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PUBLIC DEBT, FISCAL SPACE, AND INDUSTRIAL SECTOR PERFORMANCE IN NIGERIA

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ABSTRACT

There has been a surge in the public debt profile of Nigeria in recent years. This paper examines the usefulness of deficit financing plans based on public debt in driving industrial sector output performance in an economy with sufficient borrowing space. The paper utilizes the ARDL cointegration technique to investigate both the short-run dynamics of the hypothesized relationship as well as the long-run dimension of the relationship among public debt, fiscal space, and industrial sector performance in Nigeria. Two variables, *total debt stock* and the *debt service over exports ratio*, proved statistically significant in the long run in explaining industrial output performance in Nigeria. Two variables, *fiscal balance* and the *debt service over exports ratio* were statistically significant and satisfactorily explain industrial output performance in Nigeria over the short-run period. These findings, in effect, confirm the applicability of the Keynesian general theory, which assigns a positive connotation to public indebtedness, whether in the attempt to design demand-side fiscal policy or to stimulate an economy in recession onto the path of balanced economic growth. One piece of emerging evidence from this study on Nigeria is that an increase in the debt service over exports ratio, which is a key measure of debt-related risks, does not provide evidence of any long-run damage to industrial output performance.

Contribution/Originality: This study is different from previous related studies on at least two grounds. First, the study incorporates the fiscal space question in the effort to examine the usefulness of increasing public debt in the drive to boost industrial output performance and consolidate economic recovery in Nigeria. Second, the study adopts tools that are effective in separating the short-run impacts of the relationship between key fiscal space measures and industrial output performance from its long-run dimensions. These approaches are particularly useful in cases where there is the need to design appropriate policies that separately address the short-run peculiarities of the relationship as distinct from the long-run realities.

1. INTRODUCTION

There has been a surge in the public debt profile of Nigeria in recent years. Most economies, including Nigeria, have in recent times resorted to innovative fiscal responses to mitigate the economic fallouts of the Covid-19 pandemic and to support businesses and households that were already enduring pre-existing strains from other long-term structural challenges. Economists belonging to the Keynesian extraction largely believe that state indebtedness can

be rationalized with the argument that it is good for expansion of economic activities and, consequently, for overall economic growth.

Statistics from the Central Bank of Nigeria Statistical Bulletin indicate that the overall output of the industrial sector for 2015 and 2016 declined by 13.62% and 2.85%, respectively. The sectoral outputs for subsequent years have been growing but at a declining rate with 37.54% growth recorded in 2017, 29.56% in 2018, 20.05% in 2019, and 9.16% in 2020. The public debt profile of the country increased steadily during the same period. At the same time, the 2022–2024 Medium Term Expenditure Framework/Fiscal Strategy Paper (MTEF/FSP) statistics obtained from the Budget Office of the Federation indicate that the public debt level will continue to build up for the conceivable future.

An overview of the government's fiscal deficit and deficit financing plan for the three-year period ending in 2024 indicates that budget deficit projection for the 2022 fiscal year was N5.62 trillion compared to N5.60trillion in 2021. The 2022, budget deficit projection amounted to 3.05% of the gross domestic product (GDP) estimates for the year, and this was in clear breach of the budget deficit limit, which should not exceed 3% of the estimated GDP for any given year, as stated in the Fiscal Responsibility Act. The justification provided by the government for the planned increase in fiscal deficit is that it will allow for some fiscal space to sustain the recovery from economic recession, as well as ensure that critical ongoing infrastructure projects are completed. In this case, the government needed to first invoke a 'national security threat' to be able to violate the budget deficit threshold. The government intends to finance the deficit for the plan period by borrowing a total sum of N4.89 trillion, in addition to privatization earnings of N90.73 billion, and N638.32 billion drawdowns on existing project-tied loans. The 2022–2024 three-year financing plan based on the MTEF/FSP document for the country also indicates that the country's appetite for debt financing will continue to increase. For example, although the proposed net borrowing of N4.89 trillion in 2022 is projected to decrease slightly in 2023 by 2.93%, the projection for 2024, surprisingly, is an increase of 12.76%. At the same time, some critical ratios for the economy are expected to worsen. For instance, the debt service/revenue ratio will increase by 43% in 2022, 48% in 2023, and 57% in 2024. Similarly, the deficit/revenue ratio will grow by 67% in 2022, 52% in 2023, and 54% in 2024. These projections are no doubt suggestive of a very tight fiscal space for the government to operate effectively in the near future.

