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Wagner's Hypothesis: An Empirical Verification for Nigeria

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Abstract: The study assessed the validity of Wagner's hypothesis in Nigeria by evaluating the relationship between government expenditure and economic growth spanning the period of 1986 to 2019. To do this, the study used the Toda-Yamamoto (T-Y) procedure. Using gross national product as proxy for economic growth and total government expenditure, findings from the T-Y estimation revealed that there was no causal relationship between government expenditure and economic growth in Nigeria, invalidating Wagner's law that states that public expenditure rises constantly as income growth expands. It concludes that despite the rising government expenditure in the country over the years, economic growth has not recorded corresponding growth. To reverse this, the study recommends that government expenditure should be strictly tied to projects that are growth enhancing. In addition, a top-down budgetary management should be applied, and the implementation of expenditure programs should be promoted through rigorous quality assurance to guarantee value for monies spent.

Keywords: Wagner's hypothesis, Government expenditure, Economic growth, Toda-Yamamoto test.

1. Introduction

Originally observed in the 19th century by Adolph Wagner, Wagner's hypothesis states that the share of the public sector in national income increases over time [1]. Known as the hypothesis of expanding state expenditures, Wagner's law postulates that as government expands its activities, the growth rate in government spending will be proportionally in excess of the national income. The law argues that the development of an industrial economy will be accompanied by an increased share of public spending in the gross national product.

However, across world economies, the size and the role of government presents a contentious issue [2]. The contention is fueled by opposing theoretical and empirical standpoints concerning the viability of government's involvement in the economy. While the Keynesians are of the opinion that government expenditure stimulates economic growth by being complementary to private investment, the Classicals are not so positive about the role of government interference, stating that it is largely ineffective as it crowds out private investment, and stifles growth. Similarly, in line with the Classical view, the Neo-classicals argue that limited government spending is instrumental to an expanding private sector, and by extension, a flourishing economy. Additionally, while recent studies such as [3], and that of[4] supports government's active involvement in the economy, on the other end, [5] and [6]were not so optimistic in their submissions.

Despite the contention, [7] asserted that government's involvement irrespective of the extent in the economy cannot be wished away. They argued that, in line with Wagner's submission, as nations industrialize, the share of public sector in the national economy grows continually, because State expenditure is needed for the social activities of the state, administrative and protective actions, as well as the welfare role of the State. In summary, government needs to provide the necessary facilities needed for the maintenance of law and order and further enhance allocative efficiency in the presence of externalities, while also providing all the necessary infrastructural facilities that will encourage productive economic activities.

In Africa, and in particular, Nigeria, extreme market imperfections make the size of government's involvement in the economy quite substantial. Data from the Central Bank of Nigeria (CBN) indicate that for over three decades, Nigeria's fiscal policy has been expansionary [8], resulting in massive State funded expenditure programs aimed at boosting the economy and managing poverty levels. In line with the CBN data, from N16.22 billion in 1986, total government spending grew to N60.27 billion in 1990. By 1995, government total expenditure in the economy had shot up to N248.77 billion, further increasing to N947.69 billion in 1999. Between 2001 and 2019, massive spending was recorded. In 2001, 2005, 2010, 2015, 2017 and 2019, government total expenditure on the economy was N1,018.00, N1,840.70, N3,993.31, N4650.30, N6,022.28 and N9286.39 billion respectively.

Despite the foregoing, the Nigerian economy is burdened by sluggish output growth rate, low and unpredictable revenue profile, an unsustainable debt level, and with the country now holding the unenviable distinction of being the poverty capital of the world [9], Nigeria's expansionary expenditure programs over the years can be described as contentious. Consequently, this study provides empirical evidence to ascertain the

causal relationship between government expenditure and economic growth in Nigeria. In other words, it assesses the validity of Wagner's law in Nigeria spanning 1986 to 2019.

