The impact of Nigeria's external debt on economic development

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Abstract

Purpose – This paper aims to investigate the impact of huge external debt with its servicing requirements on economic growth of the Nigerian economy so as to make meaningful inference on the impact of the debt relief which was granted to the country in 2006.

Design/methodology/approach – The neoclassical growth model which incorporates external sector, debt indicators and some macroeconomic variables was employed in this study. The paper investigates the linear and nonlinear effect of debt on growth and investment utilizing the ordinary least squares and the generalized least squares.

Findings – Among other things, the negative impact of debt (and its servicing requirements) on growth is confirmed in Nigeria. In addition, external debt contributes positively to growth up to a point after which its contributions become negative reflecting the presence of nonlinearity in effects.

Originality/value – Nigeria's external debt is analyzed in a new context utilizing a different but innovative model and econometric techniques. It is of tremendous value to researchers on related topic and an effective policy guide to policymakers in Nigeria and other countries with similar characteristics.

Keywords Nigeria, Economic development, Debts, Debt financing, Investments

Paper type Research paper

Introduction

Nigeria like most developing countries of the world relies substantially on external funding in financing its development projects – iron and steel mills, roads, electricity-generation plants, etc. Such external funding usually takes the form of external loans. In the early years of political independence, i.e. 1960 to about 1975, the sizes of such loans were small, the rate of interest concessionary, the maturity was long-term, and the source was usually bilateral or multilateral, for instance external debt in Nigeria in 1960 was about $150 million. However, from 1978 the situation changed. Nigeria at the lure of the international financial centers started to borrow huge sums, from private sources, at floating rates and with shorter-term maturities. The 1978 "jumbo loan" alone was estimated at some US $1 billion. By 1982 the value of Nigeria's external indebtedness was US $18.631 billion which represented over 160 percent of Nigeria's gross domestic product (GDP) for that year. The situation precipitated a debt crisis that progressively worsened over time. By 1986 Nigeria had to adopt a World Bank/International Monetary Fund sponsored Structural Adjustment Programme with a view to revamping the economy, and making the country better-able to service her debt.

External debt can be viewed as a means of financing capital formation. According to Adepoju *et al.* (2007), developing countries in Africa such as Nigeria are characterized by inadequate internal capital formation due to the vicious circle of low productivity, low income, and low savings. This situation therefore calls for technical, managerial and financial support from abroad to bridge the resource gap. On the other hand, external debt acts as a major constraint to capital formation in Nigeria. The burden and dynamics of external debt show that they do not contribute significantly to financing economic development in developing countries. In most cases, the debt cumulates because of the servicing requirements and the principal itself. In view of the above, external debt becomes a self-perpetuating mechanism of poverty aggravation, work overexploitation, and a constraint on development in developing economies (Nakatami and Herera, 2007).

According to Ayadi (1999) and Ayadi *et al.* (2003), external debt burden had dramatically limited Nigeria's participation in the World economy and the attendant debt servicing obligations continue to manifest as an impediment to economic growth and development. Debt burden has led to a limited accumulation of capital (depletion of international reserves) and a limited application of flexible financing policies to consolidate small and medium-sized firms. This indirectly affects unemployment, literacy and poverty. A cursory look at external debt profile and some debt indicators of Nigeria reveal the inherent serious nature of a debt burden (Tables I and II). Table I shows an external debt level of $6,235 million in 1980 which jumped to $32.4 billion in 2005.

The external debt indicators in Table III include the ratio of debt stock to exports which had continued to rise since 1980 from 33 percent to a peak of almost 406 percent in 1988. It had continued to meander up and down since then. As at 2004 the ratio of debt stock to exports stood at almost 153 percent. The ratio of debt stock to gross national product (GNP) was at 10.1 percent in 1980 but jumped to 115.2 percent in 2005. Moreover, the ratio of debt service payments to exports peaked in 1992 at 28.7 percent. It is no exaggeration that the Nigerian economy needed attention in the form of a debt relief.

The recent debt relief obtained under the highly indebted poor countries in March 2006 therefore should have some probable positive effects on the Nigerian economy. To understand these effects, this paper explores the impact of external debt burden on the economy by analyzing the applicability of "debt overhang theory" and the "crowding out" effect of debt in Nigeria. In section two we review the literature on external debt, investment and economic growth as well as the literature on external debt sustainability. In section 3, we tried to build the models of external debt and growth. In section 4, we applied Nigerian data to the models built in section 3. Section 5 discusses the implication of the econometric analysis results and the observed impact of the debt – relief on the Nigerian economy so far. Section 6 concludes the paper and we offer some recommendations.