These deficit financing plans remain a great concern to stakeholders across the country and others outside the country, especially international rating agencies. The long-term implications of fiscal deficit financing on the macroeconomy are still open to debate within the extant literature. And this debate is much more than the short-term ramifications of deficit financing. The nature of the deficit could, however, hold the key to understanding this phenomenon. When deficits are financed through the sale of government securities, the effect will be to reduce the latent capital stock within the economy. This would vary if the government monetized the debt completely; the risk in this case would be price increases rather than a reduction in capital stock. If the deficit results from a decrease in earnings of the government, which may be due to tax cuts or a decline in economic activities, then no incentive is expected to take place in the economy. When deficits are designed to stimulate cumulative demand, some economists argue that such budget deficits have the potential to crowd out private investment. It could also alter capital structures and interest rates as well as weaken net exports, trigger tax increases, and even mount inflationary pressure on the entire economy.

With the considerable recovery of the economy from recession, and the pandemic gradually coming under control, simple fiscal rules alone may not be adequate in ensuring that fiscal sustainability questions do not impede the recovery and growth of the Nigerian economy. Policymakers must now begin to ask themselves tough questions on how best to balance the fiscal space. In view of the foregoing, this study questions the usefulness of increasing public debt in the drive to boost industrial output performance and consolidate economic recovery in Nigeria. In addition, the study also investigates the role of key fiscal space measures in driving output performance of the industrial sector of the Nigerian economy. In specific terms, the study addresses the following question: What are the

immediate short-term impacts and the long-run consequences of the deficit financing plan on industrial output performance in Nigeria?

This paper largely subscribes to the argument by Bilan (2016) that public debt must not be accumulated at a fast pace, and when incurred, should be deployed for use in the creation of value-added economic endeavors, such as much needed public investments that confer net benefits on the economy. In what follows, we give a brief review of the related literature on deficit financing and macroeconomic performance, present the methodological approach taken in the study, explain the key findings, discuss the results, and offer some concluding remarks.

2. LITERATURE REVIEW

Several theoretical perspectives have evolved over time to rationalize the economic effects of public indebtedness. These theories can be traced back to the classical doctrine of "laissez-faire", which places emphasis on the neutral role of the state in the effective functioning of the market. The classical economists broadly advanced the viewpoint that the public sector is much more wasteful in the use of resources compared to the private sector. The classicals argued that state indebtedness amounted to a deliberate effort by the public sector to divert private capital from its productive routines to non-productive engagements, thus hindering the growth and development of the economy. Bilan (2016) reverberated Smith's argument against the state's right to incur public debt. Smith argued that state borrowings hinder the natural growth of an economy toward overall prosperity owing to the notion that productive resources are diverted from the private sector by the state to cover its non-profitable spending, thus depleting resources with no assurance of recovering such losses in the future (Smith, 1904). Interestingly, the basic classical ideals of "laissez-faire" and the controlling hand of market forces make the accumulation of public debt to drive economic growth an unfavorable option for most classical economists.

Keynesian economists demonstrate a fundamental shift of perspective from the classical economists regarding the economic effects of public indebtedness. *Keynes* advocated a countercyclical *fiscal policy such that the state can embark on expansionary fiscal spending during periods of economic downturn and pursue a contractionary fiscal posture during periods of economic prosperity*. In the viewpoint of the Keynesians, public borrowing may not be blamed for its damaging consequences on the economy. On the contrary, the role of public indebtedness in the smooth functioning (without major imbalances) of the economy is emphasized. Keynes himself advocated a combination of the guiding hand of the state and the invisible hand of the market in navigating the economy out of every situation of macroeconomic imbalance. This viewpoint also included support for state use of public debt to accomplish the goal of restoring economic stability during periods of crisis. According to Bilan (2016), some Keynes enthusiasts assigned a positive connotation to public indebtedness in developing demand-side fiscal policies for revamping the economy out of recession or to trigger a recovery (Filip, 2010). Another adherent of Keynes, M. Duverger cautioned that budget deficit should not exceed the period of attainment of full employment (Duverger, 1975).

The neoliberal economists marked a shift of viewpoint that revived the disapproval of state indebtedness. The neoliberals were of the view that the very fact of a rising indebtedness profile of the state is a signal of difficult times ahead, irrespective of the relative position of the economy involved (Landais, 1998). The neoliberal economists, in effect, presented a direct rebuke of the Keynesian remedies. The neoliberals questioned the use of budgetary measures that involved public borrowing for stabilizing an economy in distress, arguing that public authorities lack the ability to revamp an economy in decline using these measures. For instance, Milton Friedman, cited in Bilan (2016), argues that public debt was much more disruptive than being a tool for economic stabilization (Friedman, 1995).

