External Debt Burden and its Determinants in Nigeria: An ARDL Cointegration Technique

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Abstract

This study focuses on the empirical determinants of external debt burden in Nigeria from 1973 – 2013 using Autoregressive Distributed Lag (ARDL) Cointegration Technique. Findings from the study reveals that consumer price index (CPI), interest rate on external debt (IR), gross domestic product (GDP), and money supply (M2) are cointegrated with external debt (ED) in both the short-run and long-run within the study period. The result also indicates that, CPI and IR are negatively correlated with ED. Whereas GDP and M2 reveals a positive relationship with ED. The coefficient of ECM is also consistent with the rule of thumb which suggests that, the coefficient of error correction term (ECT) should be negative, less than one in its absolute value and significant. Nigeria's external debt burden can be settled through economic diversification such as massive investment in agricultural and solid minerals sectors, boosting internally generated revenues (IGRs) and reducing overdependence on oil revenue.

Keywords: External debt, Interest rate, Money supply, Inflation, Gross Domestic Product, ARDL

1. Introduction

A reoccurring phenomenon that has remained worrying to the Nigerian government and its people since after the oil boom of the 1970's is the issue of debt which has an implication particularly on the lives and welfare of people. Imimole and Imoughele (2012) explained that scarcity of resource, low domestic savings, limited foreign exchange earnings, low productivity and low tax revenue were barriers to economic development that necessitated the intervention of governments in developing countries like Nigeria to the provision of services and infrastructures. The government's intervention grew bigger in the 1970's with oil boom as more foreign exchange accrued to the government. With resources at its disposal, the Nigeria government like most oil producing countries embarked on a spending spree during the boom. After the boom, the government had to resort to public debt finance to overcome the short fall in the provisioning of basic services caused as a result of reduction in foreign exchange earnings (DMO, 2005). The debt grew steadily to as large as US$35.94 billion (47.1% of GDP) in 2004 when the country could no longer pay. The 15-member creditor nations referred to as Paris club, initiated a write-off for highly indebted countries in 2005 including Nigeria having US$28 billion (85.8%) of its total debt owed to Paris club (Okonjo-Iwela, 2005). Following the Paris club debt relief and a payment of US$6 billion arrears on debt upfront, US$16.6 billion debt was written off while the remaining US$8.2 billion qualified for a buyback that saved Nigeria US$2 billion, reducing its external debt burden to US$3.7 billion (2.1% of GDP) in 2006 (DMO, 2005). The IMF, (2015) showed that Nigeria's external debt stands at US$9.5 billion (1.7 percent of GDP). Though, the overall external debt of the country is low relative to GDP, a stress test conducted showed that the 2014 value might rise to 40% of GDP by 2034 if the primary balance remains unchanged IMF, (2015). Two years after the IMF, (2015) report, the country's external debt took an upward turn. Latest figures show that Nigeria's external debt stands at US$11.41 billion (% of GDP) with states government share being US$3.6 billion (31.3 percent of total external debt accrued) and the federal government having the largest share of US$7.8 billion (68.7 percent of total external debt accrued) (NBS, 2017). A more discrete look at the accrued debt reveals that US$7.99 billion is multilateral, US$198.25 million bilateral and US$3.22 billion from Exim bank of China (NBS, 2017). These values only seem to be growing with high level of uncertainty on debt service.

Tiruneh (2004) in their study explained that high level of indebtedness by less developed countries(LDCs) is as a result of high capital flight, high ratio of debt service payments, high imports and its ratio to GDP, income per capita, and slow growth rate. Menbere (2009) had a broader view on developing countries including Nigeria. From his study, indebtedness and failure to service debt results from oil price shock, poverty, bad governance, unfavorable terms of trade and change in global economic policies.

Most countries in the world have external debt. However, developed countries have a better tendencies of making positive utilization of debt and its proportions to output is sizeable. While developing countries and less LDCs in particular have a part of their debt running into corrupt private pockets. What differentiates both ends is the size of debt-to-output ratio. While developed countries make positive use of the debt, LDCs have a problem justifying their spending. Being the largest crude oil producer in Africa, it would have been thought that Nigeria could service its external debt with ease from oil windfall.