2. Literature Review

2.1 Conceptual Review

The key concepts of government expenditure and economic growth underlying Wagner's hypothesis were defined as follows;

2.1.1 Government Expenditure- [10]defined government expenditure as all government consumption, investment, and transfer payments. Similarly, [2] sees it as expenses incurred by the government for its own preservation, which can be social as well as economical. Government expenditure majorly reveals the policy choice of the government, as it comprises of recurrent expenditures and capital expenditures. While capital expenditure represents the part of government spending that goes into the creation of assets like schools, hospitals, colleges, roads, dams, railway lines, bridges, airports, seaports, etc., recurrent expenditure on the other hand representsall payments other than for capital assets, including payments on goods and services, (wages and salaries, employer contributions), interest payments, subsidies and transfers, etc.

2.1.2 Economic Growth- Economic growth represents the expansion of a country's potential output.[11]defined economic growth as an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. [12] stated that economic growth corresponds to the increase of a country's potential output caused by increase in advanced technology, capital stock and improvement in the quality and level of literacy. It represents the increase in the market value of goods and services produced by an economy over time. Economic growth is essential to every country and particularly to developing countries in order to fast track their pace of development.

2.2 Theoretical Framework

Wagner's law of increasing State spending forms the theoretical framework of this study. Adolph Wagner stated that the share of the public sector in national income increases over time [1]. He was the first to recognize a positive correlation between government expenditure and economic growth, which is referred to in the literature as Wagner's law. Wagner's theory holds that for any country, public expenditure rises constantly as income growth expands. The law argues that the development of an industrial economy will be accompanied by an increased share of public expenditure in a nation's gross national product. In his view, Wagner opined that a long-run elasticity larger than unity is assumed for public spending and economic growth, implying that the role of government increases because of economic growth. This is further explained by the growing demand for regulatory and protective functions which are required to sustain the increasing levels of economic wealth.

In addition, as countries grow wealthier, the demand for public goods like education, healthcare and cultural services increases likewise. The theory states that the need for goods and services provided by the government increases with a country's industrialization because of the following three reasons. Firstly; as the economy grows, the public sector will take over the administrative and protective functions previously performed by the private sector. Secondly; as the economy grows, the need for provision of social and cultural goods and services increases as well. And lastly; as the economy grows, more government intervention is needed to manage and finance natural monopolies and to maintain functional market forces.

In summary, Wagner's theory, which is known as the law of increasing state spending, simply predicts that the development of an industrial economy will be accompanied by an increased share of public expenditure in the nation's gross national product, indicating a causal relationship between government expenditure and economic growth

2.3 Empirical Literature

In line with the objective of the study, several related literatures were reviewed. Particularly, [4] investigated the effect of government expenditure on economic growth in Nigeria using annual time series data spanning 1986 to 2018. Employing the Multiple regression technique, it tested the impact of government capital expenditure, government recurrent expenditure, money supply, gross fixed capital formation and labor force participation rate on economic growth proxied by GDP. The empirical finding revealed that government capital and recurrent expenditures had a positive and significant impact on economic growth, thus stating that government expenditure drives economic growth in Nigeria.

Similarly, [13] also examined the effects of government infrastructural expenditure on economic development in Nigeria spanning the period of 1981 to 2018. The study used the Error Correction Model (ECM) to assess how government spending on several infrastructural areas, viz; transportation, communication, education, health, agriculture and natural resources impacted on economic growth (GDP). Findings from the

study revealed that government's spending on transport, communication, education and health infrastructures had significant positive impact on growth, however, spending on agriculture and natural resources infrastructures had a significant inverse impact on economic growth in the country.

Furthermore, [7] analyzed the relationship between government capital expenditure and private investment in Nigeria using annual time series data spanning 1981 to 2016. It used the Johanson co-integration and the Toda Yamamoto (T-Y) procedures to ascertain the nature of relationship between private sector investment and government capital expenditure in Nigeria. The co-integration test confirmed the existence of long-run relationship between the government capital spending and private investment, while the result of T-Y test revealed the existence of bi-directional causality between private sector investment and government capital expenditure in Nigeria. The study noted that government capital spending is essential for private sector growth.