The main argument advanced by the neoliberals against state indebtedness stems from the "crowding out effect" of public debts to finance budget deficits. For example, the monetarists raised the possibility of debt-financed budget deficits to produce little or no GDP growth owing to the crowding out effect of public debt. The Keynesians, in turn, argue that, given the conditions of an economy that has sizeable unused resources and excess capacity, debt financing of budget deficits has the potential to mobilize such idle resources to the domain of productive economic engagement.

The current thinking of economists is summed up in Bilan (2016) to favor the Keynesian remedies given the painful realities of recurring widespread economic crises across the globe. For example, Krugman (2009) alluded that Keynesian economics still provides the optimal framework that deploys logic during recessions and depressions.

The empirical literature on the relationship between public debt and overall performance of the economy is quite rich. Saungweme and Odhiambo (2020) investigated the relationship between public debt and economic growth in Nigeria. The study showed the existence of a significant relationship in the short and long runs between the variables of interest. Using the ARDL methodology, they reported an optimal debt threshold of 40.2% in the relationship in both the short and long runs. Maheswaranathan and Jeewanthi (2021) focused their study on Sri Lanka where they investigated the impact of fiscal policy on economic growth using the ARDL approach for the period from 1990 to 2019. The paper revealed both short- and long-run significant impacts of fiscal policy on economic growth, though the impact is stronger in the long run. The consequences of public debt on economic growth and investment in the Philippines from 1975 to 2010 was examined by Akram (2015) using the ARDL methodology. The study found evidence of the debt overhang effect as the findings showed a negative significant relationship between foreign debt and economic growth. The study also found an insignificant relationship between debt servicing and economic growth, while local debt was found to exhibit a negative correlation with economic growth.

Another related study which was earlier conducted in Sri Lanka by Attapattu and Padmasiri (2018) and utilized the ARDL technique also found a sustained, significant, negative relationship between public debt and growth. Similarly, Saungweme and Odhiambo (2019) found a significant causal relationship between public debt and economic growth in Zambia. Their study, which utilized a dynamic multivariate ARDL, revealed a one-way Granger causality from economic growth to public debt in both the short run and the long run. Abdullahi (2016) investigated the relationship between public debt and capital formation in Nigeria and South Africa over three decades using ARDL and vector autoregression (VAR) models. The findings revealed a significant, negative effect of external debt on capital formation, with the impact being more pronounced in Nigeria than in South Africa.

Saungweme (2019) conducted a study on public debt, public debt service and economic growth in South Africa between 1970 and 2017 using the ARDL model and a multivariate cointegration test. The study found evidence of one-way causality from economic growth to public debt in the short run, and no causality was established between public debt service and economic growth in the short or long runs. Burhanudin, Muda, Nathan, and Arshad (2017) studied the real effect of state debt on sustainable economic growth in Malaysia using the ARDL model between 1970 and 2015. Their findings showed positive and statistically significant long- and short-run effects of government debt on sustainable economic growth.

In a study on fiscal reaction functions and public debt sustainability in Nigeria, Adeosun and Adedokun (2019) applied the error correction mechanism. The study found a long-run relationship between the variables under the condition that debt is acquired in a sustainable manner. The dynamic impacts of sovereign debt and sovereign debt service on economic growth in Nigeria from 1981–2019 using the error correction model (ECM), vector error correction model (VECM) and Granger causality. A positive short-run relationship and a negative long-run relationship between foreign debt and economic growth was found. In addition, a significant, positive relationship between domestic debt and economic growth was found in the short and long runs. Increased sovereign debt service showed a negative relationship with GDP in both the short and long runs. A one-way causality from external debt, domestic debt and sovereign debt servicing to GDP was also found (Odior & Iwegbu, 2021).

Ehikioya and Omankhanlen (2021) investigated the relationship between public debt and economic growth in Nigeria between 1981 and 2019 using ordinary least squares (OLS), VECM and Johansen cointegration. They found that there is a negative and significant long-run relationship only under the condition that public debt is lagged. In another study, Ukpe, Djomo, Filli, and Osayi (2020) used the Monte Carlo simulation technique to determine the impact of debt stock reduction on agricultural investment and economic growth over 37 years in Nigeria. The simulation results showed that public debt must increase in order to advance investment and growth through the

agriculture sector. Using the system generalized method of moments (GMM) estimator and cointegration, Ehikioya, Omankhanlen, Osuma, and Inua (2020) explored public debt and economic growth in 43 African countries between 2001 and 2018. The study found a long-run relationship between public debt and economic growth in Africa. A threshold was also reported, beyond which the relationship would be negative. Munasinghe and Padmasiri (2018) investigated the long-run relationship between public debt and economic growth between 1977 and 2012 in Sri Lanka using the Johansen cointegration test. The findings indicated the presence of a significant long-run relationship between public debt and economic growth.

