecast performance test was conducted.

4.4.3 | Forecast performance test on the symmetric and asymmetric models

For the purpose of showing the significance of asymmetry in our analysis, the out-of-sample forecast performance associated with the symmetric and asymmetric ARDL models are given in Tables 6 and 7. To conduct

TABLE 7 Out-of-sample forecast performance using 80% of the full sample

	RMSE			Campbell–Thompson test		
Model	**h = 3**	**h = 6**	**h = 9**	**h = 3**	**h = 6**	**h = 9**
Symmetry	0.150	0.259	0.121	0.773	0.925	0.667
Asymmetry	0.070	0.074	0.072	-	-	-

the forecast analysis, two different forecast periods which include 90 and 80% of the full sample were considered to ensure robustness. Secondly, we adopt the Root Mean Square Error (RMSE) and the Campbell and Thompson (2008) test, in evaluating the forecast performance for the two models. In computing the Campbell and Thompson (2008) forecast estimates, the following formula is employed: $1 - (MSE_A/MSE_S)$, where MSE_A and MSE_S represent the mean square error (MSE) of forecasts from the asymmetric and symmetric models, respectively.

To derive a decision rule using the RMSE technique requires the model with the lowest value as being adjudged to possess the highest forecast performance, indicating that the forecast performance of a model is effective, so long as the model has the lowest RMSE statistic, and vice versa. As for the Campbell–Thompson test, the decision rule is based on having a positive statistic for the Campbell–Thompson test. Hence, if the test result is positive, then the asymmetric model will be adjudged more efficient (i.e., outperforms) than the symmetric model and vice versa. Also, the out-of-sample forecast output for with 90% full sample is given for $h = 1$, 3, and 5. While for with 80% full sample is given for $h = 3$, 6, and 9, where h denotes the out-of-sample forecast horizon.

Tables 6 and 7 give the out-of-sample forecast estimates for 90 and 80% of the full sample respectively. Evidence from the two results shows that the RMSE estimates for the asymmetric model are lower than the symmetric model. Therefore, indicating that asymmetries play a crucial role when evaluating the significance of public spending determinants on the per capita budget spending decision in Nigeria. Similarly, the Campbell–Thompson test validates the RMSE test result by mostly being positive. Thus, indicating that the nonlinear (asymmetric) model outperforms the symmetric model. Both tests results suggest that the predictability of per capita budget spending of the government, through the use of public spending determinants, will be well enhanced if the role of asymmetry is incorporated in the predictive decision-making process.

4.4.4 | Baseline residual stability test

In establishing the stability of the baseline regression residuals, the Cumulative Sum of recursive residuals (CUSUM) and the CUSUM of squares (CUSUMSQ) test as proposed by Brown, Durbin, and Evans (1975), were adopted. Figure 1 is a plot of both the CUSUM and CUSUMSQ test statistics for both the symmetric and asymmetric regressions that lie within the significant 5% critical bounds. Any drift path beyond the critical lines will indicate the presence of instability in the residual. Hence, Figure 1 reveals that in the overall, both regressions' residuals exhibit stability at the 5% significance level. This shows that the estimated parameters of our regressions can be relied upon for policy decision-making, especially as it relates to the per capita budget spending decision of the government.

4.4.5 | Robust symmetric and asymmetric estimates

As prior noted, the absence of crucial determinants among the list of instituted spending determinants in Nigeria, could be the factor responsible for the poor performance of the baseline estimates. Hence, a robust model including population growth rate and gross fixed capital formation as a share of GDP is estimated as shown in Table 8. Just like in the baseline regression, we tested for cointegration of the variables to be sure of their long-term relevance. Table 4 confirms the presence of cointegration for both the symmetric and asymmetric robust regressions.

Results in Table 8 reveal that the inclusion of the robust variables in the ARDL models substantially enhances the asymmetric model's estimates. However, the symmetric model slightly responded to the inclusions. As only the international price of oil in the long-term was significant; while in the short term, the exchange rate, and population growth rate were the significant variables, thus further confirming the significance of asymmetry in public spending decisions in Nigeria.

Analyses of the significance of the asymmetric regression reveal that government revenue, and positive inflation changes, were the only similar substantial outputs to the baseline asymmetric regression. Further analysis show that the decline in the growth rate of real GDP both in the short and long term, are bound to increase per capita budget spending. When there is a decline in the growth of the economy, usually measured by fall in GDP growth rate, most governments are known to spend more

FIGURE 1 Baseline CUSUM and CUSUMSQ test. (a) Stability test on baseline symmetric model residual. (b) Stability test on baseline asymmetric model residual [Colour figure can be viewed at wileyonlinelibrary.com]

with the intention of raising aggregate demand to stimulate economic recovery. Our robust variable, population growth rate, exerted strong positive effect on per capita spending (judging by its coefficient). In fact, the effect was revealed to be stronger in the short term, indicating that the share of individuals in public spending cannot be meaningful when public spending planners strongly fail to consider population growth. Our measure for infrastructure development was however not significant. A plausible reason could be the growing preference for recurrent spending since the 1980s, over capital spending in the budget. In fact, from the 2000s, recurrent spending had continued to tripled the size of capital spending. Hence, leaving the limited infrastructures over-stretched (CBN Statistical bulletin, 2018). Also, when the decline in the price of oil in the international market increases, there is the tendency for per capita budget spending to rise. Furthermore, since the Nigerian economy is import dependent, increasing depreciating value of the exchange rate, will increase the government's cost per citizen in the budget due to rising importation cost. This effect was also found to be significant in the short term.

