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Public Debt Shocks and Public Goods Provisioning in Nigeria: Implication for National Development

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Abstract
Public debt profile of Nigeria has continuously been on the increase over the years. The drop in international crude oil prices has further worsened revenue position of the country, thus, necessitating further acquisition of public debt to bridge the gap in revenue deficit. Yet, when we look back at the increasing public sector spending, there are concerns that the government spending do not amount to increase in public goods provided for the country. Using data from 1980 to 2014 the study therefore seeks to investigate the factors responsible for the poor provision of public goods in the face of increasing public debt profile. Using the unrestricted VAR model Governance and Tax revenue were introduced into the model as structural variables. The result suggested that governance and tax revenue were structural determinants of the effectiveness of public goods provisioning in Nigeria. The study therefore identified weak governance as the major reason for the non-provision of public goods in Nigeria. While tax revenue exerted positive influence on the provisions of public goods, weak/poor governance was observed to crowd-out the benefits from increase tax revenue. The study therefore recommends reappraisal of the governance system in Nigeria. Elected officers in governance should be more transparent and accountable to the electorates they represent. Furthermore, the study advocates for an annual auditing of all government MDAs accounts by external auditors to ensure (a) accountability of public debts utilization, (b) transparent in implementation of program support funds, (c) integrity of agencies responsible for program management, and (d) measuring program effectiveness with amount of funds expended.
Keywords: Public debt shocks, Governance, Public goods, Impulse response function, Tax revenue, Vector Auto-regression.

1. Introduction

It is not a maxim that public debts have been on the increase amongst developing countries, including Nigeria. The pattern of growth of public debt has been most unstable, while decreasing at some years; it often increases in most of the years. Nigeria's public debt grew by 7.08% from 2003 to 2004, but declined by –30.16% and -46.29% in 2005 and 2006. Thereafter, it grew from a negative of -46.29% by 68.24% to 21.95% in 2007. It slightly declined by -2.73% in 2008 and jumped up further to 19.01% in 2009. The growth pattern reflects a situation where the government is seen to rely on automatic stabilization of fiscal policy rather than on fiscal responsibility rules. That is, in periods of severe unemployment, the government borrow money to spend on trying to offset unemployment wages or in cautioning the effect through the implementation of relief programmes and, if large-scale inflation results, government rather would rely on increasing taxation and thus, spend less (Yelwa, 2010) One of the reasons largely adduced by government of developing countries for the high public debts is the need to increase investment through the provision of public goods. As also noted by (2011) "the major role of the state is to provide, maintain and regulate public goods. State performance in generating public goods influences investment decisions and profitability" Due and Friedlanders (1977) describe public goods as "goods possessing the basic characteristics of non-appropriability, non-rivalry (the consumption of one individual does not reduce the availability of goods to others) and non-excludability in consumption (the goods cannot be confined to those who have paid for it)". These characteristic of public goods render price mechanism ineffective in allocating resources efficiently in a market economy, thus providing the rationale for public sector intervention in order to ensure efficient allocation (Mordi, Englama and Adebusuyi, (2010).The degree to which the government achieves the responsibility of providing the public goods (often through improve allocative efficiency) depend on how well the objectives of allocative role, distributive role, stabilizing role, regulatory role and development role are enhanced. However, the stabilizing role which is necessary to ensure rapid economic growth and sustainable development cannot be achieved without macroeconomic stability. More often, government, while attempting to perform the stabilizing role, resort to borrowing either from internal sources (domestic debt) or external sources (External debt) to finance shortfalls in the budget. Economic theory suggests that reasonable level of borrowing by the government is likely to enhance its economic growth and development (Pattilo etal, 2002)

Several reasons accounts for why the Nigeria government embark on domestic borrowing. One of the major reasons for the high growth of the domestic debt stock as stated by (Okonjo-Iweala, 2011) was attributed to the federal government intention to deepen the domestic debt markets and generate a yield curve for Nigeria which ultimately could help the corporate bodies to access the capital markets and borrow funds at a more affordable rates. Such quantum of amount needed to deepen the domestic debt could only be gotten from the

bond market. Thus, domestic debt in Nigeria is contracted through the issue of bonds which are often purchased by Nigerian banks, local pension funds, and other domestic and foreign investors. The resources realized through the sales these bonds are used to fund the budget or other domestic expenditures, such as infrastructure projects. One of the major instruments used by the government to service domestic debt is tax revenue. Government usually imposes taxes on goods whose consumption rate is high either to crowd out primary spending or increase tax revenue (Krogstrup, 2012). Hitherto, the accumulation of public debt is expected to be unanimous with the provisions of public goods, such as provision of roads, defense, medical care, transportation. If we accept the position of some economist that government with high public debt imposes higher tax rates in order to service the debt, it will therefore be expected that high-indebted countries (HIC) should experience higher provisions of public goods. According to Bataglini and Coate (2006) "there should exists a unique political equilibrium between public debt and provision of public goods, such that the equilibrium distribution of public debt should converges to a unique invariant distribution (of public goods)". Therefore, where there exist a disequilibrium in the provisions of public goods (such that the high public debt does not equate with the quantity of public goods provided), there is therefore a question mark on the justification of the high growth of public debt.

The aim of this study is to empirically identifying the causes of these asymmetries between Nigeria's high public debt profile and provision of public goods. The questions posed in this study are, is government public debt synonymous with the provision of public goods? If not, what are the causes of this asymmetry?