This study focuses on the empirical determinants of external debt burden in Nigeria from 1973 – 2013. The rest of the paper follows the introduction with section 2 being review of literature, section 3 methodology and data, section 4 presents results and discussion and lastly section five concludes the study with recommendation and policy implication.

2.   Literature Review

This section provides a brief overview of the theoretical literature and delves straight into discussing findings that determine external debt from previous studies. Drawing from a theoretical review of the "Two Gap" model first pioneered by Harrod (1939), Domar (1946) and advanced by Chenery and Strout (1996), the model explains the rationale for the accumulation of external debt. Furthermore, it explains that external debt is a path that bridges the gap between domestic savings and investments. First, the "GAP" between inadequate savings and investment (internal) and secondly, the "GAP" ensuing from inadequate foreign exchange resulting from low earning from declining export(external) are what necessitates intervention of foreign funds in form of debt. Developing countries fall short of domestic savings which is an essential component for purchasing capital goods. Chiminya and Nicolaidou (2015) further explained that this shortfall necessitates the acquisition of foreign debt which Chenery and Strout (1996) added will promote long term economic growth.

Empirically, findings from previous studies reveal varying determinants of countries level of external indebtedness. On one hand some researchers view determinants of external debt from a domestic front and entirely within a countries influence with issues bordering on a countries political system (Haggard and Kaufman, 1992) as well as exchange rate misalignment and negative interest rates Chiminya and Nicolaidou (2015). On the other hand, Iyoha, (2000) and Easterly, (2002) argue for reasons completely beyond the control of indebted countries such as oil price shocks, recession in industrial countries and weak commodity prices. Awan, Anjum and Rahim (2014) in their study, examined the role of macroeconomic determinants of Pakistan's external debt using time series data from 1976 – 2010. Their result show a significant relationship between fiscal deficit, trade openness and exchange rate in determining the external debt of Pakistan. There also exist strong evidence of long run positive relationship between fiscal deficit and external debt, nominal exchange rate and external debt burden of Pakistan. However, despite positive relationship between foreign debt and external debt, they were found to be statistically insignificant. Equally, the association between terms of trade and external debt was found to be statistically insignificant revealing a negative sign. The study recommends appropriate and effective debt management strategies i.e to avoid wasteful spending while borrowing for productive purposes. On debt and growth threshold analysis, Pescatori, Sandri and Simon, (2014) found the relationship between debt and growth to be weak in the short run. They added that debt and growth are influenced by trajectory debt. That is, if a country's public debt is on a downward trajectory, it can still grow just as fast as its peers in the long run even if its level of debt is high. However, the indication that there is no clear threshold that affects growth in the medium term should not be seen, as there is no problem with debts. This is because there is evidence that associates higher debts with more volatile growth. And volatile growth can still have significant negative effects to economic welfare. They conclude that there is need to carry out more empirical studies on the debt and growth relationship. Contrary to Pescatori et al., (2014), Daka, Sumbye, Fandamu and Christopher, (2017) in their study of Zambia from 1980 – 2014 using bounds testing approach to cointegration found that debt is positively associated with economic growth in the short run but its accumulation adversely affects growth in the long run. Additionally, debt servicing was found to be very harmful to GDP growth in the short-run. They however recommend judicious use of debt and advice on export oriented growth.

Looking more closely at Nigeria, Imimole, Imoughele and Okhuese, (2014) studied the determinants of Nigeria's public external debt and its sustainability. Results from their study show that Nigeria's national debt cannot be sustained by willingness and ability to pay, and that external debt of the country is influenced by high capital plight evident in the country's debt stock and reserve ratio. They recommend that debts should be tied to

productive investment in the public sector, effective debt management be adopted and corruption be put under control among others.

Maghyereh and Omet (2002) the study found that, a one-percentage (1%) point increase in investment to GDP is associated with a 0.37 percentage point increase in real GDP growth rate. Trade openness, is positively and statistically related with economic growth. Also inflationary pressure can lead to uncertainties about real value, return on investment and future repayment. The study also found a negative relationship between high debt profile and economic development of Jordan. Finally they recommend a more dynamic and competitive economy that will reduce external dependency, poverty and improve the economy eventually among others. From a macroeconomic perspective, Lee, Lau and Arip, (2014) in their study looked more closely at the relationship between macroeconomic variables and debt using unit root, cointegration and granger causality tests. They found a long-run relationship between external debt and macroeconomic variables in Malaysia using cointegration test, while a relationship from CPI to ED was discovered in the short-run. The study also revealed that M2 is the exogenous variable while CPI the endogenous and that both M2 and GDP are the cause of external debt in the long-run. The study recommend effective debt management strategies.