Per capita budget spending is also expected to rise both in the short and long term with increase in the rising rate of inflation. Thus, aligning with the baseline asymmetric output that the fiscal authorities need to be mindful of the pace at which inflation climbs in the economy. Other findings show that when the pace at which inflation rate declines slows-down, increase in per capita budget spending should be expected in the long-term. Usually, it is not unlikely for prices to be "sticky" downwards, hence, government's long-term intervention could involve increasing social security programmes and raising the national minimum wage.

TABLE 8 Robust ARDL estimates

Dependent variable: $\Delta lPBS$				
Independent variable	**Symmetric model result**		**Asymmetric model result**	
	Coefficient	***p*-value**	**Coefficient**	***p*-value**
Constant	18.3171	.1609	0.6595	.3787
IPO	0.0906	.0909*		
EXH	−0.0104	.6743		
INF	0.1019	.1053		
GREGDP	0.2304	.1129	0.0141	.0726*
RGDPG	−0.1720	.2136	−0.0167	.0368**
POG	−4.2249	.4220	0.9598	.0025***
lGFC	−2.6120	.1359	0.001	.9927
IPO^{+}			0.0040	.3144
IPO^{-}			0.0083	.0431**
EXH^{+}			0.0040	.0342**
EXH^{-}			−0.0288	.2568
INF^{+}			0.0215	.0000***
INF^{-}			−0.0061	.0512*
ΔEXH	0.0086	.0000***		
$\Delta RGDPG$			−0.0071	.0052***
ΔPOG	0.9518	.0655*	1.5999	.0000***
ΔEXH^{+}			0.0077	.0000***
ΔEXH^{-}			0.0167	.3640
ΔINF^{+}			0.0117	.0000***
v_{t-1}	−0.0571	.0000***		
ε_{t-1}			−0.8861	.0000***
Adj. R^2	0.3807		0.6739	
J-B	0.2719	.8729	0.8051	.6686
LM(1)	0.3847	.0498**	0.0489	.8250
LM(2)	4.4521	.1080	0.5870	.7457
LM(3)	8.9630	.0298**	16.243	.0010***
ARCH(1)	0.0003	.9869	3.0432	.0811*
ARCH(2)	0.5988	.7413	3.0838	.2140
ARCH(3)	1.3577	.7155	2.9239	.4035

Note: J-B is the Jarque–Bera test for error normality, LM(.) is the LM test for error autocorrelation up to the lag order given in the parenthesis, and ARCH(.) is the ARCH test for autoregressive conditional heteroskedasticity up to the lag order given in the parenthesis. *, ** and *** indicate significance levels at 10%, 5% and 1%, respectively.

The asymmetric regression's ECM value (−0.89) is obviously much more robust than that of the symmetric regression, indicating that about 13 months will be required for long-run equilibrium to be achieved, in the event of short-term distortions. This suggested time is 11 months shorter than the baseline's (24 months) predictive period. In addition, there is a significant improvement in the adjusted R^2 compared to that of the baseline regression. Both of these output further shows the robustness of the two variables added. Hence, it is important to note that budget planners in Nigeria must incorporate the population growth rate, for baseline determinants to substantially impact on per capita spending. Likewise, more attention should be given to growth in infrastructure development over recurrent spending.

