Economic Journal of Emerging Markets, 14(2) 2022, 151-161

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at https://journal.uii.ac.id/jep

Revisiting the threshold effect of corruption in the link between public debt and economic growth in Nigeria

Eyitayo Oyewunmi Ogbaro[1*], Ademola Obafemi Young[2], Rebecca Folake Bank-Ola[3]

[1,3]Department of Economics, Faculty of Business and Social Sciences, Adeleke University, Ede, Osun State, Nigeria.
[2]Department of Economics, College of Humanities, Management and Social Sciences, Mountain Top University, Ogun State, Nigeria.
[*]Corresponding author: ogbarooye@yahoo.com; eyitayo.ogbaro@adelekeuniversity.edu.ng

Article Info

Article history:
Received 6 February 2022
Accepted 5 September 2022
Published 5 October 2022

JEL Classification Code:
H630, O470, N470, C240

Authors' emails:
aoyoung@mtu.edu.ng
bankolafolake@gmail.com

DOI: 10.20885/ejem.vol14.iss2.art1

Abstract

Purpose — This study contributes to the empirical literature on the nonlinear relationship between public debt and economic growth in Nigeria using threshold regression methodology. It provides insight into how Nigeria can grow out of debt sustainably in the face of the prevailing level of corruption as an institutional indicator.

Method — Stata's threshold command is used for data analysis, and this command fits time-series threshold models in finding the optimal number of thresholds. It does this by minimising an information criterion and using conditional least squares to estimate the parameters of the threshold regression model.

Findings — The results show that the relationship between public debt and economic growth is nonlinear. The threshold effect of public debt on growth depends on the debt-to-GDP ratio and the level of corruption. Substantial evidence supports two threshold levels of debt-to-GDP ratio and corruption in the debt-growth nexus. The two threshold levels of corruption are 63.21 and 64.27 (on a scale of 0 to 100), with the growth effect of public debt being positive and significant in the second regime only.

Implication — Public debt exerts significant positive effects on growth as long as corruption is kept at a moderate level. Thus, the government of Nigeria needs to ensure that corruption is pegged at a fairly moderate level that will guarantee the positive contribution of accumulated debt to economic growth.

Originality — Unlike previous works, the study addresses the problem caused by the mechanical effect of a change in the real GDP growth rate on debt. It is based on the assumption of a maximum of two thresholds.

Keywords — Public debt, corruption, economic growth, Nigeria, non-linearity, threshold.

Introduction

Concerns have been expressed that the rate at which African countries accumulate debt poses a serious problem to the sustainability of such debts. This suggests the possibility of these countries slipping into debt crisis unless proactive steps are taken. According to Mustapha and Prizzon (2018), a country is said to be in debt distress when it is struggling to service its debt, as

P ISSN 2086-3128 | E ISSN 2502-180X

demonstrated by arrears, among others. World Bank (2018) claims that as of 2018, almost 40% of countries in sub-Saharan Africa (SSA) were in danger of slipping into a major debt crisis. The susceptibility of African economies to debt crisis has increased lately due to the COVID-19 pandemic. For example, the African Development Bank (AfDB, 2021) analysed the debt sustainability of thirty-eight African countries in December 2020 and found six already in debt distress, while fourteen were at high risk of debt distress. The findings also revealed that sixteen countries had a moderate risk of debt distress, while two faced low risk. Besides, the International Monetary Fund (IMF, 2020) report shows that Africa's average debt-to-Gross Domestic Product (GDP) ratio is still higher than the recommended debt sustainability threshold of 60%. This is because the figure is expected to decline from 69.3% in 2020 to 65.1% in 2023.

The AfDB (2021) has argued that for countries to grow out of debt sustainably, they would need to improve the efficiency of debt-financed investments through institutionalised transparency and accountability. This suggests that solid institutional indicators, such as the absence of corruption, are crucial if public debt is to be used to finance projects that will generate sufficient benefits. The benefits will promote growth and ensure the sustainability of the debt accumulated. By implication, debt sustainability requires setting a benchmark level for the debt-to-GDP ratio and ensuring sufficient institutional quality. The argument that the growth effect of public debt depends on the prevailing institutional indicators is supported in a study by Kourtellos, Stengos, and Tan (2013). The findings of the study show, in part, that public debt leads to lower growth in countries where institutionalised democracy falls below a particular level.

This present study aims to contribute to this body of knowledge by investigating the role of the level of corruption as an institutional indicator in the debt-growth nexus in Nigeria. The choice of Nigeria is informed by the argument of Devarajan, Gill, and Karakulah (2019) that whether or not most countries in Africa will succeed in escaping debt distress depends to a large extent on what happens to any of the continent's large economies. The implication of this is that the ability of countries such as Nigeria and South Africa to avoid falling into debt crisis has severe consequences for other countries in the region. Like many countries, Nigeria has become highly vulnerable to the global economic disruption caused by COVID-19. For instance, the proportion of government revenue used in servicing the country's debt, which the World Bank (2020) puts at just more than 60% in 2019, increased to 76.2% between January and November 2021.