1.2 Public debt profile in Nigeria

During the first half of the last decade, public finances in Nigeria deteriorated continuously, leading to a large and intractable fiscal imbalances and unsustainable national debt. Domestic debt profile in Nigeria has been taking a rising trend over the years. In 1992 the domestic debt stock stood at $10.287Bn (representing about 57.01 per cent of GDP), while the external debt profile within the same year stood at $31.463Bn (representing 74.37 per cent of GDP). Prior to the Paris Club debt relief in 2004, Nigeria's overall External debt stood at US$35.9 billion while the stock of the domestic debt amounted to US$10.3 billion. In 2004, following the increase burden of external debt while exerted significant influence on the domestic currency, the federal Government sort for a debt relief from the Paris Club through the World bank. After the successful debt relief initiative, Nigeria's stock of foreign debt declined dramatically. Indeed, in 2006, Nigeria's foreign and domestic debts amounted to US$3.5 billion and US$13.8 billion respectively. Between 2004 and 2009, while external debt holding as a percentage of GDP reduced to 2.47 per cent, domestic debt holding as percentage of GDP increased to 13.54 per cent. This thus signifies that between when Nigeria received external debt cancellation the domestic debt stock had grown substantially to US$42.23 billion, while the external debt was still a modest US$5.67 billion. This implied a total debt stock of US$47.9 billion or 21% of GDP.

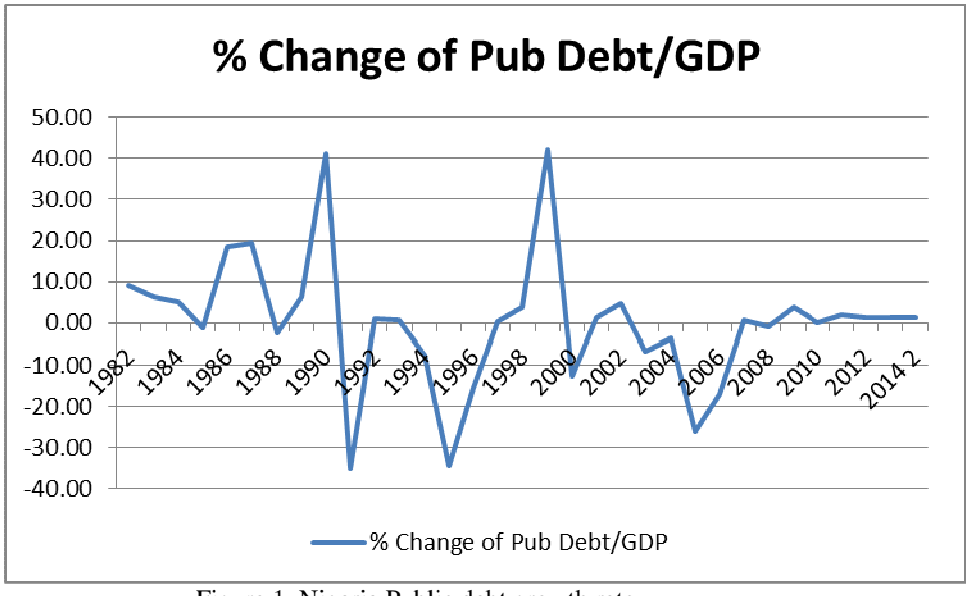

Figure 1. Nigeria Public debt growth rate

The figure 1 represents the percentage change of public debt to GDP in Nigeria. The table indicates that government gross debt as a percentage of GDP has been steadily on the negative over the period 1991 to 1997 and 2002 to 2008 indicating that the Nigeria's liabilities are constantly on the rise even after repayment.

The period 1985 – 2008 witnessed serious fiscal indiscipline which occurred as a result of the combined effect of reform-induced losses in revenue (reductions in customs and excise duty rates), poor tax performance due to a narrow tax base and low tax buoyancy, and government's inability to contain current public spending.

Both the Federal and State Governments contributed to the fiscal deterioration in Nigeria particularly with implementation of the public service wage increases in 1999 and 2000. These wage increases widened the deficits, especially at the State and Local Government levels. Persistent primary deficits led to a sharp accumulation of debts. In 2004, the total public debt stood at US$46,259.45million, the highest ever (Yelwa, 2010).

However, the country only showed a little improvement in the repayment of her debt between 2008 and 2014. To a large extent, the continued reduction in Nigeria's indebtedness can be attributed to the bold monetary and fiscal polies instituted by the Jonathans administration. Though, Nigeria's debt-GDP ratio is seemingly low, it still falls below the World Bank's acceptable limit of borrowing.

1.3 Global public debt trend

Issues of public debt had also posed as major problem among the OECD countries. **Public debt as a percentage of GDP in OECD countries as a whole went from hovering around 70% throughout the 1990s to almost 110% in 2012. It is now projected to grow to 112.5% of GDP by 2014. In Africa, public debt had been high amongst some selected countries. Countries such as Cote D'Ivore Mauritania Egypt had recorded a high percentage rise in the public debt profile.**

Table 1. Comparative position of Nigeria's public debt as a % of GDP with selected companies in Africa 2007-2014

Countries	2007	2008	2009	2010	2011	2012	2013	2014
Nigeria	12.7	11.6	15.2	15.5	17.3	14.7	15.4	15.9
Rwanda	26.9	21.4	23.0	23.3	24.0	25.8	24.3	20.2
Niger	15.9	14.0	20.1	17.6	16.6	20.4	23.6	26.7
Namibia	19.1	12.1	15.9	15.7	23.9	27.2	34.5	31.6
Kenya	46.0	45.5	47.5	49.9	48.5	47.2	45.3	45.3
Mali	21.7	21.6	24.2	29.5	30.6	30.1	27.9	28.2
Mauritania	96.9	110.5	124.3	86.1	79.4	85.1	80.0	80.5
Ghana	31.0	33.4	36.2	46.3	43.3	4.9	41.1	38.1
Ethiopia	36.8	30.6	25.1	27.6	25.9	22.2	23.3	23.8
Egypt	80.2	70.2	73.0	73.2	76.4	79.9	81.1	78.5
Chad	26.0	23.6	30.5	25.8	27.0	23.4	24.2	25.0
Cameroun	12.0	9.5	10.6	12.1	13.7	17.8	20.5	23.9
Sierra Leone	43.1	42.8	47.8	48.9	41.1	34.4	34.2	32.1
Cote D'Ivore	75.5	75.3	66.5	66.4	90.5	62.6	61.6	60.3
Angola	13.3	8.9	10.4	10.9	9.5	8.6	7.9	7.8

Source: https.//www.gfm.com/global-data/economic-data/public-debt-percentage-gdp

Among the OECD countries in Africa, Nigeria, Angola, Cameroun and Niger seems to have a lower debt profile as a percentage of GDP. Nigeria's debt profile as a percentage of GDP stood at 12.7 per cent in 2007; this increased to 17.3 per cent in 2011 and however reduced to 15.9 per cent in 2014. A high debt-to-GDP ratio may make it more difficult for a country to pay external debts, and may lead creditors to seek higher interest rates when lending. The higher the debt-to-GDP ratio, the less likely the country will pay its debt back, and the higher its risk of default.