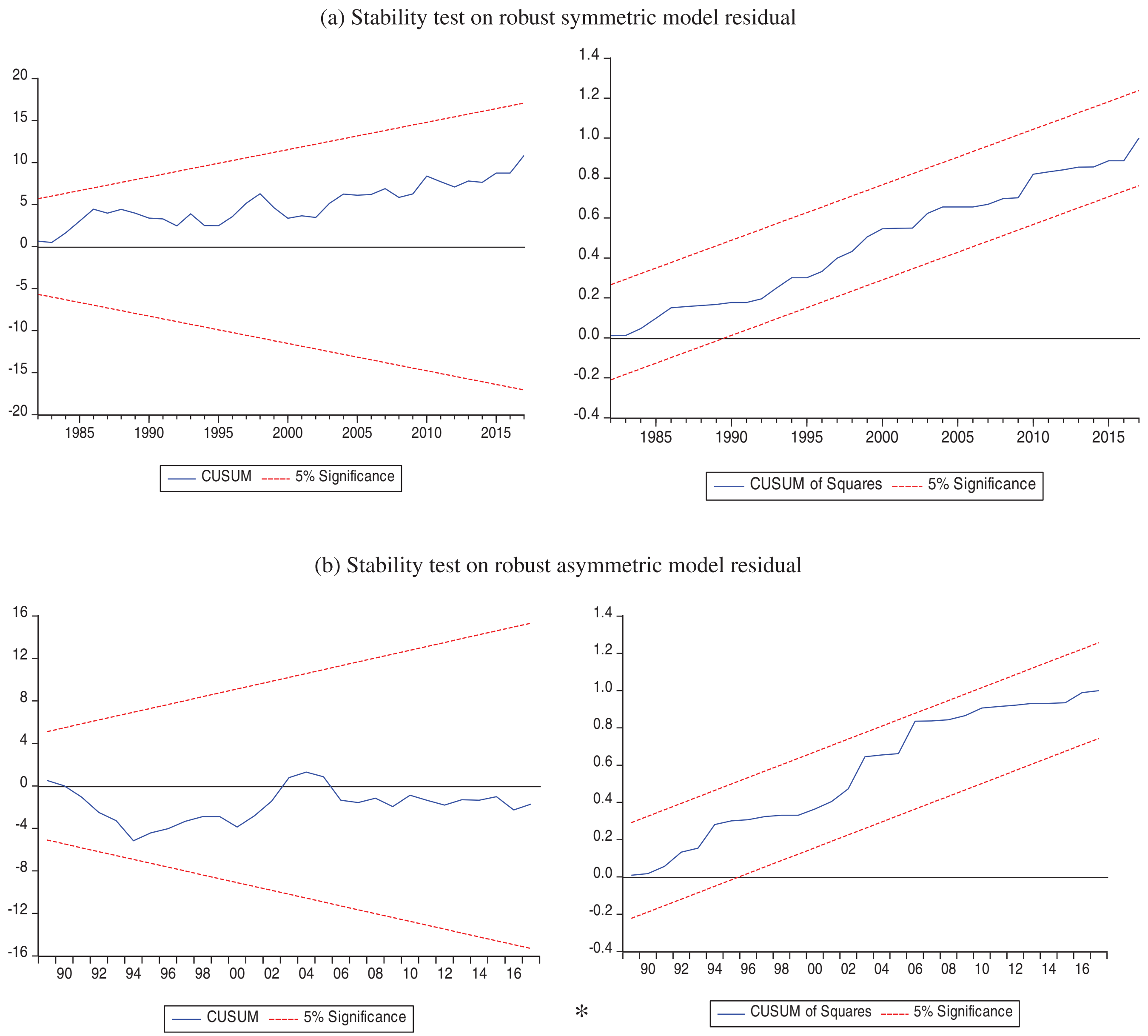

FIGURE 2 Robust CUSUM and CUSUMSQ test. (a) Stability test on robust symmetric model residual. (b) Stability test on robust asymmetric model residual [Colour figure can be viewed at wileyonlinelibrary.com]

Figure 2 reveals that in the overall, both regressions' residuals exhibit stability at the 5% significance level. This shows that the estimated parameters of our robust regressions can also be relied upon for policy decision-making, especially as it relates to effective per capita budget spending decision of the government.

5 | CONCLUSIONS AND RECOMMENDATIONS

The motivation for this study had been to assess whether the established determinants of public spending decisions in Nigeria which are government revenue, the rate of inflation, the exchange rate, the growth rate of real GDP, and the international price of oil, do actually inform the share of Nigerians in the budget as assumed by the fiscal authorities. However, evidence from the baseline symmetric and asymmetric ARDL regressions suggest otherwise. A further probe was done by adding population growth rate, and gross fixed capital formation to the baseline variables to have a robust regression. The result suggests that while gross fixed capital formation which measures for infrastructure development was insignificant, population growth rate was crucial for the instituted determinants to exert substantial effect on per capita spending. This outcome can be taken as evidence of why the budget on a yearly basis is being perceived by most citizens as not being an effective tool of fiscal policy. Since the fiscal authorities have continued to always assume that factors that play crucial role in formulating their spending decisions; are the same with those necessary in deciding the share of Nigerians in the budget; without due consideration for population growth. Hence, ridiculing whatever goal the budget is set out to achieve.

Thus, if the instituted public spending determinants are to be effective, then there is an urgent need for the fiscal authorities to properly incorporate population growth in budget planning decisions. Having a ridiculous annual average of ₦9041.45 ($29.55) allocated to each individual in the budget should be considered worrisome to all stakeholders. It would be reasonable if measures used in determining the per capita budget spending are genuinely tailored towards capital development, as against the current trend of having a huge portion allocated to recurrent spending. This should involve having capital spending grow at the same or faster rate than population growth. For instance, from 1970 to 2018, public capital spending has only exceeded public recurrent outlay in just a total of 14 years of the 48 years under review (CBN Statistical bulletin, 2009 and 2018). This will ensure that the impact of the annual spending decision of the government is felt by the common person. However, such measures might see the annual budget spending of the government rising astronomically; but the urge to raise the needed funds for such budget will only help to put more pressure on the government to also genuinely diversify their revenue source, and ensure prudent spending.

DATA AVAILABILITY STATEMENT

The data that support the findings of the study are available from the corresponding author upon reasonable request.

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