Apart from the level of corruption, the paper also investigates the role of the debt-to-GDP ratio in the nexus. This is due to the findings of some studies, including Chang and Chiang (2009) and Minea and Parent (2012), that the debt-to-GDP ratio is a crucial factor that determines the growth effect of public debt. Therefore, this present study follows these works in paying attention to non-linearity in the debt-growth link. Apart from empirical considerations, the decision to pay attention to non-linearity is also based on theoretical considerations. For example, Atil, Lahiani, and Nguyen (2014) argue that most time series behave nonlinearly over time and often follow a nonlinear pattern in their interaction with each other.

The plethora of studies on the debt-growth nexus can be categorised into two based on their relationship modelling. The first category of studies assumes that the relationship between debt or its components and growth is linear. These studies can be grouped into three strands within the Nigerian context based on the estimation method employed. The first strand adopts the approach of ordinary least squares (OLS) and obtains conflicting results. Studies in this strand include Akinwunmi and Adekoya, (2018), Alagba and Idowu (2019), Laosebikan, Alao, Ajani, Alabi, and David (2018), Ogege and Ekpudu (2011) as well as Umaru, Hamidu, and Musa (2013). These studies arrive at results that are not generally conclusive.

The second strand, which employs the error correction model (ECM), also generates mixed results. This strand is made of studies such as Abula and Ben (2016), Aigheyisi and Ogbebor (2019), Ebi, Abu, and Clement (2013), Elom-Obed, Odo, Elom-Obed, and Anoke (2017), Ijirshar, Joseph, and Godoo (2016) as well as Udeh, Ugwu, and Onwuka (2016).

The last strand is made of studies that employ the autoregressive distributed lag (ARDL) model for their estimation. These studies include Anderu, Omolade, and Oguntuase (2019) as well as Eze, Nweke, and Atuma (2019). The results of both studies show a negative and significant

effect of external debt on growth. In addition, Eze et al. (2019) find that the impact of domestic debt is positive and insignificant.

A serious defect of the three strands that make up the first category of studies is their assumption of linearity in the debt-growth link. Such an assumption has been criticised as too restrictive since such a specification ignores the possibility of a non-linearity in the nexus. Ogbaro, Young, and Bank-Ola (2021) have argued that the possibility of the existence of non-linearity in the relationship is a more plausible assumption. Many studies have been conducted to address the shortcoming of the first category of studies by focusing on the nonlinear relationship between debt and growth. Nevertheless, the scope of this paper is limited to those that capture non-linearity using threshold regression methodology. The use of the threshold methodology has generally yielded conflicting results, particularly concerning the tipping point of the threshold variable. For example, Chang and Chiang (2009) find two thresholds of 32.3% and 66.25% for the debt-to-GDP ratio, with debt having significant positive growth effects in the three regimes. On the other hand, Caner, Grennes, and Köhler-Geib (2010) find a threshold level of 77%, beyond which public debt hampers growth. On their part, Minea and Parent (2012) find that public debt exerts a negative effect on growth when the debt-to-GDP ratio lies between 90 and 115%.

In addition, Cecchetti, Mohanty, and Zampolli (2011) find a threshold level of 95% for the debt-to-GDP ratio. Baum, Checherita-Westphal, and Rother (2013) find that while public debt has a significantly positive effect on growth in the short run, the impact becomes insignificant at debt-to-GDP ratios above 67%. The results of the study by Kourtellos et al. (2013) show that the threshold level of institutionalised democracy is about 4.6 (on a scale of 1 to 10), below which public debt leads to lower growth. Using Malaysian data from 1970 to 2011, Daud and Podivinsky (2014) find that the threshold levels of indices of economic freedom as a measure of institutional quality range between 5.8 and 7.2 (on a scale of one to ten). Égert (2015) finds evidence in support of an adverse effect of debt on growth when the debt-to-GDP ratio lies between 20 and 60%. Chudik, Mohaddes, Pesaran, and Raissi (2017) find a debt threshold of between 60 and 80%. Yolcu-Karadam (2018) finds a threshold level of 106.6% for debt using data on 136 developed and developing countries, including Nigeria. Croi and Diaw (2020) find a debt threshold of 54.5%, beyond which the net growth effect of debt is positive and significant when institutional quality is considered. Finally, Hassan and Meyer (2021) find a threshold level of 5.1 for institutional quality (on a scale of 0 to 10) above which external debt contributes to the growth process.