3. Methodology and Data

This study utilizes Autoregressive Distributed Lag (ARDL) approach to cointegration in its analysis. It has been chosen over Johansen and Juselius (1990) and conventional Johansen (1988) cointegration test due to its advantages; as it does not formally requires pretesting for unit root, both short run and long run coefficients could be obtained simultaneously, so also variables regardless of their stationarity level I (0), first difference I (1) or mixture of both (I(0) and I(1)) can be used to test the cointegration amongst them. ARDL approach using small sample data between 30 to 80 observations is desirable (Narayan and Narayan, 2005)

3.1 Data description and variables

This study's data was obtained from the World Bank data base (world development indicators) for the period of Forty years (40), between 1973 and 2013 for the purpose of capturing the long-run cointegration between Nigeria's External Debt burden and its' determinants. External debt (ED) is defined according to world development indicators (WDI) as "total external debt owed to another country and is repayable in either currency (usually in current U.S. dollars), goods, or services. It is total external debt and the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt". Inflation measured by consumer price index (CPI) is defined to reflect the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals". Interest rate on external debt (ED) represents "interest payments paid by the borrower in currency (which is usually in current U.S. dollars.), goods, or services in the year specified." Then GDP is the annual gross domestic products growth in percentage (%). Lastly, broad money (M2) stands for the sum of currency (money in circulation) outside banks; such as demand deposits other than those of the central government; the time, savings, and foreign currency etc.

3.2 Model specification

The empirical model of this research is drawn from the work of Lau et al., (2015) where external debt are assumed to be determined by factors such as consumer price index/inflation, interest rate on external debt, gross domestic product and money supply. These factors are assumed to have effect on external debt, for example high inflation rate may adversely affect the purchasing power of consumers leading to low economic performance, hence may also affect the external debt. This relationship can be expressed in the following function as:

$$ED = f(CPI + IR + GDP + M2) \qquad \text{(i)}$$

Where *ED* stands for Nigeria's external debt, CPI is consumer price index (proxy to inflation), GDP is Gross Domestic Product (proxy to economic growth), IR is interest rate on external debt and M2 is representing the ratio of money supply.

Equation (i) can be transformed into an econometric time series model capturing drift variable(s) and white noise residual as follows:

$$\ln ED_t = \alpha_0 + \ln CPI_t + \ln IR_t + \ln GDP_t + \ln M2_t + \varepsilon_t \qquad \text{(ii)}$$

The unrestricted error correction model can be derived from equation (ii) as:

$$\Delta \ln ED_{t-1} = \alpha_0 + \sum_{i=1}^{n} \beta_i \Delta \ln ED_{t-1} + \sum_{i=0}^{n} \lambda_i \Delta \ln IR_{t-1} + \sum_{i=0}^{n} \eta_i \Delta \ln CPI_{t-1} + \sum_{i=0}^{n} \chi_i \Delta \ln GDP_{t-1}$$

$$+ \sum_{i=0}^{n} \gamma_i \Delta \ln M2_{t-1} + \partial_1 \ln ED_{t-1} + \partial_2 \ln IR_{t-1} + \partial_3 \ln CPI_{t-1} + \partial_4 \ln GDP_{t-1} + \partial_5 \ln M2_{t-1} + \varepsilon_t$$

$$\text{(iii)}$$

The F-statistics for testing the two hypotheses and determining the cointegration among the variables can be as follows:

$$H_0 : \partial_1 = \partial_2 = \partial_3 = \partial_4 = \partial_5 = 0 \text{ (No co-integration among the variables)}$$

$$H_1 : \partial_1 \neq \partial_2 \neq \partial_3 \neq \partial_4 \neq \partial_5 \neq 0 \text{ (Co-integration exists among the variables)}$$

Narayan (2005) developed method of testing long-run association ship among variables in which null hypothesis (Ho) is tested against alternative (H₁) using the well-known F-test, this can be done by comparing the value of F-calculated with critical upper bound of Narayan table case III. The value of F-statistics must be greater than upper bound values I(1) of F-tabulated and if, then cointegration exists, but if felt within I(0) and I(1) it is inconclusive, or co-integration does not exists if the value is less than lower bound respectively.