Year	1980	1985	1990	1995	1996	1998	2000	2001	2002	2003	2004	2005
Amount	6235	8921	33440	33485	28206	28923	28273	28347	30992	32917	35945	32400

Table I.
External debt stock for selected years (in millions of US $)

Sources: Obadan (2004) and CBN (2004) *Statistical Bulletin*

Year	1980	1986	1988	1990	1992	1994	1996	1998	2000	2001	2002	2003	2004
Total debt stock/export	33.0	324.1	405.6	226.4	222.9	341.9	47.14	84.19	148.36	158.57	199.14	145.62	152.64
Total debt stock/gross national production	10.1	60.5	101.8	114.8	107.1	102.5	210	204	87.7	92.2	15.2	108.4	115.2
Total debt services payment/exports	4.3	28.6	30.3	22.6	28.7	19.9	2.9	5	9	11.9	7.5	8	7.5

Sources: Obadan (2004) and CBN (2004) *Statistical Bulletin*

Table II.
Nigeria external debt
indicators for selected
years (percent)

| | Dependent variable is the annual growth rate of the GDP (Y_g) | | |
Variable	Coefficient	t-Statistic	p
C	0.318018	3.403034[*]	0.0020
EXPGRO	2.19×10^{-7}	2.967415[*]	0.0061
CAP/GDP	-1.172289	-1.879949[***]	0.0706
DSERV/GDP	-1.854727	-1.509726	0.1423
EXDEBT/GDP	0.200437	1.749148[***]	0.0912
SAV	-1.14×10^{-6}	-2.766376[*]	0.0099
EXR	-0.000278	-0.225953	0.8229
R^2	0.427326		
Adjusted R^2	0.304610		
Durbin-Watson statistic	1.712496		
F-statistic	3.482237		
Prob(F-statistic)	0.010673		
Akaike info criterion	-1.293671		
Schwarz criterion	-0.982601		

Notes: [*]Means significant at 5 percent level;[**]Means significant at 5 percent level;[***]Means significant at 10 percent level

Table III.
Result of the expanded neoclassical growth model

Literature review

There are two major ways in which growth can be accounted for. The first being the dynamic competition model which maintains that growth arises from innovations made possible by the process of competition (Ellig, 2001). The second is the neoclassical model, which argues that growth results from expansion in the scale of investment (Solow, 1956). The latter becomes more appealing in view of the role of scale expansion on productivity growth and; growth that can be achieved through the former is limited to scale. According to the neoclassicals, policy should focus on increasing savings and investment. The policy implication of the neoclassical growth theorists is that low-growth economies should save more to fund additional investment since increases in savings and investment cause economic growth (Hunt, 2007). Sachs (2002), in his model, argues that growth will not take-off until capital stock has risen to a given threshold. As capital rises, and investment and output rise, in a virtuous circle, saving level will also continue to rise. After a given level, the rise in both capital and savings will be sufficient to engender self-sustaining growth.

The reason for opting for external finance as a means of ensuring sustained development rather than utilizing only domestic borrowing is provided by the dual gap theory. The theory postulates that investment is a function of savings, and that in developing countries the level of domestic savings is not sufficient to fund the needed investment to ensure economic development. Thus, it is logical to require the use of complementary external goods and services. The act of acquiring external funds however depends on the relationship between domestic savings and foreign funds, investment and economic growth. The main guiding principle on when to borrow is a simple one. Borrow abroad so far as the funds acquired generates a rate of return that is higher than the cost of borrowing the foreign funds (Ajayi and Khan, 2000). In essence, by following this guiding principle, a borrowing country is increasing capacity and expanding output with the aid of foreign savings.

External debt does not automatically transform into debt burden when funds are optimally utilized. In an optimal condition, the marginal return on investment is greater than or equal to the cost of borrowing. According to Edelman (1983), the critical factors affecting debt service capacity are returns on investment, the cost of borrowing and the rate of savings. The benefits of external borrowing have been emphasized in the literature to the neglect of the costs. Ubok-Udom (1978), enumerates the costs of external borrowing to include debt service burden which incorporates costs implied by the term structure of external loans, costs of resultant liquidity crisis, costs of the viciously cumulative debt and the manageability of the debt, costs of debt rescheduling and costs of import substitution.