A notable feature of those that captured Nigeria among these studies is that their analysis is based on panel data. This has been faulted by Augustine and Rafi (2021) and Ogbaro et al. (2021). The authors argue that panel data rule out the possibility of accounting for country-specific differences. In light of this, Augustine and Rafi (2021) disagree with the option of simultaneously fitting a single threshold for a sample of countries. Hence, they emphasise the need for finding country-specific thresholds in the debt-growth link. Another limitation of the studies is their failure to capture the role of corruption as an institutional factor.

The only study that has attempted to address these defects in Nigeria is the one by Ogbaro et al. (2021). Based on quarterly data from 1984 to 2017, the study finds a threshold level of about 90% for the debt-to-GDP ratio. The authors also find that the threshold level of corruption is about 64 (on a scale of 0-100). One of the shortcomings of that study is its assumption of the existence of a single threshold level. This assumption is too restrictive since the number of thresholds may be more than one, as shown by studies such as Chang and Chiang (2009) as well as Minea and Parent (2012).

Furthermore, the analysis carried out by the study fails to address a serious problem that scholars such as Augustine and Rafi (2021) as well as Égert (2015) have associated with the correlation between debt and economic growth. According to scholars, the problem stems from the mechanical effect of a change in the real GDP growth rate on debt. To address this problem, they suggest using the lagged value of change in debt instead of contemporaneous debt.

Consequently, this present study contributes to the existing literature by complementing the study of Ogbaro et al. (2021). It examines the existence of threshold effects in the debt-growth nexus in Nigeria based on the assumption of a maximum of two thresholds.

Methods

The theories underpinning the empirical analysis carried out in this study are the New Institutional Economics (NIE) and the Debt Laffer Curve theory. Scholars have attributed the NIE to the seminar works of Matthews (1986), North (1990), North and Thomas (1973), and Williamson (1985). It was proposed mainly to correct a significant defect of the neoclassical and endogenous growth theories, which take the existence of institutions as given. Unlike the earlier approaches, the proponents of NIE argue that establishing good or strong institutions is necessary if government policies yield the desired results in promoting growth. Given this, the role of NIE is not to replace the earlier theories but to address their major shortcoming. It does this by incorporating institutions into the earlier growth models.

In light of the above, therefore, this study begins its modelling with the specification of a production function which is augmented with a debt variable in the spirit of Ogbaro et al. (2021). The production function is specified as follows:

$$Y_t = Af(K_t, L_t, H_t, D_t) \tag{1}$$

where *Y* denotes economic growth, *A* stands for technology, *K* denotes physical capital, *L* denotes labour, *H* denotes human capital, while *D* denotes public debt. The study adopts a Cobb-Douglas specification of equation (1) as follows:

$$Y_t = AK_t^{\propto_1} L_t^{\propto_2} H_t^{\propto_3} D_t^{\propto_4} \tag{2}$$

Log-linearising the two sides of the production function in equation (2) and adding a stochastic disturbance or error term to the outcome yields the following:

$$lnY_t = \propto_0 + \propto_1 lnK_t + \propto_2 lnL_t + \propto_3 lnH_t + \propto_4 lnD_t + u_t \tag{3}$$

where ln denotes natural logarithm, $\propto_0 = lnA$, and u is the error term.

Equation (3) is extended by incorporating a measure of institutions into it in line with the tenet of the NIE as follows:

$$lnY_t = \propto_0 + \propto_1 lnK_t + \propto_2 lnL_t + \propto_3 lnH_t + \propto_4 lnD_t + \alpha_5 lnC_t + u_t \tag{4}$$

where C denotes institutional factor.

Equation (4) is transformed into a nonlinear one in light of the Debt Laffer Curve theory, which posits that the relationship between debt and economic growth is nonlinear. Specifically, the theory states that there exists an optimal level of debt below and above which public debt promotes and retards growth, respectively. Of the approaches that have been adopted in the literature in modelling non-linearity, the study employs the time series threshold regression methodology in the spirit of Ogbaro et al. (2021). In utilising this methodology, this study assumes the existence of a maximum of two thresholds based on the number of observations. This is an improvement on the study by Ogbaro et al. (2021), which assumes at most one threshold. Hence, the model is specified as follows:

$$\begin{aligned} lnY_t = {} & (\beta_{10} + \beta_{11} lnK_t + \beta_{12} lnL_t + \beta_{13} lnH_t + \beta_{14} lnD_t + \beta_{15} lnC_t) I\{q_t \leq \lambda_1\} + \\ & (\beta_{20} + \beta_{21} lnK_t + \beta_{22} lnL_t + \beta_{23} lnH_t + \beta_{24} lnD_t + \beta_{25} lnC_t) I\{\lambda_1 < q_t \leq \lambda_2\} + \\ & (\beta_{30} + \beta_{31} lnK_t + \beta_{32} lnL_t + \beta_{33} lnH_t + \beta_{34} lnD_t + \beta_{35} lnC_t) I\{q_t > \lambda_2\} \end{aligned} \tag{5}$$