Djiogap (2016) used the panel smooth transition regression (PSTR) model to address public debt and economic growth between 1964 and 2014 for 126 industrialized and developing countries. Findings showed that the relationship between debt and growth is nonlinear. Also, as the debt threshold increases, GDP also increases. Ikue, Medee, Denwi, and Sodipo (2021) recently examined the relationship between macroeconomic deficits and public debt sustainability in Nigeria between 1960 and 2016 using unit root, Granger causality and cointegration to test for the sustainability of budget and trade deficits under the no-Ponzi game. Findings showed that public debt policies are not sustainable. No causal relationship between fiscal and trade policies in Nigeria was found.

Ntshakala (2015) examined the effect of both foreign and local debts on growth in Swaziland between 1988 and 2013 using OLS. No evidence of a significant relationship was found between foreign debt and economic growth, but domestic debt indicated a positive, significant relationship with economic growth. Egbunike, Emudainohwo, and Gunardi (2018) examined the relationship between government debt and economic performance in Nigeria from 1986 to 2017 using dynamic OLS. The findings revealed a significant relationship between the variables. In a similar study, Fasoranti, Sunday, and Haruna (2019) found evidence of a negative relationship beyond a debt threshold using a multiple regression analysis. The study also found a positive impact of tax revenue on GDP in Nigeria. Ten countries under the Southern African Development Community were analyzed using fixed effects regression models and two-stage least squares. These two stages were to account for full samples and a sub-sample, with the sub-sample being non-heavily indebted countries. Findings showed that at both stages, the relationship between public debt and economic growth is negative and significant, while it is negative and insignificant for the sub-sample (Biyase, 2019).

Manik and Khan (2018) studied the relationship between public debt and economic growth in India between 1980 and 2016 using the Granger causality technique. Findings showed that there is no validation of the feedback hypothesis in the short run. Akram and Das (2014) examined the consequences of public debt for economic growth and investment in four South Asian countries from 1975 to 2011 using a panel data estimation technique. The results revealed that public external debt, domestic debt, and debt servicing have a negative and significant effect on economic growth and investment. Adeosun, Ayodele, and Jongbo (2021) compared Nigeria's fiscal sustainability outcomes under different fiscal rule scenarios. The study accounted for time variation, periodic switches, and fiscal policy asymmetry. This study found results that validated the different fiscal moves made by the government.

While there appears to be an abundance of studies on the relationship between public debt and economic growth, there is a limited amount of research devoted to investigating the usefulness of increasing public debt in the drive to boost industrial output performance in Nigeria. The studies that have focused on public debt and economic performance in Nigeria left out key measures of fiscal space, such as fiscal balance, the debt service/revenue ratio and the debt service/export ratio in their analysis of the relationship. The role of these key measures of fiscal space may be central to a better understanding of the underlying question of what drives output performance of the industrial sector in Nigeria. It will also help in shedding light on the exact nature of the short- and long-run economic consequences of deficit financing plans of a country with huge public debt.

3. DATA AND METHODOLOGY

Secondary time series data for this study covering the period from 1981 to 2020 were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin's online version. The data include industrial sector output, fiscal balance

(measured by the difference between general government revenue and expenditure after accounting for payment of all yearly government debt servicing obligations), the debt service/revenue ratio and the debt service/export ratio (two measures of debt-related risks).

The study applies an autoregressive distributed lag (ARDL) model originally advanced by Pesaran (1997), Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001). The ARDL models combine the level and lagged values of the dependent and independent variables in a linear framework. These models are useful in testing for the presence of cointegration in a single estimation and they have the added advantage of separating the long-run dimension of the relationships from its short-run dynamics. Unlike other cointegration approaches, the underlying variables in an ARDL model may be a combination of I(0) or I(1) series. The ARDL model has at least three major attractions when compared with other variants of cointegration techniques:

- The ARDL method can be applied even when the underlying variables are a mix of I(0) and I(1) series.
- The ARDL technique produces more efficient estimates compared with the other cointegration methods in the presence of small and finite samples.
- The related error correction (ECM) model separates the short-run coefficients from the long-run equilibrium and still retains the validity of the long-run coefficients.