1.4 Comparative analysis of Nigeria public good provisioning versus the global competitive index

There are 11 Pillars through which the Global Competitive Index rank the performances of countries. Among these pillars of Global Competitive Index (GCI) are three pillars that greatly address the basic quality of public goods, viz, Infrastructure, Health and Primary Education, Education and Training. The components of these pillars are presented in the tables below.

The table 2. below reveals that out of 148th countries examined in 2013 – 2014 the World Economic Forum's Global Competitiveness Index (GCI) ranked Nigeria as 126th in the world. Nigeria rather than improve on the world GCI ranking drifted a step backwards in 2014-2015 as the country was again ranked 127th in the world. A comparative analysis of the countries in Africa revealed that Algeria, Tunisia, Kenya and Zambia were ranked 79th, 87th, 90th and 95th respectively in 2013-2014.

Table 2. Selected rankings in the GCI 2013-2013, 2014-2015

Countries	2003-2004 rankings among economies	2004-2005 rankings among economies	Score (1-7)
African Countries	77	79	4.8
Tunisia	87	87	3.96
Kenya	90	90	3.96
Zambia	95	96	3.86
Gabon	105	106	3.74
Ghana	110	111	3.70
Senegal	111	112	3.70
Cote D'Ivore	114	115	3.67
Cameroun	115	116	3.66
Egypt	118	119	3.60
Nigeria	126	127	3.44
Mali	127	128	3.43
Malawi	131	132	3.25

Source: http://reports.weforum.org.global-competitive-report/2014-2015/economies#economiesNGA

On a score of 1-7, Nigeria achieved 3.44 point which invariably was less that average score. This result above is an indication that Nigeria is rated poorly on the Global Competitive Index.

Table 3. Provision of infrastructure, health and primary education and higher education and training

Countries	Basic Req	Score	Infra struc	Score	Education/ Health	Score	Higher Edu/Training	Score
	2nd Pillar				4th Pillar		5th Pillar	
Algeria	65	4.64	106	3.12	81	5.61	125	3.34
Angola	137	3.21	139	2.01	136	3.54	140	2.84
Cameroun	116	3.74	126	2.74	112	4.70	117	3.22
Cape Varde	91	4.27	113	3.14	57	5.96	89	3.92
Cote D'Ivore	119	3.25	93	3.41	140	3.25	121	3.12
Ethiopia	117	3.74	125	3.49	110	4.82	131	3.63
Ghana	123	3.68	108	3.03	121	4.46	106	3.46
Guinea	144	2.74	143	1.78	139	3.35	140	2.19
Kenya	115	3.82	96	3.27	120	4.55	95	3.77
Mali	128	3.54	103	3.15	138	2.97	128	2.70
Nigeria	140	3.18	134	2.13	143	3.96	124	2.89
South Africa	89	4.30	60	4.29	132	2.54	86	4.04
Tunisia	85	4.38	79	3.80	52	6.00	73	4.28
Tanzania	124	3.67	130	2.26	108	4.86	134	2.43

Source. http//gcr.weforum.org/gcr09

The table 3 above revealed that Nigeria was ranked 134th 143rd and 124th in the provision of infrastructure, Health and Primary education and Higher Education and Training out of 144 sampled countries in the provision of infrastructure. The percentile score for the 2nd, 4th, and 5th Pillars viz 2.13, 2.97 and 2.88 indicated that Nigeria is rated poorly in the provision of the basic public goods. The country's poor performance in creating social and economic goods translates into disincentives to investors and threats to business profitability. The absence of the basic social and economic goods had pose serious constraints on local and foreign investment in the industrial and manufacturing sectors. The unreliability of electricity supply which had persisted for over a decade has hampered social and economic development of the country.

2 Literature review

The concern of every government is usually to evolve policies and programs that will ensure a sustainable and satisfactory welfare system. A satisfactory welfare system bothers around an increase and efficient allocation of public goods, improvement in the level of per capital income and reduced taxes. The decision on the size of public goods provided by the government is determined by both the current stock of public debt and the value of the public goods.

Ramakrishnan (2010) who undertook a study on Budgeting and Financial Management in Sub-Saharan Africa observed that continued high levels of domestic borrowing by government has led to a distortion of

domestic interest rate, extensive high exchange rate and huge capital mobility from abroad. The absence of effective fiscal reforms and sustained reduction of fiscal deficits has affected productive sector investment and has further enhanced the redistribution of resources from the poor to the rich. The author further noted that since a higher proportion of government expenditure is targeted towards payment of interest charges that accrue from loans, there has been a substantial compression of real expenditure on public investments and the social sector such as primary education, healthcare and other public goods.

In line with Ramakrishnan (2010), Desbonnet and Weitzenblum (2011) also reasoned that public debt affect individual welfare both positively and negatively. While the negative effect of public debt could be linked to increasing the income tax rate and reducing the wage level, the positive side of public debt is traceable to increase in interest rate. An increase in public debt reduces the income tax rate which ultimately benefits the liquidity constraint agents. Furthermore, short run gain of a reduction in the income tax rate is evident in the higher consumption pattern of agents and increase in labour supply. Thus, agents whose productivity shock is low and/or asset holding is low are likely to suffer from increasing public debt. Agents whose productivity shock is high and/or asset holding is high are likely to benefit from increasing public debt.