where the definitions of variables remain the same as given above, while q and ε_t are the threshold variable and zero mean idiosyncratic random disturbance, respectively. $I\{.\}$ refers to an indicator function, λ_1 and λ_2 denote the two threshold parameters or values which divide the observations into three regimes, while $\beta_{11}, \beta_{12}, \beta_{13}, \beta_{14}, \beta_{15}$; $\beta_{21}, \beta_{22}, \beta_{23}, \beta_{24}, \beta_{25}$; and $\beta_{31}, \beta_{32}, \beta_{33}, \beta_{34}, \beta_{35}$ denote the slope parameters corresponding to the three regimes, respectively.

The two threshold values split the observations or sample into three regimes or sub-samples. The first regime, also known as regime 1, refers to when the threshold variable is lower than the first threshold value (i.e., $q < \lambda_1$). The second regime, also known as regime 2, refers to when the threshold variable is higher than the first threshold value but lower than the second

threshold value (i.e., $\lambda_1 < q < \lambda_2$). The third and final regime, also known as regime 3, refers to when the threshold variable is higher than the second threshold value (i.e., $q > \lambda_2$). Since both public debt and corruption have the potential to cause the effect of debt on economic growth to vary across regimes, both are used as the threshold variable.

The threshold analysis carried out in this study is based on Stata 15's *threshold* command. The command fits time-series threshold models in finding the optimal number of threshold(s). It does this by minimising an information criterion and using conditional least squares to estimate the parameters of the threshold regression model. It uses the Wald test proposed by Judge, Griffiths, Hill, Lutkepohl, and Lee (1985) to confirm whether or not threshold effects exist in the relationship under study. Based on the testing option, the null hypothesis of linearity (i.e., absence of threshold effects) is first tested against the alternative of one threshold. If the results suggest the acceptance of the null, the threshold regression model in equation (5) is reduced to the linear model in (4). However, rejecting the null hypothesis would confirm the existence of a nonlinear relationship between debt and economic growth. In the event of the latter, the study uses the threshold option to determine the optimal number of thresholds from a maximum of two.

The study fits two threshold regression models in all, one with public debt as the threshold variable while the other is based on the use of corruption. The Sum of Squared Residuals (SSR) and three information criteria obtained from each of the two fitted models are compared to select the model with the better fit. The three information criteria are the Akaike, Bayesian and Hannan–Quinn information criteria. The model that contributes more to the minimisation of the SSR and the information criteria is chosen as the one with the better fit.

Based on the availability of data, time-series data on Nigeria are collected from secondary sources for the sample period 1981-2017. The natural logarithm of GDP (constant 2010 US$) is used as a measure of economic growth. Gross fixed capital formation as a percentage of GDP is used to measure physical capital. Life expectancy at birth (total) in years is used to measure human capital. Data on the three variables are sourced from the 2019 version of the World Bank's World Development Indicators (WDI). The number of persons engaged is used for measuring labour input, and data are sourced from Penn World Table (PWT), version 10.0. The public debt stock is measured using the gross government debt-to-GDP ratio obtained from the *International Monetary Fund (IMF) Historical Public Debt database*. However, the study uses lagged value of change in debt in its analysis in the spirit of Augustine and Rafi (2021) as well as Égert (2015). Finally, the Bayesian Corruption Indicator (BCI) is used as a proxy for the level of corruption. The BCI index, which lies between 0 (no corruption) and 100 (extreme corruption), is a composite index of the perceived overall level of corruption. All the collected data are converted into quarterly series using the linear interpolation method to have sufficient data points for the threshold estimation.

Results and Discussion

This section presents a formal analysis of the threshold effects of the debt-to-GDP ratio and corruption level on Nigeria's debt-growth nexus. The study begins with examining the descriptive statistics of the data used for the analysis. Results obtained from this task are displayed in Table 1. The table shows that the minimum and maximum public debt-to-GDP ratios are 11.6039% and 193.6710%, respectively. Compared to the recommended threshold of 60%, the former may be considered sustainable, while the latter would appear beyond the sustainable level. The minimum value was recorded in the first quarter of 2006, which can be attributed to Nigeria's agreement with the Paris and London Clubs of Creditors at the end of 2005. The country was allowed to buy back about $30 billion of her $32 billion external debts via a one-time cash payment of $12 billion. On the other hand, the maximum value was recorded in the first quarter of 1993. This can be attributed to the policy of giving back to petroleum companies, part of Nigeria's gains practised during that period.