In its baseline formulation, a typical ARDL regression model of order (p,q) may be expressed as follows:

$$y_t + \varphi_1 y_{t-1} + \cdots + \varphi_p y_{t-p} = \gamma_0 + \delta_0 x_{t-p} + \delta_1 x_{t-1} + \cdots + \delta_q x_{t-q} + \varepsilon_t \quad (1)$$

Where ε_t are the usual innovations (which must be serially independent), γ_0 is a constant term, φ_i and δ_i are the lagged coefficients of the dependent variable y_t and the k regressors $x_{j,t}$, respectively. No linear trend has been included in the baseline formulation for this study.

If L is used to denote the lag operator, we may then define $\varphi(L)$ and $\delta_j(L)$ as lagged polynomials, such that:

$$\varphi(L) = 1 - \sum_{i=1}^{p} \varphi_i L^i \quad and \quad \delta_j(L) = 1 - \sum_{l_j=1}^{q_j} \delta_{j,l_j} L^{l_j}$$

Consequently, Equation 1 may be rewritten without loss of generality as follows:

$$\varphi(L) y_t = \gamma_0 + \sum_{j=1}^{k} \delta_j (L) x_{j,t} + \varepsilon_t \quad (2)$$

The modelling framework for the current study is motivated by the Keynesian theory, which argues that, given the conditions of a less than full capacity economy and a critical mass of unused resources, deficit plans financed by public debt help to tap into unused resources for the economic domain. This argument accurately describes the Nigerian economy in its present state.

In more specific terms, therefore, Equation 2 translates into the following:

$$ind_t = \gamma_0 + \sum_{i=1}^{j} \varphi_i \, ind_{t-i} + \sum_{i=1}^{k} \delta_1 tdebt_{t-i} + \sum_{i=1}^{n} \delta_2 fbal_{t-i} + \sum_{i=1}^{p} \delta_3 dsrev_{t-i} + \sum_{i=1}^{q} \delta_4 dsexp_{t-i} + \varepsilon_t \quad (3)$$

Where: $ind = industrial\ output\ (logarithm)$;
$tdebt = total\ public\ debt (logarithm)$;
$fbal = fiscal\ balance$;
$dsrev = debt\ service/revenue\ ratio\ (percentage)$;
$dsexp = debt\ service/export\ ratio\ (percentage)$;
$\varepsilon = error\ term.$

$subscript\ i = optimal\ lag\ of\ each\ regressor.$

Industrial output is thought to be explained by fiscal balance (excess of fiscal revenue over fiscal expenditure after adjusting for debt service obligations), the debt service over revenue ratio, the debt service over exports ratio (two measures of borrowing space), as well as public debt stock. While we expect total public debt and fiscal balance to positively impact industrial output, the debt service/revenue ratio and debt service/export ratio are expected to negatively impact industrial output (the rationale here is that any increase in either of these two key ratios would imply that total debt is increasing at a faster rate than either the government's fiscal revenue or export revenue as the case may be, which may be a signal of some difficulty in the ability of the economy to fulfil its debt obligations when they are due).

The ARDL (p, q_1, q_2, q_3, q_4) model depicted in Equation 3 can be estimated by applying the OLS method. In this case, the following preconditions must be satisfied for the estimates of the ARDL model to be valid:

1. The response variable must be I(1) for a better performance of the model.
2. I(2) is not allowed under the augmented Dickey–Fuller (ADF) test.

Testing for the presence of a cointegrated relationship is built on the bounds testing technique as first advanced by Pesaran et al. (2001). Three possibilities are involved in the bounds testing procedure as follows:

1. The F-bounds statistic can be used to test the joint null hypothesis as follows:

$$H_0^F: \alpha = 0\ and \sum_{j=0}^{q} \delta_j = 0 \quad versus \quad H_1^F: \alpha \neq 0\ or \sum_{j=0}^{q} \delta_j \neq 0$$

2. If H_0^F is rejected, the t-bounds statistic may be used to test the single hypothesis as follows:
$H_0^t: \alpha = 0 \quad versus \quad H_1^t: \alpha \neq 0$
3. If H_1^F is rejected, then the conventional z-tests (or Wald tests) may be used to test the individual significance of the elements of δ.