In a similar development, [5] analyzed how public expenditures affected economic growth in Nigeria covering the period of 1981 to 2017 using the Auto-Regressive Distributed Lag (ARDL) model and the Granger causality test as estimation techniques. While using real GDP as the dependent variable, the independent variables were total government recurrent and capital expenditures as a percentage of GDP, total public debt as a percentage of the GDP, private consumption expenditure, and gross domestic investment as measured by annual growth of gross capital formation. Empirical findings showed that recurrent expenditures of government negatively and significantly affected economic growth, while public capital expenditure had a positive impact, but did not significantly affect economic growth over the period of the study. Further results from the causality test revealed that government's debt financing strongly granger caused public expenditures and domestic investment with the latter also granger causing growth in the economy.

In a similar study outside Nigeria, [2] evaluated the impact of expenditure compositions on economic growth in Afghanistan using annual time series data spanning 2004 to 2019. The GDP was used as the dependent variable, while public expenditure compositions (expenditure on education, security, and infrastructure) were used as independent variables. Employing the ARDL model, the study found the existence of a long-run relationship in the model. Furthermore, the previous and current expenditures on education and infrastructure had significant positive impacts on economic growth in Afghanistan. However, security spending was negatively linked with the growth rate of the economy.

In evaluating the relationship between government spending, tax revenue and the economic growth of Canada, France, Germany, Italy, Japan, UK, and the US economy, [3] employed annual data for the G7 countries covering 1980 to 2016. It employed two different panel causality approaches in order to make a comparison. In line with the time domain panel causality test results, there was a bidirectional causality between economic growth and government expenditure but unidirectional causality between tax revenue and government expenditure. However, there is no causal relationship between economic growth and tax revenue. Furthermore, the frequency domain causality result showed that there was a bidirectional short and long-run causality between economic growth and tax revenue, and long-run causality between economic growth and government expenditure.

[14] used a data-set covering 1981 to 2018 to determine the validity of Wagner's law in Nigeria. The study investigated whether there exists a relationship between total government expenditures and economic growth in the country. It employed the Johansen co-integration test, the Granger causality test and Multiple regression to carry out its empirical analysis. Variables used in the study were real GDP, government capital and recurrent expenditures, government total expenditure, population growth, and per capita income. In addition to confirming the existence of long-run relationship in the model, empirical findings from the study affirmed the validity of Wagner's law in Nigeria.

In a review of international literatures, [15] provided an insight into the relationship between public expenditure and economic growth based on a comprehensive review of previous empirical evidence across various countries since the 1980s. Using content analysis, the study grouped studies on the impact of public expenditure on economic growth based on their results. Three groups emerged, viz; positive impact, negative impact, and no impact. This was then followed by a review of each of the relevant study and an evaluation of which outcome was more prevalent among the existing studies on the subject. The reviewed literature revealed that the impact of government spending on economic growth is not clear cut. Particularly, it varies from positive to negative, with several studies even finding no impact. Although the impact of government spending on economic growth was found to be inconclusive, however, the scale tilted towards a positive impact.

Also, [16] used Multiple regression to test the effect of state budget expenditure using two major components, viz; development investment expenditure and recurrent expenditure on the Vietnamese economy for the period of 2000 to 2017. The empirical evidence from the analysis showed that the state budget expenditure of Vietnam had positive effect on the economy, however the two distinct components had different impacts. While recurrent expenditure had significant positive impact on the Vietnamese economy, there was no evidence to affirm the relationship between the development investment expenditure and economic growth.

Likewise, [17] examined how Russia's GDP growth responded to changes in the structure of general government spending between 2000 and 2017. The study employed the Structural Vector Autoregression (SVAR) on public expenditures as a percentage of GDP on economic growth. The study found that redistribution in favor of productive expenditures (national economy, education, healthcare) increases the rate of economic growth, and an increase in the share of unproductive expenditures (national defense, social policy) reduces it.

Furthermore, [18] examined the impact of government expenditure on the growth of the Nigerian economy between 1980 and 2017. The Vector Auto-regression (VAR) technique was applied on the data-set of GDP, government recurrent expenditure, government capital expenditure, and government fiscal deficit. Findings from the study led to the conclusion that government capital expenditure had a positive but insignificant effect on the growth of the Nigerian economy. Also, it was revealed that government fiscal deficit had insignificant negative effect on the growth of the Nigerian economy. Lastly, the study revealed that both in the short and long-run, government recurrent expenditure had an insignificant positive effect on the growth of the Nigerian economy.