The long-run model can be used to estimate and obtain the long run coefficients of the relationship between Nigeria's external debts (ED), consumer price index (CPI), interest rate (IR), GDP and Money supply (M2) respectively as follows:-

$$\Delta \ln ED_t = \alpha_2 + \sum_{i=1}^{n} \beta_{2i} \Delta \ln ED_{t-1} + \sum_{i=0}^{n} \lambda_{2i} \Delta \ln IR_{t-1} + \sum_{i=0}^{n} \eta_{2i} \Delta \ln CPI_{t-1} + \sum_{i=0}^{n} \chi_{2i} \Delta \ln GDP_{t-1} +$$

$$\sum_{i=0}^{n} \gamma_i \Delta \ln M2_{t-1} + \varepsilon_{2t} \qquad\qquad \text{(iv)}$$

To obtain the short run coefficients, the short run model is specified as follows:-

$$\Delta \ln ED_t = \alpha_3 + \sum_{i=1}^{n} \beta_{3i} \Delta \ln ED_{t-1} + \sum_{i=0}^{n} \lambda_{3i} \Delta \ln IR_{t-1} + \sum_{i=0}^{n} \eta_{3i} \Delta \ln CPI_{t-1} + \sum_{i=0}^{n} \chi_{3i} \Delta \ln GDP_{t-1}$$

$$+ \sum_{i=0}^{n} \gamma_i \Delta \ln M2_{t-1} + \lambda ECM_{t-1} + \varepsilon_{3t} \qquad\qquad \text{(v)}$$

Where λ is the coefficient of error correction term (ECT) that explains the long run cointegration amongst the variables in the model, which should be negative, less than one and significant, hence it measures the speed of adjustment in the event of disequilibrium, and the time it will be corrected. Diagnostics tests comprise of serial correlation test, normality test, hetroscedasticity test and stability test will be conducted to ensure the robustness of the result.

4. Result and Analysis

One of the strengths of ARDL cointegration test approach is that, it does not necessarily need stationary test, although it still requires that variables in the series be stationary at I(0), I(1) and or combination of both. This is because stationarity at I(2) and beyond violates the properties of using the Pesaran, Shin and Smith (2001) bonds test. For this reason we conduct the two prominent unit root tests using Augmented Dickey Fuller (ADF) and Phillips Perron (PP) to test for the order of integration of the series. The evidence of unit root test shows that, external debts, consumer price index, interest rate, GDP and Money supply are all stationary at first difference and significance at 1% respectively. Therefore this justifies the use of ARDL approach. The result of the unit root test is presented in Table 1 below:

Table 1: Unit root tests

Variables	ADF		PP	
	Level	First difference	Level	First difference
$lnED_t$	-0.698(0.837)	-5.351(0.000) ***	-0.829(0.801)	-5.350(0.000)***
$lnCPI_t$	-3.240(0.024)**	-6.658(0.000)***	-3.072(0.036)***	-2.377(0.000)***
$lnGDP_t$	-5.726(0.000) ***	-8.683(0.000)***	-5.734(0.000) ***	-3.244(0.000)***
$lnIR_t$	-1.823(0.365)	-7.554(0.000)***	-1.745(0.402)	-7.665(0.000)***
$LnM2_t$	-3.211(0.261) **	-7.653(0.000)***	-3.272(0.022) **	-6.446(0.000)***

Note: ***, ** indicate significance at 1% and 5% respectively. ADF and PP stand for Augmented Dickey Fuller Phillips Perron. While figures in parenthesis are standard errors. $lnED_t$ is external debt, $lnCPI_t$ is consumer price index, $lnGDP_t$ is gross domestic product, $lnIR_t$ is interest rate and $lnM2_t$ is money supply.