The table also reveals that minimum and maximum corruption indices are about 61 and 68, respectively, on a scale of 0 to 100. Since both values are above the half mark, this may be interpreted to mean the prevalence of the problem of corruption in the country. In addition, the

minimum and maximum levels of corruption were recorded in the first quarter of 1984 and the first quarter of 2014, respectively. It implies that, apart from being prevalent, the problem has worsened in Nigeria over the years.

Table 1. Descriptive Statistics of Data

Variable	Mean	Minimum	Maximum
GDP	2.33e+11	1.08e+11	4.67e+11
Physical Capital	35.972	14.168	89.386
Labour	4.07e+07	2.64e+07	7.06e+07
Human Capital	48.028	45.637	54.236
Public Debt	69.441	11.603	193.671
Corruption Index	63.597	61.281	67.724

The econometric analysis in this study begins with the sequential tests for the optimal number of thresholds of public debt and level of corruption appropriate for estimating equation (5). The null hypothesis of no threshold effects (i.e., the existence of linearity) is first tested against the hypothesis of, at most, a single threshold (i.e., the presence of two regimes). The results of this test, which are presented in Table 2, show that the null hypothesis of no threshold is rejected at the 5 per cent significance level for the two threshold variables with Wald statistics of 136.14 and 345.96, respectively (p-value < 0.05). This implies rejecting a linear relationship between Nigeria's public debt and economic growth. Given this, the hypothesis of a single threshold is also tested against two thresholds as presented in Table 2. The results reveal Wald statistics of 282.95 and 448.80 for the two threshold variables, respectively (p-value < 0.05). This indicates the rejection of the assumption of a single threshold in favour of two thresholds.

Table 2. Threshold Effect Test Using Public Debt as the Threshold Variable

Threshold Variable	Single Threshold Model	Double Threshold Model
Public Debt:		
Wald Statistic	136.14	282.95
$p-value$	0.00	0.00
Corruption:		
Wald Statistic	345.96	448.80
$p-value$	0.00	0.00

Table 3. Threshold Regression Results Using Public Debt as the Threshold Variable

Regressor	Regime 1	Regime 2	Regime 3
Constant	6.024	-59.053	217.043
	(1.297)	(16.326)	(29.634)
Log of Physical Capital	-0.282***	0.008	0.157***
Log of Labour	(0.025)	(0.079)	(0.058)
	0.387***	-0.159	4.335***
Log of Human Capital	(0.099)	(0.330)	(0.679)
	2.287***	4.451***	-19.8028***
Log of Public Debt	(0.380)	(0.753)	(2.450)
	-0.042***	-0.240***	-0.032*
Log of Corruption	(0.012)	(0.046)	(0.019)
	1.350***	17.267***	-46.161***
	(0.291)	(5.114)	(9.596)
Debt Regime	$q < 43.02$	$43.02 < q < 83.56$	$q > 83.56$
Number of observations		148	

Notes: q denotes debt-GDP-ratio. The figures shown in parenthesis are robust standard errors. ***, ** and * represent significance at 1%, 5% and 10% levels, respectively.

Hence, the study estimates equation (5) using two threshold levels of both public debt and corruption, with the results obtained from the former presented in Table 3. The results show that the two threshold values of the debt-to-GDP ratio are about 43% and 84%. The second threshold value is less than the single threshold of about 90% obtained by Ogbaro et al. (2021) but is equal to the one obtained by Caner et al. (2010). The results also show that below the first threshold value of the debt-to-GDP ratio (regime 1), both public debt and physical capital significantly negatively affect economic growth. However, the effects of labour, human capital and corruption are positive and significant in that regime. At any debt-to-GDP ratio higher than the first threshold value but lower than the second threshold value (regime 2), both public debt and labour have adverse effects on economic growth, with the latter's impact being insignificant. However, the coefficients on human capital, corruption and physical capital are positive, although that of the latter is insignificant. The findings also reveal that while the coefficients on physical capital and labour are positive and significant at 1% in the third regime, those on human capital, corruption and public debt are negative.

Table 4 shows the results obtained from using corruption as the threshold variable in equation (5) estimation. The results show that the two threshold values of corruption are about 63 and 64. The second threshold value is equal to the single threshold value obtained by Ogbaro et al. (2021). The findings also reveal that below the first threshold value of corruption (regime 1), labour, human capital and public debt exert adverse effects on economic growth, although the latter's impact is insignificant. However, the effects of physical capital and corruption are positive and significant in that regime. At any level of corruption above the first threshold value but below the second threshold value (regime 2), physical capital, human capital, public debt and corruption all significantly positively affect economic growth. However, the coefficient on labour input is negative and insignificant. The results further indicate that at the level of corruption above the second threshold value (regime 3), physical capital, public debt and labour exert negative effects on economic growth, although the effect of the latter is insignificant. The effects of human capital and corruption are positive, although that of the latter is insignificant.