Yelwa, A J (2010) who presented a position paper on fiscal responsibility rule in Nigeria observed that the high public debt in Nigeria is attributable to fiscal irresponsibility by the state government. He found was found out that all the three tiers of Government and their Ministries, Departments and Agencies (MDAs) did not comply with the provisions of the Federal Revenue Agencies (FRA) on the management of public debt, particularly on borrowing. The author further observed that the government, borrowed without due process, borrowing were done on non-concessionary terms and the use of such loan proceeds were applied to purposes other than those for which they were obtained. State government justifies borrowing on the grounds of postponement of increased taxation or non-reduction of consumption. Borrowing is therefore seen as the quickest way to meet huge expenditure outlay whether recurrent or developmental in nature and that borrowing constitutes a second-best alternative to money creation to finance government activities, especially in times of unemployment. However, poor Fiscal irresponsibility on the part of government had led to the abandonment of critical sectors like the social and development sector.

Bataglini and Coate (2006) while studying the Dynamic Theory of Public Spending, Taxation and Debt identified two regimes of government policy-making: business-as-usual (BAU) in which legislators bargain over the allocation of pork and responsible policy-making (RPM) in which legislators choose to forsake their parochial interests for the national good. In the BAU regime public good spending is responsive to changes in the value of the public good, but these spending changes are financed entirely by adjustments in pork-barrel spending, while in the RPM regime legislators allocate all revenues to providing the public good and servicing the debt. Thus, changes in the value of the public good lead to changes in taxes and debt as well as public good spending. The position of Bataglini and Coate (2006) therefore suggests that the kind of legislatures in governance either RPM or BAU determines the level of public goods that are provided from public debts.

Similarly, Krogstrup (2002) using panel regression technique for a panel of EU countries investigated the effect of effect of public debt services on the tax level, primary spending (spending related to the provision of public goods) and the tax mix. The results of the empirical investigation imply that the wedge in the budget stemming from debt service has a strong effect on either the level of tax revenues or the level of primary expenditures, assuming that there is a limitation to deficit financing. Therefore, if debt servicing were to mainly result in higher taxes, it would therefore imply that high debt results in a higher level of tax induced distortions to the economy. Alternatively, if debt service is found to mainly result in lower primary spending, it would mean that debt can be considered a mitigating factor for the tendency of the public sector (as defined by primary expenditures) to grow. The authors therefore observed that high debt levels such as experienced by some EU countries may be having a mitigating effect on the public sector since debt servicing is found to partly crowd out primary expenditures.

It has severally been reasoned that institutional regimes of governance, whether democratic or military, has contemporaneous effect on the nature of provision of public goods. For instance Persson and Tabellini (2001) investigated the suitable welfares regimes (between parliamentary and universal welfare program) that exerts the greatest impact on the provision of public goods using, using OLS regression with several number of control variables (aimed at minimizing the extent of the impact of unobservable factors on policy outcomes). The author's result revealed that parliamentary regimes lead to a shift in the composition of public spending in favor of universal welfare programs which benefit larger sections of populations.

There has been controversial argument on the responsiveness of military government and fiscal responsibility, particularly, as it relates to human capital development. Adebiyi (2010) while using the VAR model to estimate the relationship between public education expenditure and defense spending in Nigeria used the measure of military spending on education to represent the degree of human capital development in Nigeria. It is noted that, human capital development is not possible without a concurrent spending on education, water and sanitation, roads and infrastructure healthcare and related social services which are all embodiment of public

goods. The result for Adebiyi (2010) observed that a negative trade-off exist between defense spending and public education (used as a proxy for human capital development) in Nigeria. The author concluded that it is unlikely that military activity has served to enhance the productive capability of the Nigeria economy via some modernization effect.

3.1 Data source and variable description

The data used for this study covers the period of 1981 to 2014 and were sourced from the World Bank data base (data.worldbank.org/indicators) and the Central Bank of Nigeria (CBN, 2014) statistical bulletin. The concept of public goods according to Samuelson (1955, 1958) is a good that satisfies two basic essential characteristics of non-excludability and non-rivalry. Following these Samuelson's specification of public goods the study therefore chooses the following as variables for consideration (a) Health service delivery (b) Water and sanitation (c) Education and (d) Environmental protection

It has been well documented that government policies regarding the provision of public goods are well embedded in the programmes that are executed by specialized agencies. For instance, programmes that affect Primary health-care delivery are overseen by the National Primary Health-Care Development Agencies (NPHCDA), while programmes that affect basic primary education are overseen by Universal Basic Education Board (UBEB). Government programmes overseen by these national agencies are often cascaded from national to the states and local government areas. Therefore, provisions of public goods in this study are captured by the performance (quality indicators) of primary health service delivery and basic primary education in Nigeria. Health sector performance is often judged by DPT (Diphtheria, Polio and Tetanus) and measles immunization rates, life expectancy and infant mortality rates. DPT and measles immunization (which are the major components of childhood vaccine preventable diseases) are carried out by health facility workers at the primary health-care levels. Thus, immunization measures describe the rate of vaccination coverage of children under 12 month to 23 months of age. These are direct government health policies that enhance level of health of the people and hence can be adjudged as good measures of the public provision of health. Some of the measures assessing the successful implementation of the immunization campaign programs are improvement in infant mortality rates and consequently, life expectancy. Physical indicators usually examined for improvement in education in Nigeria is the level of literacy rate, primary and secondary education enrollment rate and pupil-teacher ratio. Secondary school enrollment divided by population of secondary school age or the ratio of the number of pupils to the teachers in primary schools is important indicators of public education because government education policies have a direct effect on such indicators. Literacy rate of the nation is a product of the efficiency of government policies in the provision of adequate primary and secondary education.
Thus the operational definition of variables used in this study are defined as follows,

It is expected that democratization should improve the provision of public goods since members of the National and State Assemblies are direct elected representatives of their constituencies who have the mandate to draw government attention to the plight of their constituencies.