The test for the existence of the long run cointegration between Nigeria's external debt(ED), and its determinants i.e. interest rate payment on external debt (IR), consumer price index (CPI), GDP and quasi money (M2) ratio to total reserve, unrestricted error correction model was estimated to generate the value of F-statistic. The result is presented in table 2 which reveals that, F-calculated is greater than F-tabulated, meaning that, the upper bonds at 5% level, indicating the existence of cointegration among variables considered for this study. Hence we proceed to estimate the long run model. The long run model is estimated after a lag length of 3 was selected based on Akaike Information Criterion (AIC), which is selected because it is among the famous criteria that minimises loss of degree of freedom and good for small sample. To establish the existence of cointegration amongst variables, the computed F-statistics must be greater than the upper bounds critical value of the Narayan (2005) Table. The calculated F-statistics is 5.0035 and is greater than the upper bounds I(1) value 4.544 of Narayan (2005) table at 5% level of significance. Therefore this conclude that, cointegration do exists amongst Nigeria's external debt and its determinants that are considered in this research within the study period, and also reject the null hypothesis (Ho) which states that cointegration does not exist amongst the variables, whereas we fails to reject the alternative hypothesis (Ha) which states that cointegration do exists. Narayan (2005b) table was used based on the available sample size in the study which is small and falls between 30 to 80 observations.

Table 2: ARDL Cointegration test

Bounds test result	F-statistics	Lag	Level of sig.	Unrestricted intercept and no trend	
				I(0)	I(1)
$lnED_t=f(lnCPI_t, lnGDP_t, lnIR_t, lnM2_t)$	**5.0035**	3	5%	3.202	**4.544**

Note: $lnED_t$ is external debt, $lnCPI_t$ is consumer price index, $lnGDP_t$ is gross domestic product, $lnIR_t$ is interest rate on external debt and $lnM2_t$ is money supply.

Table 3 below presented the result of estimated long run model. The consumer price index ($lnCPI_t$) and $lnGDP_t$ indicates a negative relationship to dependent variable – external debt burden ($lnED_t$) with estimated coefficient of -0.67 and -0.59 respectively. Though surprisingly amongst the independents variables, only $lnGDP_t$ is significant at 10%. However, this reveals that, 1% decrease in the consumer price index and GDP in the country, has a corresponding increase effect of 0.67% and 0.59% in the external debt of the country within the reporting period. On the other hand, the remaining independent variables that is $lnIR_t$ and $lnM2_t$ have indicated a positive relationship with estimated coefficient of 0.25 and 0.02 with the dependent variable ($lnED_t$). To be precise, an increase of 1% interest on external debt ($lnIR_t$) and money supply ($lnM2_t$) have a corresponding increase effects of 0.25% and 0.02% respectively. This finding is consistent with theoretical assertions since increase in interest on external debt stand for additional liability in servicing external debt, and this may have multiplier and adverse effects on GDP and other macroeconomic indicators such as inflation, exchange rate etc. hence weaken the purchasing power of consumer as well. The result support the findings of Lau et al., (2015) in the case of Macroeconomics Determinants of External Debt in Malaysia.

Table 3 Result of Estimated Long run Model

Dependent variable, lnEDt		
Independent variables	Coefficient	T-ratio
lnCPIt	-0.673	(-0.717)
lnGDPt	-0.598	(-1.831)*
lnIRt	0.252	(0.995)
lnM2t	0.024	(0.058)
Constant	4.755	(1.761)*

Note that: Values in the parenthesis are t-ratio statistics, while values in parenthesis are the t-statistics ratio, and * stand for level of significance at 10%. Then $lnED_t$ is external debt, $lnCPI_t$ is consumer price index, $lnGDP_t$ is gross domestic product, $lnIR_t$ is interest rate and $lnM2_t$ is money supply.

Table 4 below presents the estimated result of the short run model. As earlier stated in the methodology section that, in order to determine whether the variables used in this study have long-run cointegration amongst them, the rule of thumb suggests that, the coefficient of error correction term (ECT) should be negative, less than one in its absolute value and significant. Therefore in line with the above, the estimated coefficient of ECT is -0.11 and significant at 10%. The implication of this suggests that, ECT measures the speed of adjustment in the event of instability, and how long the time it take to be corrected. Therefore, 0.11 in the absolute value of ECT implies that in the event of economic shock or disequilibrium, the economy will go back to normal at the speed of 0.11% per annum. Other independent variables supported the findings of the long-run model in table 3, with the exception of change in money supply ($\Delta lnM2_t$).