Colaco (1985) explains debt service vulnerability in developing countries using three contexts. First, the size of external loans has reached a level that is much larger than equity finance, resulting in an imbalance between debt and equity. Secondly, the proportion of debt at floating interest rates has risen dramatically so, borrowers are hit directly when interest rates rise. Thirdly, maturities have shortened considerably in large part because of the declining share of official flows. The import of the above can be seen from the structure of the Nigeria's external debt which stood at USD28.3 billion as at December 2000 (compared with equity of about USD3.5 billion as at that same period) and this include arrears of USD14.7 billion and interest of over USD5 billion. A significant portion of this debt (75 percent) was owed to official creditors. The bulk of this debt was sourced at non-concessionary terms during the 1970s and early 1980s when the London Interbank Offered Rate (LIBOR) was between 3 and 4 percent. The debt escalated rapidly in the 1980s due to accumulation of debt service arrears and escalation of market interest rate. LIBOR peaked at 13 percent in mid-1989 making the pre-1984 debt to quadruple by 1990. In addition, after 1978, the share of bilateral and multilateral sources declined substantially. Borrowing from private sources (with short-term maturities) increased considerably.

Mehran (1986), argues that adequate debt management is essential in an increasingly complex financial environment and identifies the critical components of debt management as policy co-ordination, regulatory environment, accounting and statistical analysis. The aforementioned is true since the effectiveness of measures to reach a balanced level of debt supportive of development depends on the debtor nation adopting fiscal adjustment, and structural reform. Other features are transparency and fight against corruption, creation and/or improvement of debt management structures and decision making processes among.

The next issue in debt acquisition and management is the determination of sustainable level of debt. According to Ajayi and Khan (2000), sustainable foreign borrowing is measured by several ratios such as debt to export, debt service to export, debt to GDP (or GNP), and external debt to gross national income. However, the determination of sustainable level of these ratios is indeterminable and their usefulness is reduced to a warning concerning a potential explosive growth in the stock of foreign debt. For instance, if the acquisition of additional foreign debt increases the debt servicing burden than it increases the country's capacity to bear the burden, such an acquisition becomes undesirable and the situation must be reversed through export expansion. If export is not expanded, more borrowing will be necessitated for servicing debt and external debt will pile up above the country's capacity.

According to Omotoye *et al.* (2006), Nigeria is the largest debtor nation in the sub-Saharan Africa. They also observe in a comparative study with Argentina (Latin America's most severely indebted nation) that Nigeria's external debt as a percentage of gross national income has been continuously higher than that of Argentina since 1985 and continued to follow an upward pattern unlike that of Argentina. The problem is compounded according to Greene (1989) by inability of the economy to generate the requisite resources to meet repayment obligations especially since early 1980s. Fosu (2007) further shows the severity of the debt burden brought about by the pile-up debt (debt arrears as proportion of total debt stock) as high as 59 percent.

According to Adepoju *et al.* (2007), Nigeria's high debt burden has daring consequences for the economy and the general welfare of the citizenry. The servicing of external debt has gravely encroached upon resources availability for socio-economic development and poverty alleviation. Since 1986, Nigeria had taken a decision to limit debt service to no more than 30 percent of total oil receipts, though this has not brought much relief. Between 1985 and 2001, Nigeria expended over USD32 billion on external debt servicing. Cohen (1993), Clements *et al.* (2003) corroborate the aforementioned impact of debt as they observe that the negative effect of debt on growth works not only through its impact on the stock of debt, but also through the flows of service payments on debt which are likely to "crowd out" public investment. This is so because service payments and repayments on external debt soak up resources and reduce public investments.

Accumulated debt stock reduces economic performance through "debt overhang" effect (tax disincentive and macroeconomic instability). Tax disincentive means that a large debt stock discourages investments because potential investors assume that there would be taxes on future income in order to make debt repayments. The macroeconomic instability relates to increases in fiscal deficit, uncertainty due to exceptional financing, exchange rate depreciation and possible monetary expansion and anticipated inflation (Cleassens *et al.*, 1996).

The relevance of debt overhang hypothesis was stressed by Audu (2004). According to him:

[. . .] the debt service burden has militated against Nigerian's rapid economic development and worsened the social problems. Service delivery by key institutions designed to mitigate the living conditions of vulnerable groups were hampered by decaying infrastructure due to poor funding. By cutting down expenditure on social and economic infrastructure, the government appears to have also constrained private sector investment and growth through lost externalities. This has reduced total investment, since public investment is a significant proportion of the total investment in the country.