3.2 Model specification and validation

The VAR model is specified in this study is an adaptation of the model specified by Dalsgaard and Serres (2000) and Liu and Liu (2009). The reduced form VAR can be written as follows:

$\Delta Y_t = A_i Y_{t-1} + \ldots\ldots\ldots + A_p Y_{t-p} + \varepsilon, = A(L)Y = \varepsilon_t,$

Where, *Yt* stands for a vector with k dimensions; *Ap* is the *p*-th k*k matrix; *Yt-p* is the *p*-th lagged variable articulating to *Yt*; ε_t is a vector of reduced form error and *A(L)* is a finite polynomial. In this paper, we provide an empirical framework to analyze debt dynamics as it affects public goods provisioning in Nigeria using data from 1987 to 2013. The VAR model proposed by Sims (1980) has been severally applied in studying the relationship between and amongst variables in a stochastic model. The general purpose of our VAR model is to decompose the fluctuations in the provision of public goods arising from shocks inherent in government expenditure.

Table 4. Description of Variables

Variables	Description
Health (Mimmunization)	Measles Immunization measured as the percentage of children ages 12-23 months who received measles vaccinations
Education (Prenrolment)	Total enrollment in primary education regardless of age, expressed as a percentage of the population of official primary education age
Water and sanitation (WSupply	Access to an improved water source refers to the percentage of the rural population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection).
Environmental Protection (CO2)	Carbon dioxide emissions stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring
Public debt (Pubdebt)	The percentage total sum of debt (domestic and external) incurred by the government measured as the ratio of public debt to gross domestic product
Gross National income (GNI)	The percentage ratio of gross domestic product to national population
Governance	Measured as the legislative/military governance of Nigeria. A dummy of 1 and 0 are chosen to represent the era of democratization and military era

(Source; adapted from www.data.worldbank.org/indicators)

The target of every government in all economies is to maximize the provision of public goods subject to availability of resources within their disposal. Thus, for simplicity, we assume that the public goods for which resources are committed are the outcomes of public debt incurred. Therefore, the building framework of our model is estimated as thus,

$Outcome_t = \beta_0 + GNI_t + PubDebt_t$ ……(1)

Where,

Outcome = Vectors for health sector services, rural water supply and sanitation, educational services and environmental preservation,

GNI = Gross national income which is a ratio of GDP to national population

PubDebt = ratio of public debt to gross domestic product

Equation 1 indicates that (a) provision of public goods (Outcome) will contemporaneously increase as national income and public debt increases, (b) an increase in public debt should contemporaneously increase the provision of public goods if other sectors are excluded from the usability of public debt so incurred.

Taking logarithmic transformation, equation 1 will be specified as thus,

$\text{Log (Outcome)} = \alpha_0 + \lambda \log (GNI_t) + \beta \log (PubDebt_t)$ ……..……..(2)

Equation 2 is estimated to show the link between public debt expenditure on the associated improvement on the provision of the public goods (outcome)

The above equation presupposes that all incurred public debt y is spent on the provision of public goods. However, it is common knowledge that the total sum of public debt incurred are not spent on the provision of public goods alone since there are several other contending economic challenges that also require central government attention. If we assume that usually a fraction of the public debt incurred are spent on the provision of public goods, then the δ coefficient will be rewritten as

$\beta = y(\omega)^* \beta^*$ …… (3)

where β^* is the expected productivity of public goods and y represent level of internal mechanism which measures the efficiency in utilization of the fraction of public debt $(\omega)^*$ spent on the public goods. The internal mechanisms that this study identified are the amount of tax revenue received and the quality of the governance system in the economy. Governance variable referred in this study is the democratic governance which assumes the basic principles of effective representation (such as respect for human rights, participation of the citizens in decision making, accountability and responsiveness, equal treatment of citizens, impartiality in the

provision and distribution of resources to different sections of the population). Therefore, governance is represented as a dummy variable, 0 for military era and 1 for democratic era. Therefore, the $\hat{y}$ in equation 4 becomes,

$\hat{y} = \varphi_1 + \varphi_2$ …….. (4)

where, φ_1 and φ_2 represent the level of tax revenue receipt and governance system. Substituting equation 4 into equation 2, we have

$\text{Log (Outcome)} = \alpha_0 + \lambda \log (\text{GNI}) + \beta(\varphi_1 + \varphi_2) \log (\text{Pubdebt}_t)$ …….… (5)

The VAR specification above will require that we enter public debt, vectors of outcome and gross national income as endogenous variables while the variables of governance and tax revenue will be entered as structures or exogenous variables. The analysis above helps will us to examine (a) the strength of the provision of public good given the presence or rather, the absence of tax revenue and governance (b) the role governance and tax revenue play in strengthening the provision of public goods.

The VAR model has been acclaimed for its ability to investigate shocks transmission among variables since they provide adequate information on impulse function. It is often of interest to know the innovations in one variable following an impulse response from another variable in a system that involves a number of other variables as well. The impulse response function in this study tells us how public goods (Education, Health services, roads and railways, infrastructures) respond to public debt shocks.

4.1 Results of descriptive analysis

The next section presents the results obtained from the estimated VAR model. The result of the descriptive statistics presented in table 5 indicates that the trend of public debt has a mean value of 3.58 per cent with a growth trend ranging between a minimum value of 2.45 and a maximum value of 4.75 percent. Gross National income recorded a mean value of 10.70 percent with a minimum value of 8.25 percent and a maximum value of 13.59 percent. Measles Immunization for children below 5 years and Primary school enrollment of pupils had a mean value of 3.49 percent and 4.53 percent respectively. While the trend of measles immunization showed a minimum value of 1.38 percent and a maximum value of 4.15 percent, the trend for primary school enrollment recorded a min value of 4.36 percent and a maximum value of4.72 percent.

Table 5. Summary descriptive statistics of public debt and the outcome variables

Variables	Obs	Mean	Std Dev	Min	Max	Median
Public debt	34	3.58	0.68	2.45	4.75	3.52
Gross National Income	34	10.70	1.87	8.28	13.59	10.21
CO2 emission	34	4.06	0.29	3.47	4.46	4.14
Measles Immunization	34	3.49	0.69	1.38	4.15	3.66
Water supply and sanitation	34	3.53	0.26	2.99	3.91	3.56
Primary school enrollment	34	4.53	0.09	4.36	4.72	4.52

Source: Extracted from E-views 9.0 output.