If the null hypothesis in the three steps is rejected, that provides evidence of a cointegrating relationship. If the test statistic is less than the I(0) critical bounds, the decision will be to reject the H_0^F or H_0^t, respectively, and conclude that no cointegration exists among the underlying variables. If the test statistic is greater than the I(1) critical bounds, the decision will be to not reject the H_0^F or H_0^t, respectively, and it can be concluded that cointegration exists among the underlying variables. However, if the test statistic falls between the I(0) and I(1) F-bounds critical values, the decision will be regarded as inconclusive.

A conditional ECM representation may follow once the appropriate ARDL formulation is estimated based on the optimal lag selection. This procedure will include a reparameterization of Equation 3 in conditional error correction form as follows:

$$\Delta ind_t = \gamma_0 - \alpha(ind_{t-1} - \delta X'_{t-i}) + \sum_{i=1}^{p-1} \varphi_{yi} \Delta ind_{t-i} + \sum_{i=0}^{q-1} \varphi'_{xi} \Delta X'_{t-i} + u_t \qquad (4)$$

Where the speed-of-adjustment coefficient is defined as $\alpha = 1 - \sum_{j=1}^{p} \varphi_i$, the long run coefficients are defined as $\delta = \frac{\sum_{j=0}^{q} \delta_j}{\alpha}$, and X' is a vector of regressors included in the model.

Appropriate diagnostic tests are usually conducted to verify the validity of the bounds test results and to ascertain that the assumptions of homoscedasticity and no serially correlated residuals are not violated.

4. ESTIMATION AND RESULTS

The estimation procedure begins by examining the time series univariate properties of each underlying series included in the estimation model as specified in Equation 3. Unit root tests based on the conventional ADF test, and the Phillips–Perron (PP) test were utilized. The goal here was to determine that none of the series is I(2). The results of the stationarity test are reported in Table 1, and they indicate that all variables (except *dsexp*) are I(1). The test

assumption for each series included a constant (C), and a constant and a linear trend (C, T) under the respective test types. The optimal lag length for each series under the ADF test were selected based on the Schwarz Information Criterion (SIC) and these are reported in parentheses beside the ADF test statistic. Similar parentheses beside the PP test statistics are indicative of the bandwidth which were selected based on the Newey–West method using the Bartlett Kernel. These results revealed that each of the underlying variables indicate a mix of I(0) and I(1) series.

Table 1. Unit root tests for stationarity of variables.

Unit Root Tests of Level Variables					
Variables	**ADF test**		**PP test**		**Remark**
	C	**C,T**	**C**	**C,T**	
ind	-0.628(0)	-1.199(0)	-0.617(1)	-1.435(0)	NS
tdebt	-2.582(0)	-2.112(1)	-2.362(2)	-2.268(1)	NS
fbal	0.468(0)	-2.254(1)	0.155(4)	-2.164(4)	NS
dsrev	-2.398(0)	-1.390(1)	-2.479(4)	-2.457(4)	NS
dsexp	-3.071**(0)	-3.097(0)	-3.164**(4)	-3.158(2)	I(0)
Differenced Stationary Variables					
dind	-4.745*(0)	-4.368*(1)	-4.644*(5)	-4.646*(7)	I(1)
dtdebt	-4.508*(0)	-4.603*(0)	-4.514*(1)	-4.606*(2)	I(1)
dfbal	-3.869*(0)	-3.831*(0)	-3.820*(3)	-3.799(3)	I(1)
ddsrev	-8.817*(0)	-8.748*(0)	-8.716*(3)	-8.661*(3)	I(1)

Notes: * and ** denote statistical significance at the 1% and 5% levels, respectively.
NS = non-stationary.
C = constant, T = linear trend.
ind = industrial output.
tdebt = total public debt.
dsrev = debt service/revenue ratio.
dsexp = debt service/export ratio.

Once satisfied with the order of integration by ensuring that no I(2) variable was included in our estimation model, we proceeded by applying the ARDL cointegration technique to separate the long-run dimension of the relationship from the short-run dynamics of the variables in our hypothesized relationship.

Table 2. Estimated ARDL model and bounds F-test for cointegration.