It has been argued that external debt burden is among the factors that depressed private investment in the Philippines after 1982. By utilizing data from Nigeria, Iyoha (1997) reports result that confirms the crowding out and the debt overhang effects of debt servicing. He concludes that these two effects apparently explain to a large extent the low level of investment in the Nigerian economy. Another study by Ashinze and Onwioduokit (1996), examines the relationship between external debt and growth in Nigeria using a macro-economic model. The study reports a period of effective utilization of external finance, which, resulted in a significant level of economic growth. It also reports periods when external funds were not judiciously utilized with a resultant effect of economic decline.

Edo (2002) analyzes the African external debt problem with reference to Nigeria and Morocco. He concludes that external debt has affected investment severely. Other findings include the fact that fiscal expenditure, balance of payments (BOP) and global interest rate are the major factors explaining debt accumulation in the studied countries. He therefore suggests measures that could alleviate the above problems (privatization, sustained export promotion programme, and restructuring and development of capital markets among others. The probable effects of debt cancellation on the Nigerian economy by eliminating 100 percent of debt owed the Paris club is in this case an interesting one beginning with the analysis of debt impact on Nigeria.

Lastly, the analysis in this paper is based on the neoclassical model whose thesis it to capture the overhang effect of a huge foreign debt. This paper also verifies the validity in Krugman and Proot (1989) assertion that there is a limit beyond which external debt accumulation stimulates investment and growth. In other words, the relationship between debt and investment and/or growth is nonlinear.

Methodology
The reason for opting for external finance as a means of ensuring sustained development, as against domestic borrowing is answered by the dual gap analysis. The theory postulates that investment is a function of savings and that investment that requires domestic savings is not sufficient to ensure economic development thereby necessitating complementary external goods and services. According to Roots (1978), the GDP identity is of the form:

$$GDP = C + S. \tag{1}$$

Alternatively,

$$GDP = C + I + (X - M) \tag{2}$$

where C, consumption; I, investment; X, exports; M, imports; S, saving.

In this model, investment includes both private sector investment and government investment expenditure. That is,

$$I = I_p + I_g \tag{3}$$

where $I_g = G$ is defined as government expenditures and I_p is private sector investment.

Since GDP equals domestic consumption plus the domestic saving, it follows from equations (1) and (2) that the demand for domestic investment equals the sum of domestic savings and the import balance on current account which is financed by net borrowing from abroad.

$$I = S + (M - X) \tag{4}$$

where $(M - X)$ is the net foreign borrowing.

To answer the question of why external debt tends to increase rapidly, we recall the two-gap model of Chenery and Strout (1966). In the model, net external borrowing is known as basic transfer (BT). Mathematically, it is measured as the difference between the net capital inflow (gross capital minus the amortization on past debt) and interest payments on remaining accumulated foreign debt.

$$BT = Dd - rD \tag{4a}$$

or

$$BT = (d - r)D \tag{4b}$$

where D, total accumulated foreign debt; d, percentage rate of increase in total debt; r, average annual interest ratel; Dd, net capital inflow or the rate of increase in total external debt; rD, total annual interest rate payments.

Equation (4b) shows losses or gains in foreign exchange from international capital flows by a country in a given year. BT indicates gain if $d > r$ and loss otherwise. Generally, if borrowing is linked with productive use when rates of return exceeds r and BT is positive, increasing the external debt will not hamper the economy of the recipient country in the long run.

Given that the aforementioned theory relates to inter-temporal budget constraint, in a period-to-period flow, the following equation becomes applicable:

$$(D_t - D_{t-1}) = Y_t - rD_t - C_t - I_t - G_t. \tag{4c}$$

$(D_t - D_{t-1})$, net change in debt from a period t to a period $t + 1$; Y_t, GNP in period t (net remittance is included); C_t, consumption in period t; I_t, domestic investment in time t; G_t, Government expenditure in time t.

In equation (4c), the debt size in a given period can be reduced by an increase in a country's output and a reduction in consumption, domestic investment and government expenditure. The failure of a country to do a period-to-period flow analysis and to reach the level where the sum of output, consumption, domestic investment and government expenditure is less than the BT, will lead to a debt crisis as shown below:

$$C_t + I_t + G_t - Y_t < dD_t - rD_t. \tag{4d}$$

(Note that $dD_t - rD_t = BT_t$.)