4.2 Correlation analysis

The correlation result is presented in table 6 below shows that public debt has a positive correlation of 19 percent with the level of measles immunization coverage in Nigeria. The highest level of correlation was observed between gross national income and public debt. The result indicated that an increase in public debt will result to a 66 percent increase in gross national income, similarly, an increase in public debt also increases primary school enrollment by 55 per cent.

Table 6 Correlation result

PUBDEBT	PUBDEBT	IMUNIZATION	GNI	CO2	WSUPPLY	PREROLEMENT
	1					
IMUNIZATION	0.19	1				
GNI	0.66	0.45	1			
CO2	-0.47	-0.67	-0.33	1		
WSUPPLY	-0.02	-0.29	-0.48	-0.04	1	
PREROLEMEN	0.55	-0.21	0.43	0.11	-0.35	1

Source: Extracted from E-views 9.0 output

The result further revealed that public debt had a negative relationship with carbon-dioxide emission (CO2) and water supply. Although the result for carbon di-oxide is expected, the result for the relationship between public debt and water supply is absurd, revealing that public debt does not exert a positive impact on the

provision of rural water supply in Nigeria.

4.3 Diagnostic test for the VAR result

To determine the appropriateness of the VAR model, the study carried out some basic diagnostic test. The AR roots test will determine the suitability of the VAR to test for impulse response. The report of the inverse roots AR polynomial characteristics reported in Fig 4.1 below affirms that all the roots have absolute values less than one and all roots lie within the unit circle.

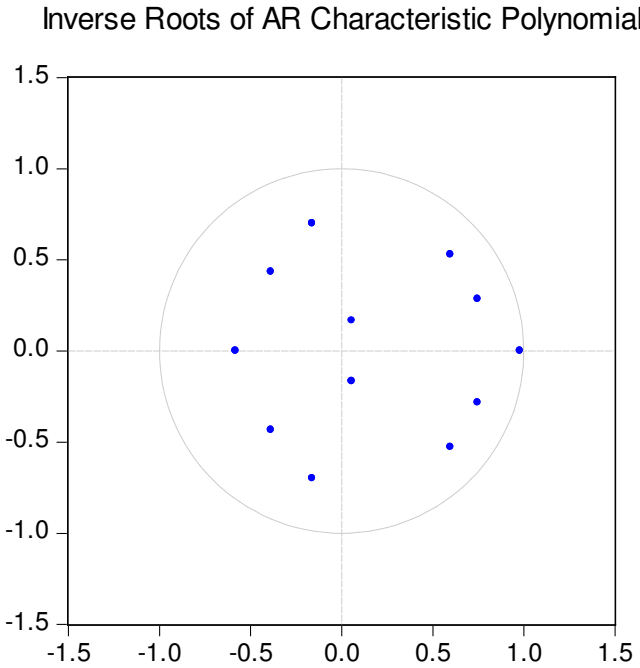

Figure 2 Inverse roots of AR characteristic polynomial

The inverse roots result therefore suggests that the variables are not only stationary but the model is also stable.

The result of the maximum lag length criteria as shown in Table 4.3 indicated that LR and SC test statistics suggested a lag length of one while the FPE, AIC and HQ test criteria suggested a lag length of three.

Table 7 lag length selection criteria

VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC
0	78.32835	NA	8.25e-10	-3.892152	-3.059514
1	235.0897	222.5000*	3.77e-13	-11.68321	-9.185294*
2	274.0861	40.25437	4.76e-13	-11.87652	-7.713336
3	339.5390	42.22766	2.44e-13*	-13.77671*	-7.948246

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The study adopted an optimal lag length order of 3 as suggested by FPE, AIC and HQ selection criteria.

4.4 Result of the outcome variables and public debt

The result of the unrestricted Vector Autoregressive model is presented in Table 4.4 below. All the variables were entered as endogenous variables. One of the unique characteristics of the VAR model is that it treats the entire variables both as dependent and independent variables. The result below characterizes the outcome variables as dependent variables according to equation 5.

Table 8: Unrestricted VAR result with endogenous variables

	Outcome variables			
	CO2	M.Immunization	Water Supply	P.Enrollment
Independent variables				
Public debt(-3)	0.4203	-0.1037	0.002864	0.005658
	[2.795]	[-0.329]	[0.16887]	[0.06980]
Gross Nat Income (-3)	-0.4287	-0.0225	-0.01979	0.050773
	[-1.117]	[0.0294]	[0.47913]	[0.25717]

Source: Extracted from E-views 9.0 output (The values in parenthesis are the respective t-statistics)

Measles immunization is observed to have a negative relationship between public debt and gross national income. Basically, one would expect that an increase in the public debt profile should contemporaneously lead to an increase in the level of immunization coverage in Nigeria. An improvement in health status should (all things being equal) lead to an improvement in gross national income of the country. A healthy work force should impact positively on the productivity and the income of the citizens, especially, if they live devoid of ailments. Therefore, if the workforce, and by extension, the health of the citizens are impaired, it is expected that there should ultimately be a reduction in the national income of the nation as observed in the result obtained in this study.

Quite interestingly government public debt is seen to have a positive effect rather than a negative relationship with Carbon di-oxide emission (CO2) which is a measure for environmental sustainability. This result puts a very big question mark on the funds that had been budgeted for ecological disasters. The result further revealed that the incessant destruction of properties and lives usually witnessed during ecological disaster impact negatively on the gross national income of the country. An increase in ecological disasters is seen to reduce Nigeria gross national income by 42.8.

Public debt is seen in this study to insignificantly contribute a mere less 5 percent increase in primary school enrollment. This result is not surprising since State primary school enrollment has been observed to suffered serious decline, particularly in the northern part of the country where for close to a decade now the country has been witnessing severe political, economic and social unrest. The failure of government to guarantee adequate and sustainable educational institutions in the country has led to the proliferation of private sector investment in the educational sector. Worse still, this private sector investment in the nation's educational system is only available in the urban areas, still leaving the rural areas with deplorable educational system.