Table 4. Threshold Regression Results Using Corruption as the Threshold Variable

Regressor	Regime 1	Regime 2	Regime 3
Constant	41.307	-133.386	0.735
	(10.779)	(11.792)	(3.142)
Log of Physical Capital	0.150***	0.164***	-0.115**
Log of Labour	(0.044)	(0.059)	(0.044)
	-0.654***	-0.448	-0.336
Log of Human Capital	(0.099)	(0.359)	(0.272)
	-22.886***	5.991***	8.178***
Log of Public Debt	(1.820)	(1.267)	(1.287)
	-0.012	0.049***	-0.333**
Log of Corruption	(0.010)	(0.016)	(0.135)
	20.007***	34.530***	0.232
	(3.160)	(2.958)	(0.490)
Corruption Regime	$q < 63.21$	$63.21 < q < 64.27$	$q > 64.27$
Number of observations		148	

Notes: q denotes the level of corruption. The figures shown in parenthesis are robust standard errors. ***, ** and * represent significance at 1%, 5% and 10% levels, respectively.

Table 5 shows the SSR and the three information criteria obtained from the two fitted regression models. It can be seen from the table that the model that is based on the use of corruption as the threshold variable provides a better fit. This is because it has lower SSR and information criteria than the model based on the use of debt itself.

These findings highlight four critical points about the issue of interest in Nigeria. One, the relationship between public debt and economic growth is nonlinear, implying the presence of threshold effects. Two, the effectiveness or otherwise of public debt in promoting growth in

Nigeria depends on the debt-to-GDP ratio and institutional factors. This accords with the results obtained by Chudik et al. (2017), Croi and Diaw (2020), Daud and Podivinsky (2014), De Pascale and Scrocco (2022), Gómez-Puig and Sosvilla-Rivero (2022), Hassan and Meyer (2021), Kim, Ha, and Kim (2017), Kourtellos et al. (2013), Sani, Said, Ismail, and Mazlan (2019), Yolcu-Karadam (2018), as well as Tarek and Ahmed (2017). The study also finds that the model involving corruption as the threshold variable provides a better fit than using the debt-to-GDP ratio. This implies that the results obtained from corruption as the threshold variable are more reliable than those obtained using the debt-to-GDP ratio. This supports Daud and Podivinsky (2014) assertion that ensuring sufficient institutional quality plays a more important role in ensuring public debt sustainability than just focusing on the debt alone.

Table 5. Test of Fit

Statistic	First Model	Second Model
Sum of Squared Residuals	0.0975	0.0901
Akaike information criterion	-940.0342	-950.5094
Bayesian information criterion	-911.1307	-921.6059
Hannan–Quinn information criterion	-928.2889	-938.7641

Note: First and second models represent the models based on using public debt and corruption index as the threshold variable, respectively.

Results further show that while public debt does not exert any significant positive influence on growth at deficient and very high levels of corruption, it exerts a significant positive influence on growth at moderate levels of corruption. This implies that corruption is not totally bad and that there exists some moderate level of corruption that contributes positively to the ultimate objective of economic growth. It is difficult to situate this finding within existing empirical studies. This is because those that captured the threshold effect of institutional quality assumed only the possible existence of one threshold level. However, the result is consistent with the argument by Nur-tegin and Jakee (2020) that corruption may have both the "grease" effect and the "sand" effect. The "grease" effect is derived from the "grease the wheels" hypothesis, which states that some level of corruption promotes growth because of its ability to overcome inefficient regulations. On the other hand, the "sand" effect is derived from the "sand the wheels" hypothesis, which states that corruption acts as a drag on economic growth by imposing a heavy tax on innovative activities. This study has found the "grease" effect to apply at moderate levels of corruption, while the "sand" effect is found to use at low and high levels of corruption for the same dataset.

The study contributes to the economic literature by estimating two threshold levels of corruption and the implications for the growth-debt link. Hence, policymakers are better informed on how to pursue sound debt management policies within the context of prevailing corruption, which is an aspect of institutional quality.

Conclusion

This study provides insight into how Nigeria can grow out of debt sustainably in the face of the overall level of corruption as an institutional factor. Based on findings, the study concludes that the Nigerian economy may face the problem of unsustainable debts, which can potentially hamper long-term growth and stability if the level of corruption in the country is not kept at a moderate level. Therefore, the study recommends that policymakers in Nigeria may not necessarily reduce the country's debt accumulation to mitigate the adverse effect of debt on growth. What is required is for them to be able to improve the country's institutional quality by ensuring that corruption is reduced to a relatively moderate level. This will facilitate the effective management of public debt and guarantee debt's positive contribution to the economy's growth.