The regression models in this study take the Solow-type neoclassical growth model of the following specific forms. Output growth has been reviewed as being determined by domestic savings, debt burden, capital and other macroeconomic variables such as exchange rate. equation (5) analyses the impact of debt indicators on output growth (debt overhang effect). Equations (6) and (7) capture the overhang effect while also accounting for the nonlinearity impact of debt (Krugman and Proot, 1989).

Model 1
The first model explores a linear relationship between output and debt burden indicators. The model is based on the following equation:

$$Y_g = \Omega_0 \Omega_1 \text{EXPGRO} + \Omega_2 \frac{\text{CAP}}{\text{GDP}} + \Omega_3 \frac{\text{DSERV}}{\text{GDP}} + \Omega_4 \frac{\text{EXDEBT}}{\text{GDP}} \atop + \Omega_5 \text{SAV} + \Omega_6 \text{EXR} + \mu_t \tag{5}$$

Y_g is the annual growth rate of the GDP. CAP/GDP is the total investment-output ratio and EXPGRO is the annual growth rate of exports (measured as: $((\text{EXPORT}_t - \text{EXPORT}_{t-1})/\text{EXPORT}_t)$. DSERV/GDP is the ratio of debt service to GDP,

and SAV is savings, EXR the exchange rate, EXDEBT/GDP is the size of external debt stock relative to GDP, and, μ_{it} is the random error terms assumed to have a zero mean and variance-covariance matrix, $\delta_1 I$.

The above is the neoclassical growth model extended to exports and non-export sectors. The common variables that enter the growth model are: growth rates of labour, exports and investment-GDP ratios (that is, capital). Gounder (2001) utilizes the Solow-type neoclassical growth model to analyze the impact of official development assistance (ODA) on growth. In Gouder's model, which is incorporated into Solow's model, the explanatory variables are, the ODA to GDP ratio, (AID to GDP ratio) multilateral aid to GDP ratio, ratio of grant aid to GDP, ratio of loan to GDP, ratio of technical cooperation to GDP in separate equations. It is relevant to include as explanatory variables in this analysis, the ratio of debt stock to GDP and debt service to GDP as shown in equation (5) above.

Model 2

The second model is based on variants of Elbadawi, Ndulu and Ndung'u (1999) model of external debt sustainability. The model has two versions, namely:

(1) Rate of growth and external debt relationship (the debt Laffer curve) which investigates the debt overhang and financial constraint hypothesis.

(2) Private investment and external debt relationship (which investigates both demand side and the credit constraint).

The Elbadawi *et al.*'s model investigates the impact of large external debt stock with its servicing requirements and the resultant fiscal deficit on private investment (measured as private investment to GDP). The shortcoming of this model is that it considers only the public sector gap, and ignores the BOP. It also takes government expenditures and revenues, interest rates and exchange rates as given. Our re-formulated Elbadawi, Ndulu and Ndung'u model is shown as:

$$Y_g = \alpha_0 + \alpha_1 \frac{EXDEBT}{GDP} + \alpha_2 \left(\frac{EXDEBT}{GDP}\right)^2 + \alpha_3 \frac{GCAPIT}{GDP} + \alpha_4 \frac{DSERV}{EXPORT} \quad (6)$$
$$+ \alpha_5 TOT + \mu_{it}$$

$$\frac{PRIVCAP}{GDP} = \beta_0 + \beta_1 \frac{EXDEBT}{GDP} + \beta_2 \left(\frac{EXDEBT}{GDP}\right)^2 + \beta_3 \frac{GCAPIT}{GDP} \quad (7)$$
$$+ \beta_4 \frac{DSERV}{EXPORT} + \beta_5 TOT + \mu_{it}$$

where Y_g measures the rate of output growth (ΔGDP/GDP) and TOT is the external shock (measured as terms of trade variability). GCAPIT/GDP is the public investment (measured as capital expenditure) to GDP while EXDEBT/GDP is the external debt to GDP ratio and PRIVCAP/GDP is the ratio of private investment to GDP. DSERV/EXPORT is the debt service to exports and EXPGRO is export growth.

In carrying out the analysis in this paper, the dependent and independent variables chosen are based on their ability to portray the investigation in a meaningful and

consistent manner. Variables were included, excluded or proxied based on theoretical and/or empirical justification. However, data availability and measurability acted as major constraints in terms what variables to include.