4.5 Synergizing governance and tax revenue with the provision of public goods?

The study included governance and tax revenue as structures in determining the effectiveness in government provision of public goods. The result from this study is presented in table 4.5.

Table 9. Unrestrictive VAR with structural variables

	Structural variables	
	Governance	Tax revenue
Independent variables		
Public debt (PubDebt)	0.50514	0.07517
	[0.73633]	[0.15617]
Measles Immunization (M.Immunization)	-0.19486	-0.10790
	[0.43440]	[-0.34284]
Gross National Income (GNI)	-0.34028	0.59405
	[-0.97220]	[2.41890]
Rural Water Supply (W.Supply)	-0.05847	0.05556
	[-2.50221]	[3.38869]
Primary school enrollment (P.enrollment)	-0.07966	0.06233
	[-0.80256]	[0.89509]

*The figures in parenthesis are the respective t-statistics
Source: Extracted from E-views 9.0 output

The result above indicates that governance has a negative and insignificant effect on Nigeria's gross

national income, measles immunization, primary school enrolment and rural water supply, and positive effect on carbon di-oxide emission. The implication deducible from the result is that a weak governance structure is observed in Nigeria. The governance system in Nigeria is incapable of advocating and strengthening the provision of public goods. Furthermore, the observed weak governance structure has demonstrated severe ineffectiveness in reducing the burden of public debt in Nigeria. Furthermore, democratic governance in Nigeria has demonstrated further weakness in determining and directing public debt funds to the provision of public goods. It may appear apparent that the legislatures (elected from amongst the people) may have been on self-seeking venture and not particularly concerned about representing the poor through the enactment of appropriate legislations and also enforcing that such legislations are directed towards the provision of public goods.

Tax revenue is observed to exert a positive effect on the entire public goods outcome apart from measles immunization. The significance of tax revenue in promoting public goods provisioning was only observed in gross national income, carbon dioxide emission and rural water supply. Government Tax revenue receipt exerted appreciable impact on improving the provision of public. The result further observed that a unit increase in tax revenue only leads to a mere 7 percent increase in public debt as opposed to governance which increases public debt by over 50 percent. It is expected that a responsive, effective and accountable governance system should have an appreciable impact on reducing the public debt profile of economies, through a unified and consolidated system of resource management. From the study it could be inferred that weak governance crowds-out the expected effect that tax revenue should have had on the economy. Where this (good governance) is lacking then no amount of revenue mobilized by agencies will have a positive developmental effect on the economy.

The result in this study confirms the opinion of Earle and Scott (2010) and Moore (2001) that 'bad governance system' as identified by international development agencies, is a major obstacle to economic growth and improved welfare in poor countries. Thus, any economic system which encourages, corruption, unaccountability and irresponsibility amongst public office holders, devoid of transparency, will usually witness severe weaknesses in the provision of social welfare to the citizens, and such is the problem faced by developing countries.

4.6 Impulse response function

An impulse function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. Therefore, impulse response function in this study will clearly specify the response of outcome variable to shocks or variations arising from public debt in Nigeria. The solid middle lines represent the impulse response curve, while the dotted lines represent +/- twice the standard deviation of the deviation from the band.

(a) Impulse response function of Measles Immunization to shocks from Public debt

The result in Fig. 4.2 shows that when a positive shock arises due to a unit increase in public debt, measles immunization will respond negatively in the first month then rises positively until it reaches its peak in the 3rd month then falls negatively again to its lowest ebb in the 4th month where it remains negative for a long period of time until the 7th month where a positive effect is again realized. The result reveals that public debt shocks has an immediate negative effect on measles immunization in Nigeria.

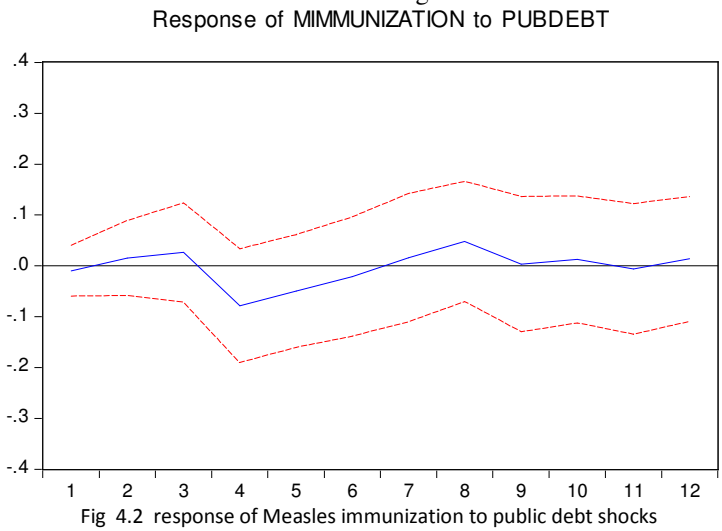

Fig 4.2 response of Measles immunization to public debt shocks

(b) Impulse response function of gross national income to shocks from public debt

The result in Fig 4.3 observed that Gross National Income had a positive response following a shock from public debt in the 1st month. This observed positive response decreased gradually until it become negative in the 4th

month where it remained negative until 10th month. The implication of this result is that public debt exerts a positive effect on the Gross National Income of the country only in the short run. In the long run, public debt is not seen to be beneficial to the economic development of the country.