Acknowledgment: Not applicable

References

Abula, M., & Ben, D. M. (2016). The impact of public debt on economic development of Nigeria. *Asian Research Journal of Arts & Social Sciences*, *1*(1), 1–16. https://doi.org/10.9734/arjass/2016/27263

African Development Bank. (2021). African economic outlook 2021 – From debt resolution to growth: The road ahead for Africa. Retrieved July 24, 2021, from https://www.afdb.org/en/documents/african-economic-outlook-2021

Aigheyisi, O., & Ogbebor, O. (2019). Public debt, foreign direct investment and economic growth in Nigeria. *Finance & Economics Review*, *1*(1), 1–24.

Akinwunmi, A. A., & Adekoya, R. B. (2018). Assessment of the impact of external borrowing on the economic growth of the developing countries-Nigerian Experience. *Asian Business Research*, *3*(1), 29–40. https://doi.org/10.20849/abr.v3i1.331

Alagba, O. S., & Idowu, E. (2019). Effect of public debt on economic growth in Nigeria: An empirical analysis. *International Journal of Business and Economic Development*, *7*(2), 10–18. https://doi.org/10.24052/ijbed/v07n02/art-02

Anderu, K. S., Omolade, A., & Oguntuase, A. (2019). External debt and economic growth in Nigeria. *Journal of African Union Studies*, *8*(3), 157–171. https://doi.org/10.31920/2050-4306/2019/8n3a8

Atil, A., Lahiani, A., & Nguyen, D. K. (2014). Asymmetric and nonlinear pass-through of crude oil prices to gasoline and natural gas prices. *Energy Policy, Elsevier*, *65*, 567–573. https://doi.org/10.1016/j.enpol.2013.09.064

Augustine, B., & Rafi, O. M. (2021). *Public debt-economic growth: Evidence of a nonlinear relationship* (BASE University Working Paper Series No. 11). Retrieved from https://base.ac.in/wp-content/uploads/2021/10/BASE-University-WP-Series-11-2021.pdf/

Baum, A., Checherita-Westphal, C., & Rother, P. (2013). Debt and growth: New evidence for the euro area. *Journal of International Money and Finance*, *32*, 809–821. https://doi.org/10.1016/j.jimonfin.2012.07.004

Caner, M., Grennes, T. J., & Köhler-Geib, F. (2010). *Finding the tipping point - When sovereign debt turns bad.* (World Bank Policy Research Working Paper No. 5391). https://doi.org/10.2139/ssrn.1612407

Cecchetti, S. G., Mohanty, M., & Zampolli, F. (2011). Achieving growth amid fiscal imbalances: The real effects of debt. In *Economic Symposium Conference Proceedings* (pp. 145–196). Federal Reserve Bank of Kansas City. Retrieved from https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.297.2

Chang, T., & Chiang, G. (2009). The Behaviour of OECD public debt: A panel smooth transition regression approach. *The Empirical Economics Letters*, *8*(1), 7–46.

Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2017). Is there a debt-threshold effect on output growth? *Review of Economics and Statistics*, *99*(1), 135–150. https://doi.org/10.1162/rest_a_00593

Croi, K. F., & Diaw, A. (2020). Debt and growth in West African Economic and Monetary Union Countries (WAEMU): The role of institutional quality. *Modern Economy*, *11*(9), 1505–1521. https://doi.org/10.4236/me.2020.119107

Daud, S. N., & Podivinsky, J. (2014). Government debt and economic growth in Malaysia: The role of institutional quality. *Applied Economics Letters*, *21*(17), 1179–1183. https://doi.org/10.1080/13504851.2014.916378

De Pascale, G., & Scrocco, A. (2022). How does institutional quality shape the impact of public

debt on economic growth? A threshold panel analysis over EU-28. SSRN. https://doi.org/10.2139/ssrn.4145370

Devarajan, S., Gill, I. S., & Karakulah, K. (2019). *Africa's debt: Three concerns, three remedies* (Duke Global Working Paper Series No. 09). https://doi.org/10.2139/ssrn.3422880

Ebi, B. O., Abu, M., & Clement, O. D. (2013). The relative potency of external and domestic debts on economic performance in Nigeria. *European Journal of Humanities and Social Sciences*, *27*(1), 1414–1429.

Égert, B. (2015). Public debt, economic growth and nonlinear effects: Myth or reality? *Journal of Macroeconomics*, *43*, 226–238. https://doi.org/https://doi.org/10.1016/j.jmacro.2014.11.006

Elom-Obed, F. O., Odo, S. I., Elom-Obed, O., & Anoke, C. I. (2017). Public debt and economic growth in Nigeria. *Asian Research Journal of Arts & Social Sciences*, *4*(3), 1–16. https://doi.org/10.9734/arjass/2017/36095

Eze, O. M., Nweke, A. M., & Atuma, E. (2019). Public debts and Nigeria's economic growth. *IOSR Journal of Economics and Finance, 10*(3), 24–40.