An econometric model is employed to quantify the economic effects of foreign debt and economic growth in Nigeria. However, since foreign debt and the servicing requirements are not the only factors affecting output growth, there is a need to capture other variables in order to avoid model misspecification error. In order to capture the impact of domestic resource on growth, we utilized the total investment to GDP ratio as opposed to the savings-GDP ratio employed as a proxy for investment as the domestic resources (Mbaku, 1993; Islam, 1992). The use of total investment to GDP is in conformity with earlier studies (such as Gounder, 2001).

Following from (Gounder, 2001), the export coefficient in our model relates to the output elasticity of exports and this variable reflects the degree of "Openness" of the economy and constitutes an "input" in the production function. Edwards (1998) observes that exports play a positive role in the growth process by increasing total factor productivity after including factor productivity and institutional factors.

Apart from capital and export variables, effective labour force is included theoretically as a determinant of output since labour is an important variable input in a formalized input-output model. Our shortcomings in this study include our inability to obtain an accurate labour data or its good proxy, so we excluded it. Other variables used in our models include the ratio of debt stock to the country's output (measured as GDP). This variable (new variable formed) is a traditional debt indicator that compares a country's debt stock with its productive capacities. By implication, the higher a country's debt stock is compared with its output, the greater the debt burden or indebtedness of that country.

Debt service ratio to GDP is another traditional indicator of indebtedness, which compares an economy's debt service expenditure to its level of productivity. Generally, the higher the ratio of debt-service to a nation's productivity, the more serious the debt burden on the economy (see also Omotoye *et al.*, 2006).

Analysis and discussion
The data employed in this study are macroeconomic variables including, GDP, public capital expenditure, exports, foreign debt stock, debt service variables, savings, exchange rates and private investments. The sample period is from 1975 through 2005. The sources of data include various issues of the Central Bank of Nigeria's Statistical Bulletin.

Model 1

$$Y_g = \Omega_0 + \Omega_1 \text{EXPGRO} + \Omega_2 \frac{\text{CAP}}{\text{GDP}} + \Omega_3 \frac{\text{DSERV}}{\text{GDP}} + \Omega_4 \frac{\text{EXDEBT}}{\text{GDP}}$$
$$+ \Omega_5 \text{SAV} + \Omega_6 \text{EXR} + \mu_t$$

The results in Table III indicate that exports growth, investment-output ratio, external debt stock and savings determine output growth rate in Nigeria. All our independent variables explained about 43 percent variability in our dependent variable. The *F*-statistic validates the joint contributions of our independent variables in explaining output growth in Nigeria. The Durbin-Watson test results also reject the

hypothesis of the presence of serial autocorrelation making our ordinary least squares an efficient one. The Lagrange Multiplier test results also rejected the presence of serial correlation in the residuals.

The influence of export growth on GDP growth is confirmed by our results even though the coefficient is relatively small; it is statistically significant. The implication of this is that Edward's (1998) observation that exports play a positive role in the growth process by increasing total factor productivity has been confirmed in Nigeria. The results also confirm that exchange rate deterioration depresses output growth in Nigeria, although this is not statistically significant.

Interestingly, savings compress output growth contrary to expectation. This of course, can be explained via the "debt overhang" and the "crowding-out" theories. As savings pile up, less of it is channeled towards productivity growth and infrastructural build-up. The bulk of savings is mobilized towards debt servicing, re-scheduling and repayment to the detriment of social capital. In addition, the variable that relates the seriousness of debt burden (EXDEBT/GDP) on productivity growth (Y_g) indicates that the more serious the burden (based on the stock of the debt) the more likely it is to contribute significantly to output growth. In other words, some of the debt stock must have been well-utilized in the past. This result however cannot be taken too seriously as some collinear exogenous factors might have acted to make debt burden beneficial in this manner.

The variable that captures the impact of domestic resources on growth (CAP/GDP) suggests that domestic resources significantly depressed growth in Nigeria. As more domestic resources are committed to the economy, the less is their effectiveness in generating a higher level of growth. Lastly, a unit increase in debt burden as measured by the debt service to GDP ratio can generate 185 units growth. Although, debt burden did not significantly explain growth, but its combination with other forces could significantly depress growth.