	Bounds testing for cointegration			
Estimated ARDL model		**Optimal Lag**	**F-Stat**	**Decision**
$F_{IND}(ind/tdebt, fbal, dsrev, dsexp)$		(1,0,1,1,2)	8.510	Cointegrated
Diagnostic tests				
	χ^2_{NOR} (p-value)	χ^2_{ARCH} (p-value)	χ^2_{RESET} (p-value)	χ^2_{SERIAL} (p-value)
	0.849	0.909	0.786	0.418
		Critical Value Bounds		
		Sig Level	I(0)	I(1)
n = 38 (after adjustment)		10%	2.660	3.838
		5%	3.202	4.544
		1%	4.428	6.250

The estimated conditional ARDL (P, q_1, q_2, q_3, q_4) model for ind is specified in Equation 3 and the F-bounds test results for cointegration are reported in Table 2. The following ARDL (1,0,1,1,2) specification was applied based on the Akaike Information Criterion (AIC). The F-bounds test statistic for cointegration is 8.510, which is greater than the 1% upper critical value bounds of 6.25, indicating the presence of a cointegrating or equilibrium relationship among the variables in the estimated model. The results of the diagnostic tests also revealed that the estimated ARDL model is free from any violation of the assumptions of no serially correlated residuals, normality, and homoscedasticity. These are indicated by the P-value of each of the test statistics, all of which are greater than the 5% threshold, hence, we fail to reject the null hypothesis in each case.

The estimated coefficients in Equation 4 of the long-run relationship and the short-run dynamics for all variables and the ECM results are reported in Table 3. The results indicate a positive, statistically significant one-period lagged effect of industrial output on its current realizations in the long run. With a coefficient estimate of 0.08, a 1% increase in one-period lagged industrial output will cause the current level of industrial output to decrease by about 0.08% in the long run. This is indicative of the possibility of a loss of growth momentum in the industrial sector of the economy over the long-run period. Total debt stock expectedly has a positive, statistically significant one-period lagged effect on current realizations of industrial output in the long run. Given a coefficient estimate of 0.12, a 1% increase in total debt stock will cause industrial output to increase by about 0.12% in the long run. What this result suggests is that public debt, to some extent and in part, is properly invested and gainfully exploited in increasing the productive capability of the industrial sector in Nigeria over the long-run horizon. This result provides evidence in support of the Keynesian view that public borrowing can aid necessary state interventions to correct disparities and ensure meaningful progress of the economy. The result also confirms similar earlier empirical results by Burhanudin et al. (2017) and Ehikioya et al. (2020).

The debt service/export ratio is another variable with a statistically significant coefficient estimate in the long run. The coefficient for this variable is 0.03, indicating that when the debt service/export ratio increases by 1%, industrial output is expected to increase by about 0.03% in the long run. This result is unexpected but not surprising since the long-run period allows the economy sufficient time to adjust to changing situations. The constant term is also statically significant, explaining about 0.32% of the variation in industrial output, even in the absence of all regressors in the long run. No other variable in the estimated model returned a statistically significant result.

Table 3. Estimated ARDL model and ECM results.

Long-Run Coefficients				
Dependent Var: ind				
	Coefficient	**Std. Error**	**t-stat**	**P-value**
ind(-1)	-0.081**	0.033	-2.471	0.019
tdebt(-1)	0.123*	0.036	3.447	0.002
fbal(-1)	0.000	0.000	1.303	0.203
dsrev(-1)	-0.003	0.003	-1.325	0.196
dsexp(-1)	0.026**	0.010	2.581	0.015
Constant	-0.328**	0.146	-2.238	0.033
Short-Run Coefficients				
d(fisbal)	0.000*	0.000	4.959	0.000
d(debtsrev)	-0.000	0.002	-0.151	0.881
d(debtsexp)	-0.005	0.006	-0.866	0.394
d(debtsexp(-1))	-0.016*	0.003	-5.015	0.000
ECT (-1)	-0.081	0.012	-6.973	0.000

Notes: * and ** denote statistical significance at the 1% and 5% levels, respectively.
NS = non-stationary.
C = constant, T = linear trend.
Ind(-1) = industrial output (first lag values).
tdebt(-1) = total public debt (first lag values).
dsrev(-1) = debt service/revenue ratio (first lag values).
dsex(-1)p = debt service/export ratio (first lag values).

The estimated coefficients of the short-run dynamics are also largely consistent with theoretical expectations. Fiscal balance and one-period lagged coefficient estimates of the debt service over exports ratio are both statistically significant at the 1% level, and they are also correctly signed in the short run. The meaning here is that these variables exhibit a meaningful and significant impact on industrial output in Nigeria over the short-term horizon. While any marginal increase in fiscal balance exerts a positive impact on industrial sector output, a similar marginal increase in the debt service exports ratio tends to hurt or undermine any expansion of industrial sector output in the short run. The error correction term (ECT) has a negative coefficient of - 0.08, as expected, and is significant at the 1% level. What this means is that about 8% of any disequilibrium of the system from its equilibrium path among the

cointegrating variables in the relationship is corrected in each year. The negative sign and statistical significance of the ECT term means that there is convergence in the adjustment to the long-run equilibrium path in the face of perturbations to the system, and this confirms that meaningful error correction is taking place in the cointegrating relationship.