Gómez-Puig, M., & Sosvilla-Rivero, S. (2022). The relationship between public debt and economic growth in advanced, emerging and developing economies: Differences and determining factors. SSRN. https://doi.org/10.2139/ssrn.4048038

Hassan, A. S., & Meyer, D. F. (2021). Moderating effect of institutional quality on the external debt-economic growth nexus: Insights from highly indebted poor countries (HIPC). *African Journal of Business and Economic Research*, *16*(2), 7–28. https://doi.org/10.31920/1750-4562/2021/v16n2a1

Ijirshar, V. U., Joseph, F., & Godoo, M. (2016). The relationship between external debt and economic growth in Nigeria. *International Journal of Economics & Management Sciences*, *06*(01), 1–5. https://doi.org/10.4172/2162-6359.1000390

International Monetary Fund. (2020). *World Economic Outlook Database, October 2020*. Retrieved from https://www.imf.org/en/Publications/WEO/weo-database/2020/October

Judge, G. G., Griffiths, W. E., Hill, R. C., Lutkepohl, H., & Lee, T. C. (1985). *The theory and practice of econometrics* (2nd ed.). New York: Wiley.

Kim, E., Ha, Y., & Kim, S. (2017). Public debt, corruption and sustainable economic growth. *Sustainability*, *9*(3). https://doi.org/10.3390/su9030433

Kourtellos, A., Stengos, T., & Tan, C. M. (2013). The effect of public debt on growth in multiple regimes. *Journal of Macroeconomics*, *38*(Part A), 35–43. https://doi.org/10.1016/j.jmacro.2013.08.023

Laosebikan, J. O., Alao, J. A., Ajani, J. O., Alabi, F. A., & David, J. O. (2018). Federal government domestic and external debt: Implications on nigeria's economic growth (1981 -2015). *International Journal of Innovative Finance and Economics Research*, *6*(4), 95–106.

Matthews, R. C. O. (1986). The economics of institutions and the sources of growth. *The Economic Journal*, *96*(384), 903–918. https://doi.org/10.2307/2233164

Minea, A., & Parent, A. (2012). *Is high public debt always harmful to economic growth? Reinhart and Rogoff and some complex nonlinearities*.

Mustapha, S., & Prizzon, A. (2018). Africa's Rising debt: How to Avoid a New Crisis. ODI. Retrieved from https://odi.org/en/publications/africas-rising-debt-how-to-avoid-a-new-crisis/

North, D. C. (1990). *Institutions, institutional change and economic performance*. *Political Economy of*

Institutions and Decisions. Cambridge: Cambridge University Press. https://doi.org/DOI: 10.1017/CBO9780511808678

North, D. C., & Thomas, R. P. (1973). *The rise of the western world: A new economic history*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511819438

Nur-tegin, K., & Jakee, K. (2020). Does corruption grease or sand the wheels of development? New results based on disaggregated data. *The Quarterly Review of Economics and Finance*, *75*, 19–30. https://doi.org/10.1016/j.qref.2019.02.001

Ogbaro, E. O., Young, A. O., & Bank-Ola, R. (2021). Investigating the existence of non-linearity in the debt-growth nexus in Nigeria. *Journal of Economics, Business and Market Research (JEBMR)*, *2*(4), 452–466.

Ogege, S., & Ekpudu, J. E. (2011). The effects of debt burden on the Nigerian economy. *Journal of Research in National Development, 8*(2). https://doi.org/10.4314/jorind.v8i2.66829

Sani, A., Said, R., Ismail, N. W., & Mazlan, N. S. (2019). Public debt, institutional quality and economic growth in sub-saharan Africa. *Institutions and Economies*, *11*(3), 39–24.

Tarek, B. A., & Ahmed, Z. (2017). Institutional quality and public debt accumulation: An empirical analysis. *International Economic Journal*, *31*(3), 415–435. https://doi.org/10.1080/10168737.2017.1354906

Udeh, S. N., Ugwu, J. I., & Onwuka, I. O. (2016). External debt and economic growth: The Nigeria experience. *European Journal of Accounting Auditing and Finance Research*, *4*(2), 33–48.

Umaru, A., Hamidu, A., & Musa, S. (2013). External debt and domestic debt impact on the growth of the Nigerian economy. *International Journal of Educational Research*, *1*(2), 70–85.

Williamson, O. E. (1985). *The economic institutions of capitalism*. New York: The Free Press.

World Bank. (2018). Africa's Pulse 17. Washington DC: World Bank Group.

World Bank. (2020). *Nigeria - Country Partnership Framework for the Period FY21-FY25 (English)*. Washington, DC. https://doi.org/10.1596/35098

Yolcu Karadam, D. (2018). An investigation of nonlinear effects of debt on growth. *The Journal of Economic Asymmetries*, *18*, e00097. https://doi.org/10.1016/j.jeca.2018.e00097