Model 2

$$Y_g = \alpha_0 + \alpha_1 \frac{\text{EXDEBT}}{\text{GDP}} + \alpha_2 \left(\frac{\text{EXDEBT}}{\text{GDP}}\right)^2 + \alpha_3 \frac{\text{GCAPIT}}{\text{GDP}} + \alpha_4 \frac{\text{DSERV}}{\text{EXPORT}}$$

$$+ \alpha_5 \text{TOT} + \mu_{it}$$

The result in Table IV indicates that external debt influenced growth positively and there is a linear relationship between the two. External debt's stock indicator does not significantly influence growth. Government investment however affects growth negatively and significantly. Debt service indicator affected growth negatively and significantly too. The above model suffers in that its coefficient of determination is low and, the Durbin-Watson statistic indicates the presence of serial autocorrelation. Taking cue from Greene (1997) who stresses the problem posed by autocorrelated disturbances and suggests a way to deal with them. Accordingly, when autocorrelated disturbances are present, a generalized regression model is employed because the ordinary least squares method becomes inefficient. Judge *et al.* (1985) also agree on the loss of efficiency but differ on the severity of the problem. In view of the above argument, we fitted the

Table IV.
Results from the
non-linear Elbadawi's
reformulated model

Dependent variable is the annual growth rate of the GDP (Y_g)			
Variable	Coefficient	t-statistic	P
C	0.339338	4.683986[*]	0.0001
EXDEBT/GDP	0.028671	0.117108	0.9076
(EXDEBT/GDP)^2	0.094804	0.441045	0.6625
GCAPIT/GDP	-1.439962	-2.601869[**]	0.0145
DSERV/EXPORT	-0.400045	-2.184666[**]	0.0371
TOT	-3.21×10^{-8}	-2.293573[**]	0.0293
R^2	0.376546		
Adjusted R^2	0.269054		
Durbin-Watson statistic	1.633544		
F-statistic	3.503010		
Prob(F-statistic)	0.013426		
Akaike info criterion	-1.265855		
Schwarz criterion	-0.999224		

Notes: [*]Means significant at 5 percent level; [**]Means significant at 5 percent level

generalized least squares (GLS) Elbadalwi's model and report our results as follows.

Table V shows the GLS results of Elbadalwi's nonlinear growth-model. In this version of our model, GCAPIT/GDP, DSERV/EXPORT and TOT are statistically significant. However, this model suffers from the problem of serially correlated disturbance term. Therefore, the estimated parameters are inefficient. The presence of autocorrelation could be a result of fitting a nonlinear model to illustrate a linear relationship.

Table V.
GLS fitted on the
non-linear Elbadawi's
reformulated model

Dependent variable is the annual growth rate of the GDP (Y_g)			
Variable	Coefficient	t-statistic	P
C	0.367895	4.060074[*]	0.0004
EXDEBT/GDP	0.008875	0.030075	0.9762
(EXDEBT/GDP)^2	0.103380	0.404701	0.6889
GCAPIT/GDP	-1.624851	-2.522774[**]	0.0178
DSERV/EXPORT	-0.401945	-2.074697[**]	0.0477
TOT	-3.58×10^{-8}	-2.576432[**]	0.0158
RHO	0.174226	0.899494	0.3763
R^2	0.411205		
Adjusted R^2	0.280361		
Durbin-Watson statistic	1.881804		
F-statistic	3.142723		
Prob(F-statistic)	0.018120		
Akaike info criterion	-1.225646		
Schwarz criterion	-0.911396		

Notes: [*]Means significant at 5 percent level; [**]Means significant at 5 percent level

$$\frac{\text{PRIVCAP}}{\text{GDP}} = \beta_0 + \beta_1 \frac{\text{EXDEBT}}{\text{GDP}} + \beta_2 \left(\frac{\text{EXDEBT}}{\text{GDP}}\right)^2 + \beta_3 \frac{\text{GCAPIT}}{\text{GDP}} + \beta_4 \frac{\text{DSERV}}{\text{EXPORT}}$$

$$+ \beta_5 \text{TOT} + \mu_{it}$$

Table VI shows the results of a nonlinear private investment and cash-constraint model. This model is utilized to capture the disincentive nature of debt and its servicing requirements on investment. First of all, the independent variables collectively capture about 59 percent variability in private capital. This is quite a good fit. In addition, the F-statistic validated the joint contributions of all the independent variables in explaining private capital. Furthermore, the Durbin-Watson statistic indicates the absence of autocorrelation in the disturbance term. This result is validated by the Langrange Multiplier test results.