Finally, we report the results of the parameter stability tests as advanced by Pesaran and Pesaran (1997) using the CUSUM and the CUSUMQ tests in Figures 1 and 2. The results indicate that both the CUSUM and CUSUMQ statistics are not outside the 5% critical bands of the confidence interval of parameter stability. These results do not provide any evidence of the presence of any instability of the estimated coefficients.

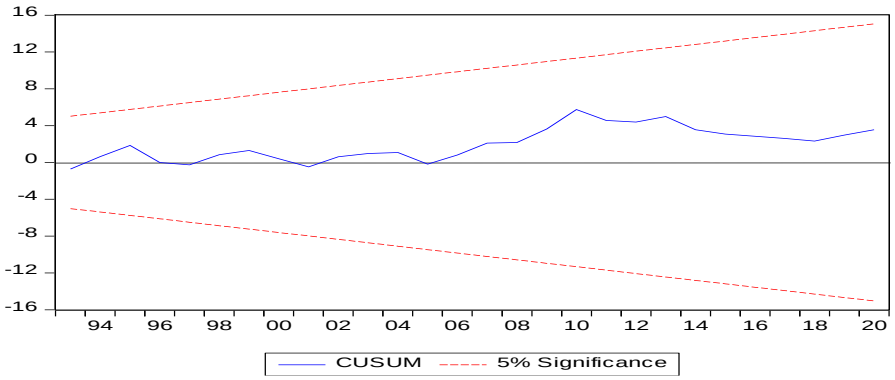

Figure 1. Cumulative sum of recursive residuals (CUSUM).

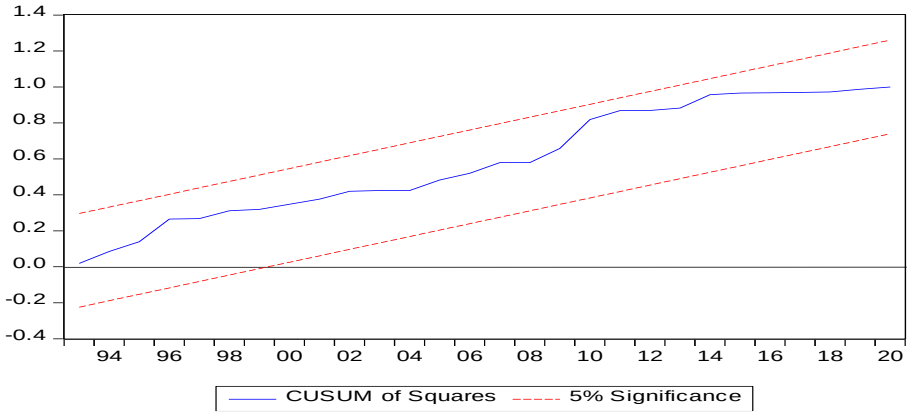

Figure 2. Cumulative sum of squares of recursive residuals (CUSUMQ).

5. CONCLUDING REMARKS

This paper offers empirical rationalizations for the instrumentality of public debt in driving industrial sector output performance in an economy with sufficient borrowing space. The paper utilized time series data in Nigeria to affirm the applicability of the Keynesian general theory as it relates to fiscal policy and the economy. Keynesians assign a positive connotation to public indebtedness in developing a demand-oriented fiscal policy required to stimulate growth and recovery of an economy in recession. Two variables, total debt stock and debt service over exports ratio proved statistically significant in the long run in explaining industrial output performance in Nigeria. Two variables, fiscal balance, and debt service over exports ratio (with one-period lagged effect) were statistically significant and largely consistent with theoretical expectations in explaining industrial output performance in Nigeria over the short-run period.

The emerging evidence from this study on Nigeria is key in many respects. Keynes General Theory is applicable to the usefulness of state indebtedness in driving growth either at a sectoral or an overall economy level and is valid in the case of Nigeria. This finding is largely consistent with those of earlier related studies. One of the key economic fundamentals on measuring debt-related risks and the debt service over exports ratio correctly indicate its potential

to undermine industrial output performance in the short run but does not provide any evidence of any damage in the long run to industrial output performance in Nigeria. This finding is both plausible and relatively new to the literature and may trigger interest among researchers to conduct future investigations.

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