Table 4: Estimated short run model

Dependent variable, ΔlnEDt		
Independent variables	Coefficients	T-ratio
$\Delta lnCPI_t$	-0.004	(-0.886)
$\Delta lnGDP_t$	-0.019	(-1.953)*
$\Delta lnIR_t$	0.028	(0.771)
$\Delta lnM2_t$	-0.003	(-0.083)
Constant	4.755	(1.761)*
ECM(-1)	-0.108	(-1.816)*

Note that: ECT (-1) stand for error correction term and values in the parenthesis are t-ratio statistics, while values in parenthesis are the t-statistics ratio, and * stand for level of significance at 10%. Then $lnED_t$ is external debt, $lnCPI_t$ is consumer price index, $lnGDP_t$ is gross domestic product, $lnIR_t$ is interest rate and $lnM2_t$ is money supply.

In order to obtain an ARDL cointegration approach, a diagnostic test is required for more robust result. The graphical presentation of the stability test of CUSUM and CUSUM square has been conducted and pasted in Fig. 1 and 2 below indicating a stability test. The graphical result fails not to exceed the critical bounds at 5% level of significance. This signifies that the ARDL estimates are stable, consistent and reliable.
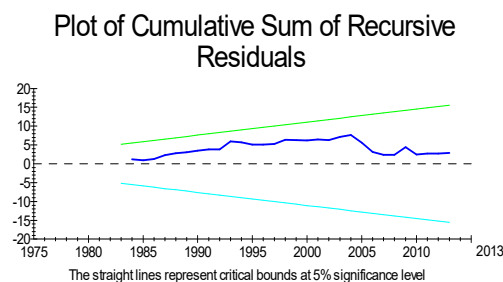
Figure 1: Plot of Cumulative Sum of Recursive Residuals
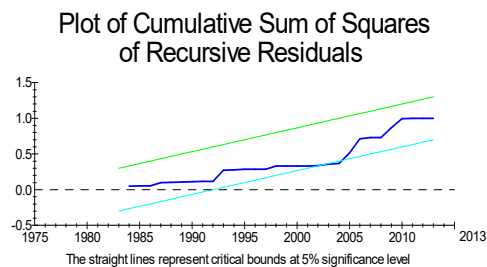
Figure 2: Plot of Cumulative Sum of Squares of Recursive Residuals

5. Conclusion and Policy Recommendation

This study aims to investigate the determinants of external debt in Nigeria from 1973 – 2013 using ARDL cointegration technique. For the purpose of obtaining unbiased results, unit root test was conducted and suggests that all our variables are stationary at I(1) at 1% level of significance in both ADF and PP unit root test. Sequel to this, we proceed to the cointegration test and the outcome reveals the existence of cointegration relationship between consumer price index, interest rate on external debt, GDP, money supply and external debt within the study period. The coefficient of ECM is also consistent with the rule thumb which implies that, in the event of shock or disequilibrium, the situation would go back to normal at the speed of 0.11% per annum. Finally, we observe that Nigeria's external debt is steadily on the rise. This has several policy implications. Based on the results, we predict that if the nation's external debt keeps piling at the same rate, with the federal government guaranteeing state governments and private businesses debt acquisition, the country will in no time find itself in a worst situation than it did before the 2006 Paris club debt relief. This route will only expose the country, making it vulnerable and on a recourse to debt rescheduling or once again requesting debt relief. Several measures can be taken to avoid these possible scenarios. Following the crash of crude oil price to about US$52 per barrel in 2016, state and federal government as a matter of urgency must find alternative sources of increasing their internally generating revenues (IGR). First, the government must develop strategies of improving tax revenues through tax reforms, improving tax administration and expanding tax revenue base. Secondly, increase investments in agriculture and mining with a broad view of increasing exportation of raw materials and finished goods at least to African and other developing countries in the medium term and globally in the long run to reduce its debt burden and offset the deficit balance of trade. This would be possible if the government rethinks its high dependence on one commodity as the major revenue earner for the country and diversify its revenue base. Lastly, provide a more conducive atmosphere for private capital investment by improving the quality of governance and institutions and improve the ease of doing business by local and international investors alike. This can only be achieved when political commitment is sustained at the highest level. The consideration of the effect of institutions in determining external debt burden should be an important option for future studies.

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