A cursory look at the results in Table VI shows that four out of the five variables significantly affect private investment. In addition, the terms of trade variable is inversely related to private investment which indicates that the presence of trade deficit diminishes the size of private investment. In addition, the terms of trade are important in the determination of productivity. External debt as a proportion of GDP is inversely related to growth in private sector at an initial point. At some point the relationship becomes reversed. The turning point could not be ascertained in this study. The key point is that the growth in debt stock relative to productivity discourages further growth in private investment in Nigeria. This of course, is the argument of the debt overhang proponents. However, at some other interval in time, debt contributed significantly to growth in private investment. This argument is logical because at an earlier period of debt acquisition, because of its manageable size, and meaningful borrowing, external debt significantly contributed to private investment growth. After some time however, indiscriminate borrowing became the order of the day and debt became a discouraging factor for private investment in Nigeria.

Variable	Dependent variable is the private capital to GDP		
	Coefficient	t-statistic	P
C	0.048303	10.71156*	0.0000
EXDEBT/GDP	−0.069985	−4.323304*	0.0002
(EXDEBT/GDP)^2	0.045498	3.170568*	0.0035
GCAPIT/GDP	−0.126263	−3.545989*	0.0013
DSERV/EXPORT	0.024812	2.001422**	0.0545
TOT	-5.81×10^{-10}	−0.614430	0.5436
R^2	0.578299		
Adjusted R^2	0.508015		
Durbin-Watson statistic	1.248879		
F-statistic	8.228078		
Prob(F-statistic)	0.000055		
Akaike info criterion	−6.652201		
Schwarz criterion	−6.388281		

Notes: *Means significant at 5 percent level; **Means significant at 5 percent level; GCAPIT/GDP is government's capital expenditure to GDP

Table VI.
Non-linear private
investment model results

Moreover, public sector investment rather than increase private investment lead to its decline, confirming the crowding-out hypothesis. Deterioration in the BOP tends to depress private investment, validating the impact of deficit on private investment. Lastly, growth in external debt servicing did not depress private investment. This of course, is expected as the "crowding out" theorist explained that external debt service crowd out public investment rather than private. Generally, we found both the debt overhang theory and crowding out theories relevant in Nigeria, and debt relief obtained therefore a justified palliative measure to Nigeria.

Conclusion

To understand the effects of the recent debt forgiveness granted to Nigeria, this paper explores the impact of external debt burden on the economy by analyzing the applicability of "debt overhang" theory and the "crowding out" effect. Based of the results reported in the previous section of this paper, it is obvious that Nigeria's external indebtedness up to the time she was granted relief in 2006 had become a burden, and it was unsustainable. It did not only "crowd-out" investment, it discouraged output growth, and had negative impact on social and economic infrastructures, aggravating poverty and inequality.

The major factor militating against growth and development in Nigeria is the huge external debt with the implied servicing requirements. Accumulated debt reduced economic performance through overhang effect and macroeconomic instability in the form of discouraging savings, increase fiscal deficit, exchange rate depreciation, and BOP disequilibrium among others. In addition, large external debt stock had exerted a significant influence on Nigeria's level of international reserves.

The probable effect of debt cancellation (by eliminating 100 percent of debt owed the Paris club) means that Nigeria's annual debt service payments fell from USD1.8 billion to USD0.8 billion. The difference of USD1.0 billion can now be channeled into poverty reduction programmes. Nigeria would escape from the debt spiral caused by escalating penalties and interest on unpaid debts. This gesture of benevolence would have a positive impact (via annual savings) on national expenditures on health and education among other sectors of the economy. Moreover, Nigeria's reduced debt burden would improve the country's credit worthiness into potential investors thereby improving confidence and promoting private sector development with the country.

The implication of results of this study for other debtor countries include: proper management of external funds by creating or improving debt management structures and decision making process. External finance should only be sourced for highest priority project and must be applied on well-appraised and self-liquidating projects. Such projects should have direct impact on economic development. There is also need to cultivate a culture of transparency in the issue of debt management. Governments should make fiscal adjustments through cuts in expenditures. This could reduce the level of deficit financing which exerts pressure on foreign exchange. Finally, we reported a nonlinear effect of debt on private sector investment which pre-supposes the existence of a turning point which represents an optimal level for employing of external funds. Further study is required to determine the turning point for Nigeria. As in many studies done on developing countries, our results are susceptible to data availability problem.

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