Additionally, [19] analyzed the effect of government expenditure on economic growth in Nigeria spanning 1981 to 2016. The ARDL procedure was applied on the variables of real GDP, and government capital and recurrent expenditures. Empirical findings revealed that capital expenditure had a positive relationship with economic growth, while recurrent expenditure had a negative relationship with economic growth, both were however not significant, thus stating that capital and recurrent expenditures had no significant effect on economic growth in Nigeria.

With respect to previous studies reviewed, this work represents a recent attempt that examines the relationship between government expenditure and economic growth in Nigeria. Government investments in the form of expenditures extends beyond the domestic economy, as such, the use of gross domestic product as a proxy for economic growth as identified in previous studies becomes inadequate in a study that assesses government expenditure on the performance of the economy in general. Consequently, unlike previous studies, this study used the gross national product which is a more comprehensive and integrated proxy to measure economic performance. Additionally, it employed the superior Toda Yamamoto (T-Y) procedure to carry out its empirical analysis.

3. Methodology

3.1 Data and Method of Analysis

Secondary data was employed for the study. It used annual time series data spanning the period of 1986 to 2019. The data were sourced from the 2019 annual CBN statistical bulletin and the World Bank Data base of 2019. To ascertain the validity of Wagner's law in Nigeria, the study used the Toda-Yamamoto (T-Y) procedure

Following [20], the justification for using the T-Y approach stems from the fact that it helps in overcoming the problem of asymptotic critical values when causality tests are done in the presence of non-stationarity or no co-integration, as such, the T-Y test minimizes the risks associated with the possibility of a wrongly identified order of integration. Similarly, the approach is applicable for any arbitrary levels of integration for the variables.

3.2 Model Specification

The study adapted the work of [19]. Consequently, it used the variables of economic growth proxied by gross national product and government total expenditure to carry out its empirical analysis. The causal model specification for the T-Y procedure are given in the equations below:

$$LnGNP_t = \alpha_0 + \sum_{i=1}^{k} \varphi_{1i} LnGNP_{t-1} + \sum_{j=k+1}^{k+d\max} \varphi_{2j} LnGNP_{t-j} + \sum_{i=1}^{k} \lambda_{1i} LnGEXP_{t-1} + \sum_{j=k+1}^{k+d\max} \lambda_{2j} LnGEXP_{t-j} + \varepsilon_{1t} \quad (1)$$

$$LnGEXP_t = \beta_0 + \sum_{i=1}^{k} \phi_{1i} LnGEXP_{t-1} + \sum_{j=k+1}^{k+d\max} \phi_{2j} LnGEXP_{t-j} + \sum_{i=1}^{k} \varpi_{1i} LnGNP_{t-1} + \sum_{j=k+1}^{k+d\max} \varpi_{2j} LnGNP_{t-j} + \varepsilon_{1t} \quad (2)$$

where, α_0 and β_0 are the intercepts; φ, λ ϕ and ϖ are the parameters of the model; ε_t represents the residuals of both models; *k* denotes the optimal lag length; *dmax* is the maximum order of integration suspected to occur in the system; *LnGNP* represents the natural log of gross national product, and *LnGEXP* stands for the natural log total government expenditure.

3.3 Estimation Procedure

The empirical analysis for the study begins by giving the descriptive statistics of the data-sets. It summarizes the basic statistical features of the data under consideration by providing a historical background for the behavior of the data distribution.

The implementation of the T-Y procedure follows these 3 stages;

Step 1:Determination of the Maximum Order of Integration

The first step for the T-Y test involves the testing of the time series to determine the maximum order of integration (*dmax*) of the variables in the system. This was done using the Augmented Dick Fuller (ADF) and the Kwaiatkowski, Phillips, Schmidt and Shin (KPSS) unit root tests. For the case of the ADF test, the null hypothesis is non-stationarity, while for the KPSS, the null hypothesis is that of stationarity.

Step 2:Determination of the Optimal Lag Length (*k*)

The *k* is always unknown and has to be obtained from the VAR estimation of the variables in their levels. In the econometric literature, a number of selection criteria have been proposed that can be used to determine the optimal lag order. The criteria considered in this study are the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC), and the Hannan-Quinn Criterion (HQC).