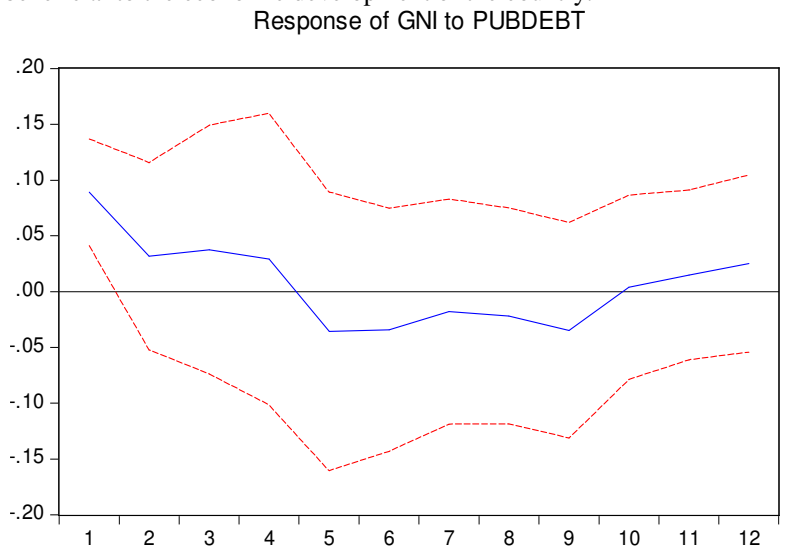

Fig. 4.3 Impulse response of Gross National Income to Public Debt shocks

(c) Impulse response function of environmental protection to shocks from public debt

The result of the Impulse response function of Environmental Protection to shocks from Public debt is presented in Fig 4.4 The result shows that Environmental Protection as represented by carbon-dioxide (CO2) responded negatively immediately following a shock from public debt in the 1st month. However, the negative response fizzled out in the 2nd month where it became positive until the 7th month when it again became negative, falling to its lowest ebb in the 8th month. The result indicates that public debt shocks exert a positive innovation on environmental protection for only a short period of time. The majority of the period observed public debt exerting a negative effect on environmental protection.

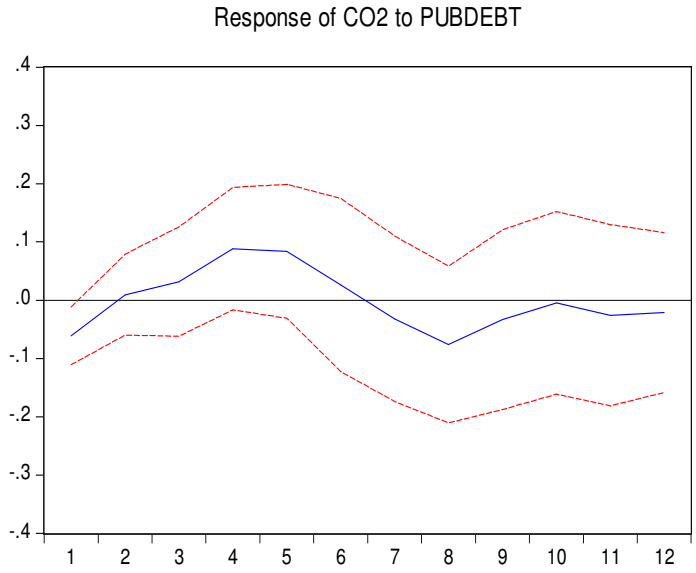

Fig 4.4 Impulse response of Environmental Protection to shocks from Public debt

(d) Impulse response of primary school enrolment from public debt shocks

The result of the impulse response of primary school enrolment to shocks from public debt is presented in Fig 4.5. The result reveals that primary school enrolment had an immediate positive response in the 1st month following shocks from public debt. However, this positive effect gradually declined until the 4th month where it becomes negative. The result further observed that primary school enrolment responded negatively following shocks from public debt for a lengthy period of 6th to the 10th months.

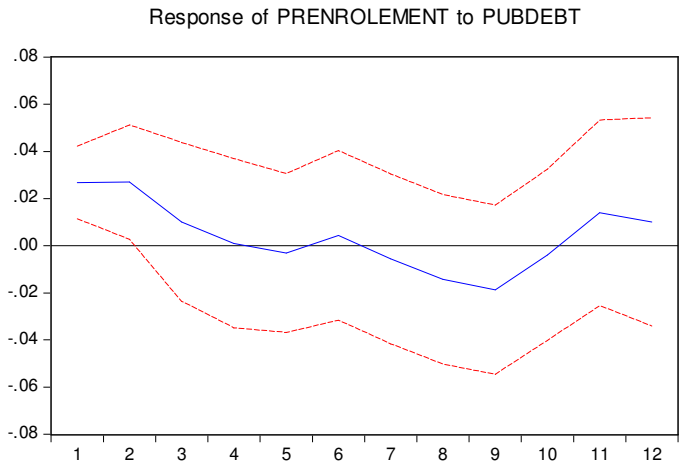

Fig 4.5 Impulse response of Primary school enrolment to shocks from public debt

5. Conclusion and recommendation

The study had its basic intention of investigating the factors that were responsible for the poor provision of public goods despite the continuous increase in the country's public debt profile. Public goods identified in this study were (Health care delivery (Measles Immunization), Environmental protection (Carbon dioxide emission, CO2), Education (primary school enrolment) and Rural water sanitation. Tax revenue and governance variables were introduced into the unrestricted Vector autoregressive (VAR) model as structural variables.

The study observed that tax revenue exerted a positive effect on the entire public goods outcome apart from measles immunization. The significance of tax revenue in promoting public goods provisioning was only observed in gross national income, carbon dioxide emission and rural water supply. Governance as noted in the study had a negative and insignificant effect on Nigeria's gross national income, measles immunization, primary school enrolment and rural water supply, and positive effect on carbon di-oxide emission. The implication deducible from the result is that the governance structure observed in Nigeria is weak and unrepresentative.

The study concludes that good governance which emphasizes accountability, political stability, government effectiveness, regulatory quality, rule of law and control of corruption is necessary to improve the provision of public goods in Nigeria. The study stresses the need to get governance systems right. Improve capacity to design and deliver policies as birth-marked by good governance, are therefore central pillars to reducing Nigeria's public debt and promote an improve welfare state. Given good governance system; policy priorities will therefore be set based on which actions produce more results in terms of efficiency, effectiveness, and responsiveness; which produce the most benefit for the poor; which political actions logically precede others; which are easier to undertake or produce results in the short term; and under what conditions particular reforms are likely to have the most impact.

The study further recommends that there should be an annual auditing of all government MDAs accounts by external auditors to ensure (a) accountability of public debts utilization, (b) transparent in implementation of program support funds, (c) integrity of agencies responsible for program management, and (d) measuring program effectiveness with amount of funds expended.

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