Step 3:Testing for Causality

The causality test is done by using the Modified Wald procedure in the VAR system, where the optimal lag length is equal to $k + d\max$. The Modified Wald test has an asymptotic chi-square distribution with *k* degrees of freedom in the limit when a $VAR(k + d\max)$ is estimated. The causality between two variables can be described as unidirectional, bidirectional or no causality considering these decision rules; unidirectional causality occurs when either null hypothesis is rejected, bidirectional causality exists when both null are rejected, and no causality exists if neither null hypothesis is rejected.

As post-estimation tests, the study carried out the VAR Residual Serial Correlation LM test to test for serial correlation and used the Inverse roots of AR characteristic polynomial to test for the stability of the model.

4. Presentation & Analysis of Result

4.1 Descriptive Statistics

The descriptive statistics on Table 1 provides the basic statistical features of the data-set under consideration.

Table 1: Descriptive Statistics

Statistics	*GN*	*PGEXP*
Mean	29.827466	6.637337
Maximum	32.578879	9.136305
Minimum	25.985832	2.786245
Skewness	-0.39397	-0.612025
Kurtosis	1.868406	2.149472
Jarque-Bera	2.693590	3.147401
Probability	0.260072	0.207277
Observations	34	34

Given the mean values of each data set, evidence of variations was observed in the data-set as shown by the difference between the minimum and maximum values of both distributions. The skewness of the dataset indicated that slight deviations from the mean were negatively skewed. The kurtosis indicated that both data-set were platykurtic, indicating that both distribution produced fewer and less extreme outliers. Additionally, the probability of the Jarque-Bera statistics conducted at the 5% level accepted the null hypothesis that the population under consideration were normally distributed.

4.2 Unit Root Test

Considering the sensitivity of the T-Y procedure to the order of integration of a data-set, the study conducted the Augmented Dickey-Fuller (ADF) test and the Kwaiatkowski, Phillips, Schmidt and Shin (KPSS)

tests. Carrying out these two tests is considered reliable noting that the null hypotheses for both procedures are mirror opposites, i.e., while the ADF tests the null hypothesis for the presence of unit root, the KPSS procedure is converse. The results of both tests are presented on Table 2.

Table 2: ADF & KPSS Unit Root Test Results

Variable	ADF Stat.	Order	KPSS Stat.	Order
GNP	11.42984 (-2.954021)	1(0)	0.249492 (0.463000)	1(1)
GEXP	8.939843 (-2.960411)	1(1)	0.349782 (0.463000)	1(2)

Fig. in parenthesis represents the critical values at the 5% level.

The unit root test on Table 2 showed different orders of integration for both test procedures. A confirmatory analysis of both the ADF and the KPSS procedures showed that only *GNP* was stationary, following the ADF test (i.e., at levels 1(0)). The KPSS unit root test however indicated that *GNP* was stationary at first difference (1(1)). *GEXP* indicated stationarity at the 1st and 2nd orders for ADF and the KPSS unit root tests respectively. To determine the maximum order of integration (*dmax*) of the variables in the system, the study adopted the KPSS procedure as a result of the fact that the ADF procedure is fragile to structural breaks in comparison to the KPSS procedure. Consequently, the *dmax* for the T-Y procedure in this study was 2.

4.3 The Lag Length Selection Test

The first step in carrying out the T-Y estimation based on the Augmented VAR procedure requires selecting an optimal lag length. Consequently, the optimal lag length required for the estimation of the T-Y procedure is carried out as presented on Table 3.

Table 3: Optimal Lag Length Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-48.42242	NA	0.110993	3.477408	3.571705	3.506941
1	38.05252	155.0585*	0.000376	-2.210518	-1.927630*	-2.121921
2	43.45359	8.939699	0.000344*	-2.307144*	-1.835663	-2.159482*
3	44.68599	1.869860	0.000421	-2.116275	-1.456202	-1.909549
4	48.64184	5.456340	0.000432	-2.113230	-1.264564	-1.847439
5	54.53935	7.321053	0.000394	-2.244093	-1.206835	-1.919237

* indicates lag order selected by the criterion
where 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

Analysis of the selection criteria showed that majority of the test criteria chose 2 lags. As such, the study adopted 2 lags in carrying out the T-Y estimation.

4.4 Toda Yamamoto Result

The result of the T-Y causality tests is presented on Table 4.

Table 4: Toda Yamamoto (T-Y) Test Result

Null hypothesis	Chi-sq	df.	Prob.	Remark
LnGEXP does not Granger Cause *LnGNP*	2.256575	2	0.3236	No Causality
LnGNP does not Granger Cause *LnGEXP*	1.464313	2	0.4809	No Causality

The result of the T-Y test conducted at the 5% level indicates that there was no causal relationship existing between government expenditure (*LnGEXP*) and economic growth (*LnGNP*) in Nigeria for the period under analysis. Government expenditure for period under analysis did not cause economic growth and vice versa, invalidating Wagner's law that states that public expenditure rises constantly as income growth increases. Here, increasing public expenditure does not cause growth and vice versa. In line with [5], the result points to the poor growth rate over the years in face of massive government spending.

4.5 Residual Diagnostic Test

To ensure model adequacy, the VAR residual serial correlation test and the inverse root of AR characteristic polynomial stability tests were conducted.

4.5.1 Serial Correlation Test- The result of the VAR Residual Serial Correlation LM test is presented on Table 5.

Table 5: VAR Residual Serial Correlation LM Test Result

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	Df	Prob.	Rao F-stat	Df	Prob.
1	3.781531	4	0.4364	0.965217	(4, 42.0)	0.4366
2	3.543878	4	0.4712	0.902026	(4, 42.0)	0.4715

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	Df	Prob.	Rao F-stat	Df	Prob.
1	3.781531	4	0.4364	0.965217	(4, 42.0)	0.4366
2	6.266949	8	0.6174	0.784477	(8, 38.0)	0.6191

The result of the VAR residual serial correlation LM test led to the acceptance of the null hypothesis considering the probability values of the lags at the 5% level. As such, the study concluded that the T-Y model was free from serial correlation.

4.5.2 Stability Test

The plot of the Inverse roots of AR characteristic polynomial used to test for the stability of the model is presented on Figure 1.

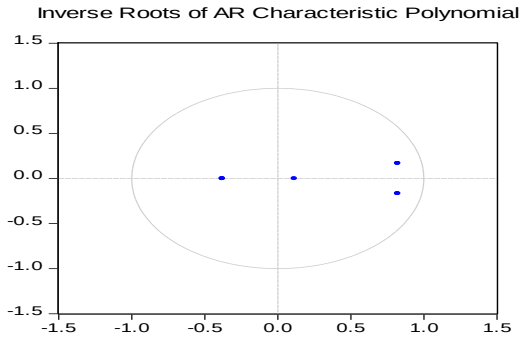

Figure 1: AR Stability Graph

The Inverse roots of the AR characteristic polynomial graph on Figure 1 have roots with modulus which are less than one and they lie within the unit circle, indicating that the model is stable and the conclusions drawn thereof are also reliable. Therefore, the growth model satisfies the dynamic stability condition.

5. Conclusion and Recommendation

5.1 Conclusion

In line with the finding of the T-Y procedure, the study concluded that there was no causal relationship between government expenditure and economic growth and vice versa in Nigeria. Thus, this study invalidates Wagner's law for Nigeria, stating that despite the expansion in government size over the years, economic growth has not recorded corresponding growth.

5.2 Recommendation

To ensure that growth in government expenditure is reflected on the growth of the economy in Nigeria in line with Wagner's postulation, the study recommends that government expenditure should be strictly tied to projects that are growth enhancing. Equally, expenditures should follow strict budgeting and management procedures to ensure that wastages are trimmed and mismanagements are limited, so as to guarantee that every naira expended can be accounted for, thereby ensuring value for monies spent. Lastly, all government expenditure programs should be subjected to proper feasibility studies. Along this line, all projects should be

followed through so as to end the problem of abandoned projects scattered across the country, so as to ensure that all government expenditure programs are beneficial to the economy.

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